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How User and Requirement Risks Moderate the Effects of Formal and Informal Controls on IT Project Performance

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HOW USER AND REQUIREMENT RISKS MODERATE THE EFFECTS OF FORMAL AND INFORMAL CONTROLS ON IT PROJECT PERFORMANCE

Comment les risques liés aux utilisateurs et aux conditions de projet modèrent les effets des contrôles formels et informels sur la performance des projets TI

Completed Research Paper

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Abstract

Controlling information technology (IT) projects is a prime concern for both project managers (PMs) and users, yet little is known about how key risks affect the relationship between controls and performance. Based on data collected on 128 completed IT projects, we examine the moderating effects of requirement and user risk on the relationship between controls and process performance from the perspectives of both the project manager and the user liaison. Both risks were found to suppress the relationship between controls and process performance for each group. While both formal and informal control explain a significant amount of variance in process performance, formal control had a more significant role than informal control from the PM perspective, whereas informal controls play a more significant role than formal controls from the user perspective. The relationship between formal control and process performance was found to be stronger for PMs than for users.

Keywords: IT project management, formal and informal control, requirement risk, user risk

Résumé

En collectant des données issues de 128 projets TI achevés, nous examinons les risques liés aux conditions requises et ceux liés aux utilisateurs comme variables modératrices de la relation entre les contrôles formel et informel et la performance du processus.

Introduction

Successfully managing information technology (IT) projects continues to be a challenge and the success rate for such projects remains low. The Standish Group's 2006 "CHAOS" study update, incorporating data from several thousand IT projects, reveals that only 35% of IT projects started in 2006 were categorized as successful; 19% percent were judged to be outright failures, and the remaining 46% were completed over-budget, behind schedule, or failed in some way to meet user requirements (Rubinstein, 2007). This dismal record of performance suggests that many IT projects would benefit from improved control. However, from prior research we know that there are a multitude of risks that can negatively impact IT projects stemming in part from users and the difficulties associated with obtaining accurate requirements. In this study, we seek to better understand the interplay between risk and control and how this affects process performance.

Prior research on control of IT projects has not been integrated with the literature on IT project risk. Instead, control research has focused primarily on three areas: (1) understanding the specific control modes (e.g., behavior, outcome, clan, self control) used during a project (Choudhury and Sabherwal, 2003; Henderson and Lee, 1992; Kirsch, 1996; Kirsch, 1997), (2) exploring the factors (e.g., project size, outcome measurability, behavior observability) that affect the choice of control modes (Beath, 1987; Kirsch, 1996; Kirsch, 1997; Kirsch et al., 2002), and (3) the dynamics of control (i.e., how do portfolios of controls change during the course of an IT project) (Choudhury and Sabherwal, 2003; Kirsch, 2004).

Surprisingly, the critical relationship between control and performance has received comparatively less attention. Henderson and Lee (1992) established that some modes of control (outcome and self control) influence team performance and others (Klein et al., 2006) have observed a relationship between formal control modes (behavior and outcome control) and project performance. A relationship between formal control and process performance (i.e., the ability to deliver a project on schedule and within budget) was proposed by Nidumolu and Subramani (2003), but never empirically tested. Moreover, the relationship between informal control and process performance has received no attention. Kirsch et al. (2002, p. 496) suggests that this is an important direction for research, stating that there is "little empirical evidence" concerning the relationship between "control and performance".

The control literature speaks to the importance of both project managers (PMs) and users as controllers on IT project (Kirsch, 1997; Kirsch et al., 2002). However, research to date has examined the relationship between control and performance only from the perspective of the project team (Henderson and Lee, 1992; Klein et al., 2006; Na et al., 2004), but not from the perspective of the user. Traditionally, user involvement has been seen as an important IT project success factor. Users are often responsible for articulating business requirements (Ives and Olsen, 1984). Additionally, firms frequently rely on the user liaison role as a means of creating ownership and exercising formal or informal control over IT projects. User liaisons can provide oversight to ensure that IT projects deliver business value and adhere to proposed schedules and budgets (Kirsch et al., 2002). This paper examines the relationship between control and performance from the perspectives of both PMs and users. Thus, our first research question is:

> Research Question 1: *How do formal and informal control affect process performance from the perspectives of both project managers and users?*

While both formal and informal controls are frequently used to manage IT projects, little is known about which type of control has greater influence on process performance. In a multiple case study, Kirsch (1997) observed a greater reliance on formal rather than informal control. However, Choudhury and Sabherwal (2003), who studied outsourced projects, observed a greater reliance on informal rather than formal controls. This suggests that the choice, and presumably the effectiveness, of formal and informal controls may vary depending on the context. Moreover, PMs and users may hold different views concerning the relative effectiveness of formal and informal control on process performance. Therefore, our second research question is:

Research Question 2: *What is the relative impact of formal and informal control on IT project process performance from the perspective of both project managers and users?*

Despite the exercise of various control strategies, many IT projects are delivered late and over budget. Failure to understand and manage risk is often cited as a major cause of IT project problems such as cost and schedule overruns (Alter and Ginzberg, 1978; Barki et al., 1993; Boehm, 1991; Charette, 1989; McFarlan, 1981). This suggests that risks can weaken the effectiveness of controls.

High risks are generally identified as being associated with low project performance (Han and Huang, 2007; Nidumolu, 1996; Wallace et al., 2004a; Wallace et al., 2004b). In addition, high-risk projects may require for higher levels of formal planning and control (Barki et al., 2001). While there has been some research on the impact of both formal controls and various risks on project performance (Jiang and Klein, 2004; Barki et al., 2001; Nidumolu, 1996), little is known about how key risks affect the relationship between controls and performance. Moreover, PMs and users have different perceptions of risk factors (Keil et al., 2002). In this study, we focus on two key risk factors that have been identified in previous research: requirement risk and user risk (Schmidt et al., 2001; Wallace et al., 2004a). Therefore, our third research question is:

Research Question 3: *How do requirement risk and user risk affect the relationships between formal and informal control and process performance of IT project from the perspectives of project managers and users?*

The remainder of the paper is structured as follows. First, we introduce relevant theory, our research model, and present our hypotheses. Next, we describe our research methodology for hypothesis testing which relied on survey data collected from 128 IT projects in China. Then, we present and discuss the results of our study, including the implications of our findings for both research and practice.

Theory, Research Model, and Hypotheses

Formal Control and Informal Control in IS Research

In this research, control is viewed in a behavioral sense (Kirsch, 1997; Kirsch et al., 2002) and is seen as attempts to ensure that individuals working on organizational projects act according to an agreed-upon strategy to achieve desired objectives. In the broadest sense, there are two types of control: formal and informal. The definition and description of formal and informal control are summarized in Table 1.

Table 1. Definition and description of formal and informal control constructs		
Construct	Definition and Description	References
Formal Control	"Modes that rely on mechanisms that influence the controllee's behavior through performance evaluation and rewards" (Choudhury and Sabherwal 2003, p. 292)	Kirsch, 1996; Kirsch, 1997; Choudhury and Sabherwal, 2003
Informal Control	"Modes that utilize social or people strategies to reduce goal differences between controller and controllee" (Choudhury and Sabherwal 2003, p. 292)	Eisenhardt, 1985; Kirsch, 1997; Choudhury and Sabherwal, 2003

Formal control is comprised of two control modes: behavior and outcome-based controls. In behavior control, controllers define appropriate steps and procedures for task performance and evaluate controllees' performance according to their adherence to prescribed procedures (Eisenhardt, 1985; Kirsch, 1997; Kirsch et al., 2002; Ouchi, 1979). In outcome control, controllers define appropriate output targets and allow controllees to decide how to meet them. Performance evaluation then focuses upon the extent to which targets were achieved, and not on the processes used to meet the targets (Henderson and Lee, 1992; Kirsch, 1997; Kirsch et al., 2002; Ouchi, 1979).

Informal control is also comprised of two control modes: clan and self control. In clan control, all members of the work group embrace the same values, adopt similar problem-solving approaches, and commit to achieving group goals (Kirsch, 1997; Kirsch et al., 2002; Kirsch and Cummings, 1996; Ouchi, 1980). In self control, an individual sets his own goals and monitors his/her own goal achievement and rewards or sanctions him/herself accordingly (Henderson and Lee, 1992; Jaworski and Merchant, 1988; Kirsch, 1996; Kirsch, 1997; Kirsch et al., 2002).Here, we conceptualize users as the source of control and the project development team as the target of control for all modes of control except self-control. For self-control, we conceptualize the development team as the source of control and the target of control.

Process Performance

The dependent variable of interest in this study is process performance. Process performance describes how well the software development process has been undertaken. Process performance is defined as the extent to which the project was delivered on schedule and within budget (Nidumolu, 1995; Wallace et al., 2004a) and can be objectively measured. Projects that incur cost and schedule overruns are simply less likely to deliver a successful product (Wallace et al., 2004b). Thus, process performance is a major element of project performance.

Formal control and process performance

As mentioned earlier, formal control is comprised of both behavior and outcome-based controls. Behavior control ensures that proper procedures are followed and can reduce errors and rework in projects, thus minimizing the chance that a project will go over budget or beyond schedule. Outcome control reviews work completed to provide feedback for improvement and corrections (Klein et al., 2006; Love and Josephson, 2004). Formal control can aid development team members in the execution of project tasks and can enable users to better monitor project progress and schedule (Henderson and Lee, 1992). Formal control also ensures greater efficiencies in the selection, planning, implementation and related efforts that contribute directly to the achievement of performance goals (Bello and Gilliland, 1997), such as delivering the project on schedule and within budget. Thus, we state the following hypothesis:

Hypothesis1: *Formal control has a positive effect on Process performance from the perspective of both PMs and users.*

Informal control and process performance

Informal controls focus on the interpersonal or self-regulating dynamics that govern behavior (Ashford and Tsui, 1991; Kirsch, 1997). Through careful selection and socialization, the clan propagates the norms and values, resulting in a group of individuals who share a common ideology, who have internalized a set of values, and who are committed to the clan (Kirsch, 1997; Orlikowski, 1991; Ouchi, 1979). The informal control literature assumes performance is a function of cooperative relationships, characterized by common values and norms (Birnberg and Snodgrass 1988; Kirsch, 2004; Ouchi, 1980). By actively participating in project team meetings and developing a shared understanding of values and goals, users can work cooperatively with project team members and avoid some potential costs (e.g. cost of conflict, negotiation) (Lee and Cavusgil, 2006). The user can also provide support and input for the project team by becoming a regular member of the project team, which can improve process performance. Without a shared understanding and close working relationship between users and developers, it is unlikely that project managers and their development team will be able to deliver successful IT projects (Kirsch, 2004).

Self control represents another mode of informal control whereby individuals not only set their own goals for a particular task, but provide their own monitoring, rewards, and sanctions (Kirsch, 1997). Under self control, one may assume that team members will attempt to reach their goals on schedule and within budget. Self control may have a significant impact on individual performance (Porter and Lawler, 1968; Wright et al., 1993). Moreover, team performance can also improve if team members engage in increased levels of self control (Henderson and Lee, 1992). Thus, we state the following hypothesis:

Hypothesis 2: *Informal control has a positive effect on Process performance from the perspective of both PMs and users.*

The relative importance of formal control and informal control for process performance

Both formal and informal controls are used in IT projects and each type of control can affect performance (Henderson and Lee, 1992). The exercise of control is varied under different conditions (Jaworski et al., 1993). In some cases, there is a greater reliance on formal control, while in other cases there is a greater reliance on informal control (Choudhury and Sabherwal, 2003; Kirsch, 1997).

Role expectations play an important part in determining whether formal control or informal control will be exercised (Kirsch, 1997). As the role of PMs and users are different, it is reasonable to expect that they will have different role expectations. Thus, PMs and users may favor different combinations of formal and informal controls in a manner that is consistent with their respective roles. In this research, we posit that PMs will view formal controls as more effective, while users will view informal controls as more effective. For supporting these conjectures, we turn to Ouchi (1977, 1979) who suggested a framework for determining which types of control are more effective.

If the ability to measure outputs is high and knowledge of the transformation process is perfect, then formal control is more effective and should be chosen. If the ability to measure outputs is low and knowledge of the transformation process is imperfect, then informal control is more effective and appropriate. Support for the Ouchi framework can be found in Kirsch et al.'s research (2002) where it was shown that low levels of outcome measurability and knowledge of the transformation process were associated with increased exercise of informal control.

PMs, by virtue of their role, can be expected to spend considerable time and effort monitoring project outputs and controlling the behavior of team members. PMs will therefore be more likely to appreciate the value of formal rather than informal control in managing IT projects and, consistent with Ouchi's framework, they will be inclined to believe that formal controls are more effective than informal controls. In some organizations, PMs may even be rewarded for meeting the project schedule and delivering the project within budget (Kirsch, 1996). Such incentives provide a further motivation for PMs to favor outcome-based controls (i.e., formal control) and to believe that these controls will have a greater impact on process performance than informal controls. Thus, we state the following hypothesis:

Hypothesis 3: *For PMs, the relationship between formal control and process performance is stronger than the relationship between informal control and process performance.*

Users will generally have less domain-specific knowledge of IT and will lack an in-depth understanding of the IT development (i.e., transformation) process. Users will also tend to be further removed from day-to-day project activities and will therefore have less ability to observe the process and to measure outputs. As a general rule, users are not in the best position to exercise formal controls. Based on Ouchi's (1979) framework, we can therefore expect that users will lean heavily toward informal controls and to believe that these controls will have a greater impact on process performance than formal controls. Thus, we state the following hypotheses:

Hypothesis 4: *For users, the relationship between informal control and process performance is stronger than the relationship between formal control and process performance.*

Since PMs have more experience with IT and possess more expertise relative to users, it is reasonable to believe that PMs will have a greater ability than users to measure project outputs and to understand the development (i.e., transformation) process (Kirsch, 1997). PMs will therefore be more likely to appreciate the value of formal control in managing IT projects and, consistent with Ouchi's framework, they will be inclined to believe that formal controls have a greater impact on process performance than will users. Thus, we state the following hypothesis:

Hypothesis 5: *The effect of formal control on process performance is stronger for PMs than for users.*

In many cases, the user may not be a position to monitor projects closely or to direct developers' behaviors, thus hampering their ability to rely on formal control. Instead, users may find it easier to implement informal controls. Users will therefore be more likely to exercise informal control in managing IT projects and, consistent with Ouchi's framework, they will be inclined to believe that informal controls have a greater impact on process performance. Thus, we state the following hypothesis:

Hypothesis 6: *The effect of informal control on process performance is stronger for users than for PMs.*

Risk and the relationship between control and performance

Consistent with prior literature (Wallace et al., 2004b; March and Shapira, 1987), we define risks as conditions that can pose a serious threat to the successful completion of an IT project. Many studies have focused on identifying, assessing, and mitigating IT project risks (e.g., Alter and Ginzberg, 1978; Barki et al., 1993; Boehm, 1991; McFarlan, 1981; Moynihan, 1997; Schmidt et al., 2001), but comparatively fewer studies have examined the relationship between risk and performance (Nidumolu, 1996; Jiang and Klein, 1999; Jiang and Klein, 2000; Wallace et al., 2004b). From these studies, we know that high risk is associated with low process performance. Although there have been no studies that have focused explicitly on the relationship between risk and control, the literature suggests that project performance can be improved when risk mitigation strategies are fitted to the risk profile of a project (Jiang and Klein, 2004; Barki et al., 2001). This suggests that there may be some interplay between risk and control. In this research, we focus on two key risk factors that may serve as moderators of the relationship between control and performance: requirement risk and user risk. Table 2 shows the definition and descriptions of requirement risk and user risk.

Table 2. Definition and description of requirement risk and user risk constructs		
Construct	Definition and Description	References
Requirement Risk	Uncertainty surrounding system requirements or frequently changing requirements. Also includes incorrect, unclear, inadequate, ambiguous or unusable requirements.	Nidumolu, 1996; Wallace et al., 2004a; Schmidt et al., 2001
User Risk	Lack of user involvement during system development. Also includes negative attitudes of users towards a new system and lack of cooperation during development.	Barki et al., 1993; Wallace et al., 2004a; Jiang and Klein, 1999

These two risk factors were selected from many dimensions of risk for four reasons. First, these two risk areas are acknowledged to be critical. In a cross-cultural study of IT project risks, Keil et al. (1998) reported that requirement and user risk dominated the top five risks. The requirements analysis phase is the most important of all software development phases and requirement risk has great impact on subsequent phases (Zmud, 1981; Nidumolu, 1996). The rich literature on user involvement suggests that managing user risk is also critical to the success of IT projects. Second, while there are other risks that can affect process performance (e.g., team risk and technology risk), requirement risk and user risk are likely to moderate the relationship between control and performance. Prior evidence suggests that some risks, such as environmental uncertainty, are unlikely to interact with control in a manner that would have a significant impact on performance (Rustagi, 2004). Third, previous research suggests that the effect of requirements risk and user risk on performance may be indirect (Wallace et al., 2004b; Nidumolu, 1996). For example, Wallace et al. (2004b) posits that requirements risk and user risk impact process performance indirectly through project management risk. Fourth, while a few studies find a positive relationship between formal control and performance (Henderson and Lee, 1992; Na et al., 2004), some studies have not found the relationship to be significant (Tiwana and Keil, 2007; Klein et al., 2006), suggesting that there may be other factors that influence the effectiveness of control on performance. In addition, Hunton and Beeler (1997) show that user involvement and control interact to affect performance. Consequently, we suggest that requirement risk and user risk (essentially lack of user involvement) will moderate the relationship between control and performance. Building on our main effects model, Figure 1 presents our research model which incorporates the two risk factors as moderators.
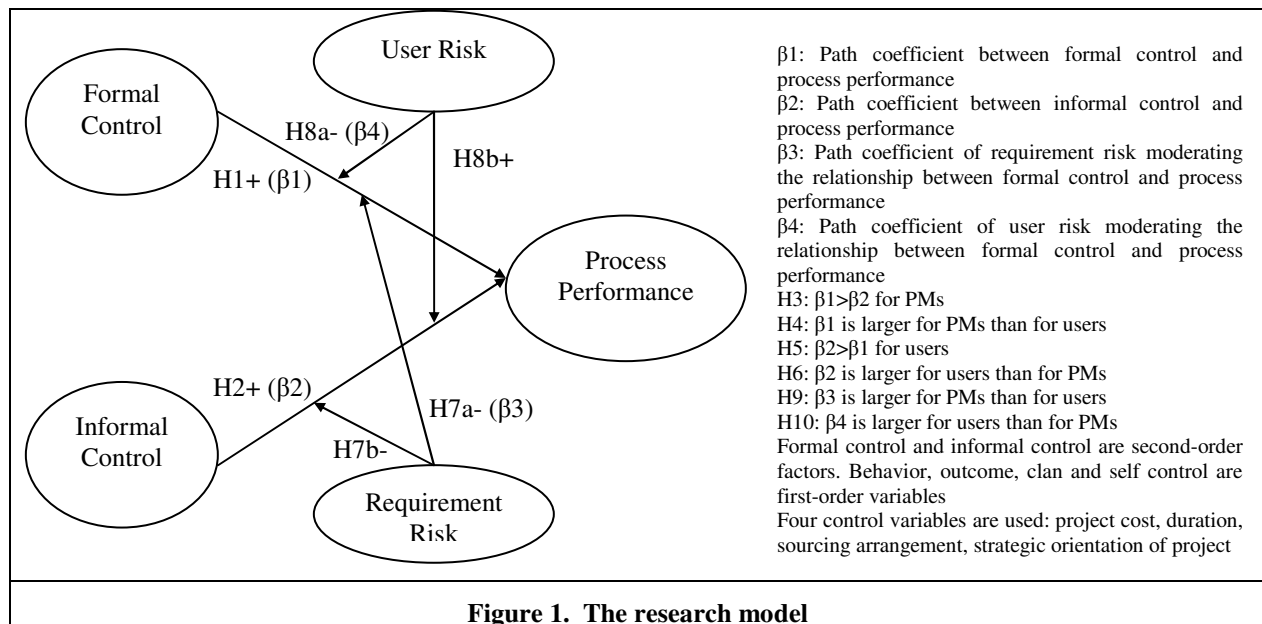

β1: Path coefficient between formal control and process performance
β2: Path coefficient between informal control and process performance
β3: Path coefficient of requirement risk moderating the relationship between formal control and process performance
β4: Path coefficient of user risk moderating the relationship between formal control and process performance
H3: β1>β2 for PMs
H4: β1 is larger for PMs than for users
H5: β2>β1 for users
H6: β2 is larger for users than for PMs
H9: β3 is larger for PMs than for users
H10: β4 is larger for users than for PMs
Formal control and informal control are second-order factors. Behavior, outcome, clan and self control are first-order variables
Four control variables are used: project cost, duration, sourcing arrangement, strategic orientation of project

Figure 1. The research model

The moderating effect of requirement risk

Requirement risk can be thought of as uncertainty surrounding system requirements. While the literature does not explicitly discuss requirement risk as a moderator of the relationship between control and performance, there are indications that uncertainty, which is a closely related construct, may serve as such a moderator. For example, in the marketing literature, Merchant (1982) argued that complete control is impossible because of the unforeseen events that inevitably occur (i.e., uncertainty). Jarwaski and Merchant (1988) makes this argument even more explicitly when he suggests that environmental uncertainty will have a moderating effect on the relationship between control

and individual performance. Sengün and Wasti (2007) suggest that informal control mechanisms between supply chain partners may be rendered ineffective due to uncertainty (brought about by such factors as changing demand).

In the IS literature, Rustagi (2004) hypothesized, but failed to find support, for the notion that formal control and environmental uncertainty interact to affect IS outsourcing success. One explanation for this result is that there may be value associated with formal control regardless of environmental uncertainty, as long as there is sufficient domain knowledge. If, however, there is a deficit of domain knowledge, we would expect that the use of formal control would be less effective. In this research, we therefore posit that if there is uncertainty regarding users' requirements (i.e., requirement risk), this will suppress the relationship between formal control and performance.

Under formal control, the user would place significant weight upon completing project goals (e.g., delivering the project on schedule and within budget) and the development team would be expected to follow a documented and repeatable process toward the accomplishment of these goals. When requirement risk is present, however, this leaves the development team with unpredictable and dynamic sets of tasks to perform, making it difficult or impossible to follow any pre-established process or to meet project goals. Moreover, the project will be delayed because of changing requirements and rework associated with incorrect or unclear requirements. Therefore, the effectiveness of formal control on process performance will likely be suppressed by requirement risk, as suggested in the following hypothesis:

Hypothesis 7a: *The effect of formal control on process performance is suppressed by requirement risk for both PMs and users.*

Requirement risk is likely to result in conflicts among team members and between users and developers about project direction and objectives. Such conflict can be expected to create an environment in which it would be difficult to exercise informal control. Clan control, for example, would be hard to establish and maintain in such an environment. Similarly, team members will likely find that self control is minimally effective in an environment in which they face tremendous task uncertainty. Thus, the benefits of informal control are unlikely to be exploited to their full potential, and we therefore state the following hypothesis:

Hypothesis 7b: *The effect of informal control on process performance is suppressed by requirement risk for both PMs and users.*

The moderating effect of user risk

User risk is one of the most cited risk factors in the IS literature. Lack of user involvement and participation during IT project development is regarded as user risk and it is usually related to less successful project outcomes. User involvement is regarded as a means of mitigating user risk and is seen by many as a necessary condition for successful development of information systems (Hwang and Thorn, 1999). In an empirical study, Hunton and Beeler (1997) found that user participation with instrumental voice which provides users with a sense of control yielded higher performance than either user participation with non-instrumental voice or no participation. The results of their study suggest that user participation interacts with control to affect performance.

User risk, which is essentially lack of user involvement, means that users will have fewer opportunities to express their opinions, preferences, and concerns. In this case, users will not be in a position to exercise instrumental voice (or any voice for that matter) which means users will have less control over the development process and we can expect that performance will be lower (Hunton and Beeler, 1997; Hunton, 1996). Based on this, we would expect that user risk may suppress the effect of control on process performance.

When user risk is present, the user will be more distant from the day-to-day development process and will not be in a position to closely observe team members behaviors. This will reduce the effectiveness of behavior control. The presence of user risk will also create a situation in which the users will have less understanding of the IS development process and may find it more difficult to effectively measure outcomes (due to lack of involvement). Under such circumstances, we can expect that the effectiveness of outcome-based controls will be reduced. Thus we state the following hypothesis:

Hypothesis 8a: *The effect of formal control on process performance is suppressed by user risk for both PMs and users.*

User risk can also be expected to suppress the effectiveness of informal control on process performance. One aspect of user risk involves resistance to change. When users exhibit resistance, they do not participate fully in the development process and they are unlikely to share the same values, goals and norms as the developers. Under such

circumstances, we can expect that the effectiveness of clan control would be reduced. Even if the development team uses self control to autonomously regulate their goals, tasks, and activities, this would seem to require some effort and resources expended to interact with users. Thus, when user risk is present, the benefits of informal control are unlikely to be exploited to their full potential, and we therefore state the following hypothesis:

Hypothesis 8b: The effect of informal control on process performance is suppressed by user risk for both PMs and users.

The relative strength of moderation between PM and User subgroups

In H7 and H8, we proposed that requirement risk and user risk would suppress the relationship between control and performance for both PMs and users. Prior literature indicates that PMs and users have different risk perceptions and that risks over which one has limited control are perceived as being more important in shaping outcomes (Keil et al., 2002). Users tend to focus on the importance of certain risks associated with project management capabilities and skills, whereas project managers may tend to focus on the importance of certain risks associated with the user (e.g. user commitment) (Keil et al., 2002). Thus, relative to users, PMs may ascribe more importance to how risks that stem from the user (e.g., requirement risk and user risk) impede the efficacy of project management mechanisms, especially those that are formalized and for which PMs are responsible. Since PMs have comparatively little control over requirement risk and user risk, this also suggests that PMs should perceive these risks as playing more important role in hampering formal controls than would users. Thus, we posit that for PMs, requirement risk and user risk will more strongly moderate the relationship between formal control and process performance than for users.

Hypothesis 9: *PMs will perceive that the effect of formal control on process performance is suppressed by requirement risk to a greater degree than will users.*

Hypothesis 10: *PMs will perceive that the effect of formal control on process performance is suppressed by user risk to a greater degree than will users.*

Control variables

We introduce four control variables into our model that are expected to affect process performance: project cost, project duration, outsourcing arrangement and strategic orientation of the project. Project cost and duration are two dimensions of project scope or size. To account for the effect of project scope on process performance (McFarlan, 1981), we specified project cost and duration as control variables. Outsourcing arrangement refers to whether the project is performed in-house or outsourced. This was used as a control to capture any effects of variations on process performance. Strategic orientation refers to the type of project: whether it is operational, managerial, or strategically oriented.

Research methodology

Data collection

A survey instrument was developed to collect the quantitative data needed to test our hypotheses. The survey was distributed to senior IS executives in a variety of industries in China who were asked to identify appropriate projects and survey respondents. To qualify for inclusion in the study, the project had to meet two criteria: (1) it had to be the latest completed project undertaken by the organization so that there would be no recall issues in responding to the survey, and (2) its cost had to be over CNY 100,000 so as to exclude projects that were so small that they would not require elaborate control systems.

The senior managers were given the option of distributing the survey to either a project manager (PM) or a user liaison. The PM was defined as the individual who was responsible for day-to-day management of the project from an IT perspective (Kirsch et al., 2002). PMs are in a good position to reliably report on the controls exercised by users because: (1) they are in touch with the development team on a regular basis and will likely be well informed concerning users' attempts to exercise control, (2) they interact with both users and user liaisons throughout the course of a project. The user liaison was defined as the individual responsible for the overseeing the project from a user perspective. Survey participants were asked to retrospectively assess controls, performance, and materialized risks at the conclusion of the project.

In spring 2006, both paper-based and email questionnaires were mailed to the senior IS executives giving them the option of using whichever medium was most convenient. A total of 300 questionnaires were distributed in this

manner. The executives were then contacted by phone to ensure that the questionnaires had been received and distributed to appropriate respondents. By January 2007, a total of 128 usable questionnaires had been received (105 paper-based questionnaires and 23 email questionnaires) from 65 project managers and 63 user liaisons, yielding an overall response rate of 42.7%. The PMs had from 2 to 35 years of IT experience (mean=11.1, sd=6.9). The user liaison's had from 0 to 31 years of IT experience (mean=7.3, sd=6.0). The 128 projects varied in terms of project cost, duration, sourcing arrangement and strategic orientation.

Both Mann-Whitney and Kruskal-Wallis tests were used to examine whether there were any differences between respondents who returned the paper-based questionnaires and those who completed the email version of the questionnaire. The results revealed no differences, suggesting that there was no method bias and that the data could be pooled for subsequent analysis.

Construct measurement

Measures for all constructs in the research model (except control variables) were adapted from existing instruments. Five-point Likert-type scales ranging from "strongly disagree" to "strongly agree" were used for the measurement items. To ensure that the measures were understandable and reliable, the questionnaire was pre-tested with 26 project managers and user liaisons. Based on the feedback received, modifications were made to enhance the understandability of the instrument. Table 3 summarizes the measures for the constructs and their informing sources.

Table 3. Constructs and Measures				
Construct		Item#	Measure Item	References
Formal Control	Behavior Control	C11	The user expected the development team to follow an understandable written sequence of steps toward the accomplishment of project goals.	Kirsch, 1996; Kirsch, 1997; Kirsch, 2002
		C12	The user expected the development team to make understandable written system development documents toward the accomplishment of project goals.	
		C13	The user assessed the extent to which existing written procedures and practices were followed during the development process.	
	Outcome Control	C21	The user placed significant weight upon timely project completion.	Kirsch, 1996; Kirsch, 2002; Tiwana and Keil, 2007
		C22	The user placed significant weight upon project completion within budgeted costs	
		C23	The user placed significant weight upon project completion to the satisfaction of the user.	
		C24	The user used pre-established targets as benchmarks for the development team performance evaluations.	
Informal Control	Clan Control	C31	The user actively participated in project meetings to understand the development team's goals, values, and norms.	Kirsch, 1997; Kirsch, 2002; Choudhury et al., 2003
		C32	The user attempted to be a "regular" member of the development team.	
		C33	The user attempted to understand the development team's goals, norms, and values.	
		C34	The user attempted to form a committee which often communicated with development team	
		C35	The user actively joined with development team for important decision-making.	
	Self Control	C41	The development team autonomously set specific goals for this project without the involvement of the user.	Henderson and Lee, 1992; Kirsch and Cummings, 1996; Kirsch, 2002
		C42	The development team autonomously defined specific procedures for this project's activities without the involvement of the user.	
		C43	The development team autonomously set specific timelines for this project without the involvement of the user	
		C44	The development team autonomously chose experienced IT professionals for the project development	

Table 3 (continued). Constructs and Measures			
Requirement risk	R11	Continually changing scope and system requirements	Schmidt et al., 2001; Wallace, 2004b
	R12	Unclear system requirements	
	R13	Conflicting system requirements	
	R14	System requirements not adequately identified	
User risk	R21	Users resistant to change	Wallace et al., 2004a; Wallace et al., 2004b
	R22	Users with negative attitudes toward the project	
	R23	Lack of user participation	
	R24	Users not committed to the project	
Process Performance	P11	The system was completed within budget	Wallace et al., 2004a
	P12	The system was completed within schedule	

Results

Measurement model

Partial least squares (PLS) was used for analysis as our research objective is to develop an exploratory model on how controls and selected risks jointly predict process performance of projects. Smart PLS 2.0 was used both to evaluate the measurement model and to conduct hierarchical regression analysis for hypothesis testing. Separate analyses were conducted for the PM and user groups. For the measurement model, each construct was modeled to be reflective, with two exceptions: outcome control and self control, which were treated as formative constructs. Formative construct items are not interchangeable and do not have to covary (Petter et al., 2007), and the direction of causality is from the items to the latent construct (Jarvis et al., 2003). In addition, two constructs were modeled as second-order factors: formal control and informal control. Formal control is a second order factor that includes behavior control and outcome control as latent constructs. Informal control is modeled as a second-order factor that includes clan control and self control as latent constructs.

Internal consistency and convergent validity were evaluated by examining the item to construct loading, composite reliability, and average variance extracted (AVE)[1]. All item-to-construct loadings were found to be greater than 0.707 indicating that the shared variance between each item and its associated construct exceeds the error variance (Chin 1998). An examination of the cross-loadings shows that each item loaded higher on its associated construct than on other constructs. The cross-loading differences were much higher than the suggested threshold of 0.1 (Gefen and Straub, 2005). Composite reliabilities and Cronbach α's were all higher than the recommended threshold of 0.70 (Nunnally and Bernstein 1994), and the values of AVE were all above 0.50 (Fornell and Larcker, 1981). Next, discriminant validity was assessed by examining if the squared correlation between a pair of latent variables was less than the AVE associated with each construct. Our measures passed this test, thus providing additional evidence of discriminant validity. These results collectively suggest good measurement properties for both the PM and user groups. Due to space constraints we have not included descriptive statistics and the construct correlation table.

Hierarchical regression analysis for hypotheses testing

Having established an adequate measurement model, hierarchical regression analysis was independently performed for both PM and User groups using PLS. Using this approach, theorized predictor variables are included stepwise to determine if they explain variance in the dependent variable. In our case, we specified and evaluated the models shown in Table 4 in order to test H1, H2, H7, and H8, all of which were found to be supported.

A bootstrap analysis was performed using 1000 subsamples. The size of the bootstrap sample was set equal to the size of the PM and user group sample (n=65 and n=63, respectively). The resulting model for both groups explained a significant amount of variance in the dependent variable. Table 4 presents the unstandardized path coefficients, the explained construct variances and the effect size for examining the incremental changes in R^2 between models.

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[1] A linear composite based on unit means of indicator scores are used in two constructs: Outcome Control and Self Control. The use of unit means, as opposed to factor scores, is recommended when new measures are used and transferability is desired (Hair et al., 1998). Accordingly, we use a unit mean-based index score for outcome control and self control in subsequent analysis.

Table 4. Hierarchical regression results							
Project Manager Group	Model1	Model2a	Model2b	Model3a	Model3b	Model3c	Model3d
Block1: control variables							
Project cost	0.069	-0.189	-0.174	-0.150	-0.134	-0.168	-0.139
Project duration	-0.076	-0.028	-0.022	-0.049	-0.027	-0.051	-0.048
Strategic orientation	0.040	0.150	0.133	0.109	0.070	0.142	0.116
Sourcing arrangement	0.060	-0.046	-0.059	-0.075	-0.063	-0.048	-0.035
Block2: Main effects							
Formal control		**0.503*****	**0.515*****	**0.441*****	**0.390****	**0.346****	**0.364***
Informal control		**0.294***	**0.304***	**0.252***	**0.289***	**0.259***	**0.266***
Requirement risk			-0.048	-0.029	0.015		
User risk			-0.032			0.021	0.042
Block3: Risk moderation							
Requirement risk × Formal control				**-0.274*****			
Requirement risk × Informal control					**-0.245*****		
User risk × Formal control						**-0.305*****	
User risk × Informal control							**-0.262*****
ΔR^2 (Process performance)		0.334	0.017	0.088	0.067	0.099	0.060
f^2 (effect size)		**0.542**	**0.028**	**0.167**	**0.122**	**0.191**	**0.108**
R^2 (Process performance)	0.050	0.384	0.401	0.472	0.451	0.483	0.444
F Hierarchical		31.436	1.568	9,352	6.832	5.544	6.048
User Group	Model1	Model2a	Model2b	Model3a	Model3b	Model3c	Model3d
Block1: control variables							
Project cost	-0.053	-0.087	-0.077	-0.117	-0.090	-0.136	-0.088
Project duration	0.069	0.021	0.029	0.035	0.024	0.030	0.010
Strategic orientation	-0.141	-0.089	-0.064	-0.097	-0.093	-0.083	-0.046
Sourcing arrangement	-0.163	-0.071	-0.033	-0.053	-0.120	-0.043	-0.053
Block2: Main effects							
Formal control		**0.228***	**0.262***	0.217	**0.225***	0.215	**0.264***
Informal control		**0.470*****	**0.454*****	**0.444*****	**0.413*****	**0.432*****	**0.338***
Requirement risk			-0.039	-0.016	-0.030		
User risk			-0.038			-0.043	-0.083
Block3: Risk moderation							
Requirement risk × Formal control				**-0.182***			
Requirement risk × Informal control					**-0.208***		
User risk × Formal control						**-0.158***	
User risk × Informal control							**-0.240*****
ΔR^2 (Process performance)		0.311	0.013	0.035	0.054	0.032	0.071
f^2 (effect size)		**0.497**	**0.021**	**0.059**	**0.094**	**0.054**	**0.128**
R^2 (Process performance)	0.063	0.374	0.387	0.409	0.428	0.406	0.445
F Hierarchical		27.832	1.134	3.186	5.076	2.916	6.912

Path coefficient is significant at: * Significant at α=.05, ** Significant at α=.01, *** Significant at α=.005.
a. All Path coefficients are unstandardized coefficients. b. One-tailed t-tests were performed as the direction of differences was hypothesized.
c. Unstandardized coefficients were calculated following the formula: $b_u = b_s * S_Y / S_i$, b_u is unstandardized coefficient, b_s is standardized coefficient, S_i is standard deviation of the independent variable, and S_Y is standard deviation of the dependent variable.
Model 1: Control variables; Model 2a: Control variables, formal control and informal control; Model 2b: Control variables, controls, two risks;
Model 3a: Control variables, controls, requirement risk, formal control×requirement risk; Model 3b: Control variables, controls, requirement risk, informal control×requirement risk; Model 3c: Control variables, controls, user risk, formal control×user risk;
Model 3d: Control variables, controls, user risk, informal control×user risk

Within Group Analysis for PMs and Users

To test H3 and H4, we conducted a within group analysis for both PM and user groups. As can be seen in Table 6, formal and informal control significantly affect process performance for both the PM and user groups. In the PM group the effect of formal control appears to be greater than informal control, whereas the opposite appears to be the case within the user group. In order to test this statistically, we compared path coefficients using the appropriate one-tailed t-test. For the PM group, the effect of formal control on process performance was greater than the effect

of informal control (t=1.81). Thus, H3 was supported. For the user group, the effect of informal control on process performance was greater than the effect of formal control (t=2.11), thus supporting H4.

Between Group Analysis

To test our hypotheses associated with differential impact across groups (H5, H6, H9, and H10), we compared the coefficients of individual paths in the main effect models (model 2a) and the moderation models (Model 3a-3d) across both groups. Before doing this, we assessed whether the PM and user group perceived the latent constructs in a similar fashion (Carte and Russell, 2003). Following Carte and Russel's (2003) suggestion, Box's M test of equal covariance matrices was performed at the item level. No significant differences were found between these groups, indicating that meaningful path comparisons can be made between groups.

When variances are not too different across groups, a t-test can be applied to assess statistical differences in path coefficients for each pair of paths (Chin, 2004). Using the approach suggested by Cohen et al. (2003), we obtained the results shown in Table 5. For the PM group, the path from formal control to process performance was significantly greater than it was for the user group, thus supporting H5. None of the other across group differences in path coefficients were found to be significant. Thus, H6, H9, and H10 were not supported.

Table 5. Results of Path Comparison Tests Across Groups[*]					
Path	PM group		User group	T-value	Result
H5: Formal Control → Process Performance	0.503***	>	0.228*	2.18*	S
H6: Informal Control → Process Performance	0.294*	<	0.470***	1.40	NS
H9: Formal Control×Requirement risk → Process Performance	-0.274***	>	-0.182*	0.75	NS
H10: Formal Control×User risk → Process Performance	-0.305***	>	-0.158*	1.21	NS

[*]S = Significant; NS = Not Significant. Path coefficient is significant at: **p < .01, *p < .05. One-tailed tests were performed

Discussion

Table 6 summarizes the results of our hypothesis testing. Five of the six main effect hypotheses were supported (H1, H2, H3, H4, and H5) and all of the in-group moderation hypotheses were supported (H7a, H7b, H8a, and H8b).

Table 6. Results of Hypothesis Testing*		PM group	User group	Within group	Across groups
Main Effect	H1:Formal control → Process performance	S	S		
	H2:Informal control → Process performance	S	S		
	H3:Formal control$_{PM}$ > Informal control$_{PM}$			S	
	H4:Informal control$_{User}$ > Formal control$_{User}$			S	
	H5:Formal control$_{PM}$ > Formal control$_{User}$				S
	H6:Informal control$_{User}$ > Informal control$_{PM}$				NS
Moderation Effect	H7a:Formal Control×Requirement risk → Process Performance	S	S		
	H7b:Informal Control×Requirement risk→Process Performance	S	S		
	H8a:Formal Control×User risk → Process Performance	S	S		
	H8b:Formal Control×User risk → Process Performance	S	S		
	H9:Formal Control×Requirement risk$_{PM}$> Formal Control×Requirement risk$_{User}$				NS
	H10:Formal Control×User risk$_{PM}$> Formal Control×User risk$_{User}$				NS

*S = Support; NS = No Support

The impact of formal control on process performance

As we hypothesized, formal control was found to have a positive effect on process performance for both PMs and users (H1). This suggests that formal control is an effective means of ensuring that projects are delivered on schedule and within budget. This finding is consistent with results obtained in the marketing literature where a control system with high clarity (i.e., a formal control system) was associated with increased performance (Futrell et al., 1976). Formal controls are important for both PMs and users because they provide the mechanism to regulate groups to ensure that team members work in a predictable and consistent manner (Das and Teng, 1998). Many team members are also encouraged by formal control because they receive feedback from managers concerning their job

outputs and activities (Cravens et al., 2004). Thus, formal control helps to ensure that team members will complete their assigned tasks on time and within budget, thus improving the project's overall process performance.

The impact of informal control on process performance

Our results provide the evidence that informal control also has a positive effect on process performance for both PM and users (H2). Through the exercise of informal control, the users can build trust and cooperative relationships with developers and establish a shared understanding of goals, norms, and values. This will also provide the mechanism to enforce social and self obligations (Ferguson and Bergeron, 2005). By promoting the creation of relational capital between developers and users, informal control can improve the speed and quality of communication (Kale et al., 2000). As a result, the need for rework will be reduced and the project will be more likely to be delivered on schedule and within budget. Informal control mechanisms are also significantly associated with resource availability (Rao, 2006). Therefore, when a project encounters obstacles, informal control mechanisms can prove helpful because they engage users who can marshal the additional resources needed to break the logjam and push the project forward.

Relative importance of formal control and informal control for PMs and users

As we hypothesized, for the PM group, the effect of formal control on process performance is stronger than the effect of informal control, suggesting that the PMs view formal control as being more effective than informal control (H3). Conversely, for the user group, the effect of informal control on process performance is stronger than the effect of formal control, suggesting that the users view informal control as being more effective than formal control (H4). Between the two groups, the relationship between formal control and process performance is stronger for PM group than it is for the user group (H5). This finding indicates that the PMs perceive formal control to be more effective than the users in terms of managing process performance. Although the effect of informal control on process performance appears to be greater for the user group than for the PM group (Table 4, Model 2a for the two groups), the cross-group analysis showed that this difference was not statistically significant. Thus, H6 was not supported. The overall pattern of results indicate that formal control plays a more important role for PMs than it does for users and that users perceive informal controls to be more important than formal controls. One explanation for these results is that because IT PMs have greater expertise and more IS experience, they are in a better position exercise formal control mechanisms. This would be consistent with Ouchi and Maguire's (1975)'s finding that managers will rely more heavily on formal control when their understanding of the relationship between means and ends. Ouchi and Maguire (1975) also suggests that managers will appreciate formal control when they have a need to provide legitimate evidence of performance. One could argue that PMs have a greater need to provide legitimate evidence of performance because their promotion and future are to some extent tied to the outcome of the projects they manage.

In contrast to PMs, informal controls have a stronger positive effect on process performance for the user group than formal control does. This is also consistent with Ouchi and Maguire's (1975) and Merchant's (1982) findings that when detailed knowledge of which specific actions are desirable is low and when the ability to measure results is lacking, this will promote the use of informal control. Because users have less IS expertise than PMs, they can be expected to have lower ability to measure outputs and less knowledge which specific actions are needed to manage the development process. This will naturally lead them to favor informal control.

While formal control is mechanistic and emphasizes predictable performance, informal control is more organic and is often associated with greater flexibility (Ouchi, 1980; Das and Teng, 1998). Based on our results, it appears that PMs may favor predictability over flexibility. This would explain the importance they seem to place on formal control relative to users. Users, however, appear to favor flexibility over predictability. This may explain why users view informal controls as being more important than formal controls. In summary, our results show that formal and informal control are important for PMs and users, there are key differences in the impacts of these controls across these groups.

The moderating effects of requirement and user risk

 One of the key findings from our study is that risk moderates the relationship between control and process performance. In particular, both requirement risk and user risk suppress the effectiveness of formal and informal control on process performance for both PMs and users (H7a, H7b, H8a, and H8b). Our results further suggest that requirement risk and user risk affect process performance only indirectly by suppressing the effect of formal and informal control. This stands in contrast to prior studies in which risk has been shown to have a direct affect on

performance. One explanation for this is that previous studies have not investigated the joint effect of risk and forms of controls on measures of project performance.

While the same basic results were obtained for both PM and users, the explanation behind the results may be slightly different for each group. PMs have limited control over requirement risk and user risk (Keil et al., 1998; Schmidt et al., 2001), as these two risk factors are both associated with users. Therefore, for PMs, controls will be less effective when these risks are present. Much of the responsibility for managing user and requirement risk rests with the users. When users are not sufficiently involved in the process, these risks increase and weaken the relationship between control and performance.

The relative strength of the moderating effect of risk across the two groups

We did not detect a greater moderating effect of requirement risk and user risk on the relationship between formal control and process performance for PMs than users (Table 4, Model 3a and 3c). As a result, H9 and H10 were not supported. One possible reason for these results is that users are not oblivious to the risks they themselves bring to the development process.

The effect of control variables

None of the control variables were found to have a significant impact on process performance for either PMs or users. Project cost and duration did not significantly affect process performance, suggesting that even though a project has a large cost or long development duration, it may not necessarily lead to a degradation in process performance. Another explanation for this, however, is that in excluding small projects from our sample, there was inadequate variance in the cost and duration of projects in our sample to make the control variables significant.

Based on our results, there was no evidence that whether a project was outsourced or not had any significant effect on process performance. Finally, whether the type of IT project was operational, managerial, or strategic in nature did not materially affect process performance.

Limitations and directions for future research

As with all research, this study has several limitations. First, as is the case with other studies on control (e.g., Kirsch et al., 2002), our results are based on a limited sample size. However, we believe that the sample is relatively diverse in that it includes project managers and user liaisons with extensive experience managing both small and large projects working for companies in a wide range of industries. Second, while we were unable to obtain matched pairs of PMs and user liaisons from the same projects, the covariance matrices for the two groups were not significantly different. Thus, we believe that the cross group comparisons are meaningful. Third, project managers and user liaisons from different countries may have different perceptions of IT project risk as well as the relative importance of formal and informal controls. For example, people from collectivistic culture may perceive informal control as being more important than people from an individualistic culture. Thus, while the findings from this study may hold in similar cultures, the generalizability of this study, which was conducted in China, may be limited to a certain degree. Additional research is needed to determine if our results can be replicated across different cultures.

There are several directions for future research. First, one could examine the moderating effect of other risks (e.g., team risk, technology risk, planning and control risk) on the relationship between control and performance. Second, one could examine the effectiveness of formal and informal control on other aspects of project performance (e.g., product performance and team performance) and how risk factors moderate the relationship between controls and these other aspects of project performance. Third, formal and informal control could be studied on a more granular level by examining the effectiveness of specific control modes (e.g., behavior control, outcome control, clan control and self control) on performance. A fourth extension to our study would be to examine whether formal and informal control performed by other controllers (e.g., senior executives) influences performance as well as how risks moderate the effectiveness of control on performance from other perspectives.

Implications

Implications for research

This study has several implications for both control theory researchers and project risk researchers. For control theory researchers, this study represents an important step toward understanding the effectiveness of formal and informal control on process performance from the perspectives of both PMs and users. It demonstrates that both formal and informal control can explain a significant amount of variance in process performance both for PM and

user groups. While the importance of formal control has long been recognized, this study demonstrates that there is a strong and direct relationship between formal control and process performance. In terms of the role of informal control, this study represents a significant contribution because prior work has focused on choosing a portfolio of control modes for a project and has largely ignored the connection between informal control and performance. The results of this study highlight the key role that informal control plays. Informal control is a means of fostering relationships to ensure cooperation and to enhance the level of trust among project participants (Kirsch, 1997; Das and Teng, 1998). Therefore, as suggested in the literature (Kirsch, 1997), more research on how formal and informal control complement each other would be desirable.

The results of this study also highlights both similarities and differences in how PMs and users view control. Both groups find that formal and informal control is important. For PMs, formal control is seen as being more effective than informal control, perhaps because PMs have considerable knowledge of the transformation process and a strong ability to measure outputs. For users, informal control is seen as being more effective than formal control, perhaps because users have less knowledge of the transformation process and weaker ability to measure outputs than PMs. The study also provides evidence that for PMs, the relationship between formal control and process performance is stronger than it is for users. This observed between-group difference warrants further examination as it may lead to additional insights into the use of formal and informal control.

For project risk researchers, this study presents a new perspective that integrates risk and control. Prior research has associated risk with performance, without taking control into consideration. This study demonstrates how various risks can interact with control to affect performance. Specifically, we find that requirement and user risk suppress the effectiveness of both formal and informal control on process performance. These results have two implications for project risk researchers. First, just as project risk can moderate the relationship between control and performance, it is reasonable to assume that risks can moderate the relationship between other factors (e.g., trust) and performance (Sengun and Wasti, 2007). Thus, project risk researchers should reconsider simplistic models that merely connect risk to performance and think more deeply about the moderating role that risk plays. Second, if requirement and user risk moderate the relationship between control and performance, there may be other risk factors that would also serve as moderators.

Implications for practice

Prior research suggests that formal control can improve project management by emphasizing adherence to established procedures and assessing project outputs, while informal control can help build trusting relationships between users and developers (Kirsch, 1997, 2002; Das and Teng, 1998). The results of this study suggest that both formal and informal control can help to ensure that IT projects are delivered on schedule and within budget.

Both project managers and users can play an important role in controlling IT projects (Kirsch, 1997). For each of them, this study provides insights on the need to balance the use of formal and informal control. The differing views of control expressed by PMs and users suggests that more dialog between stakeholders regarding the appropriate combination of controls would be useful. Regardless of which perspective one takes, exercising one form of control to the exclusion of the other is not likely to be effective.

PMs should remember that users can play an important role in controlling projects. While PMs may prefer formal control to ensure the project is delivered on time and within budget, they should not neglect informal control. This requires that PMs appropriately manage the relationship with the users by encouraging team members to build trust and share goals, norms, and values with them.

Users should recognize the importance of their involvement in IT projects and be willing to make some investment in understanding the IT development process. They should recognize the importance of developing and maintaining good relationships with the development team (Kirch, 1997). While they may be more naturally inclined toward informal controls, they should also be comfortable with the use of formal controls.

Both PMs and users should note the significant role that risks play in influencing the relationship between control and performance. In particular, requirement and user risk suppress the effectiveness of control on process performance. Therefore, PMs and users would do well to consider risk mitigation strategies for the IT projects that they are involved in. In project contexts that involve a high degree of uncertainty, control strategies should be designed for early detection of problems so that appropriate adjustments to the project plan can be made. In order to improve process performance, practitioners should consider the fit between risk and control mechanisms, adapting control strategies to the degree of risk exposure (Barki et al., 2001).

Since requirement risk can dampen the effectiveness of controls, another implication of our study is that PMs should make sure that requirements are carefully identified at the outset of a project. Similarly, since user risk can also weaken the effectiveness of controls, PMs should be certain that users are committed to the project.

Conclusions

This study breaks new ground in that it is the first attempt that we are aware of to integrate control theory and IT project risk. We view this as the central contribution of the paper from a theory building perspective. The study clearly shows that formal and informal controls affect performance and risk moderates these relationships. Specifically, requirement risk and user risk suppress the effectiveness of formal and informal control on process performance. Another key contribution of the study is that it provides an enlightened understanding of the perspectives that PMs and users bring to the problem of controlling IT projects. While both PMs and users regard formal and informal control to be important for process performance, they do appear to place differences on the relative importance of each type of control. From the PM perspective, formal control plays a more significant role than informal control, whereas from user perspective, informal control plays a more significant role than formal control. Looking across the two groups, however, formal control was found to have a greater impact on process performance for PMs than for users.

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