



The mediating effects of in-role and extra-role behaviors on the relationship between control and software-project performance

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Received 4 April 2017; received in revised form 25 July 2017; accepted 23 August 2017

Available online xxxx

Abstract

Research on project controls has mainly focused either on their direct effect on project outcomes, or on the joint effect of controls and other factors on such outcomes. A few studies have examined the impact of control mechanisms on teamwork processes, usually with the aim of ascertaining why a particular mechanism is needed, or how control affects final outcomes. This study goes further, exploring control mechanisms' influence on teamwork and how this influence, in turn, leads to changes in project performance. Moreover, while many past studies have only examined the extent to which controlees can effectively perform their tasks, this one looks at in-role and extra-role behaviors as process variables; and, instead of treating control as a single undifferentiated phenomenon, it models the integrated effects of formal and informal (clan) control on projects. Analysis of data collected from 220 practitioners shows that both types of formal control mechanisms and clan control had distinctive impacts on both in-role and extra-role behaviors, and that both these behavior types had identifiable impacts on project performance. When formal and clan control mechanisms were applied simultaneously, in-role behavior was reduced and extra-role behavior increased. We conclude with a discussion of our findings' implications for past and future control studies as well as for practitioners.

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Keywords: Formal control; Clan control; In-role behaviors; Extra-role behaviors; Project performance

1. Introduction

The inherently complex and knowledge-intensive nature of contemporary information systems development (ISD) requires project team members to collaborate in intricate technical activities and to solve problems through trial and error. Project team members are also expected to collaborate to generate innovative ideas and achieve project goals. Interpersonal trust among team members can boost communication and knowledge exchange (Hsu et al., 2016). When trust is absent or still developing, it is especially important for project managers and project owners to exercise effective controls to ensure high project performance.

Lack of appropriate controls is frequently cited as a primary cause of low ISD-project process and product performance (Henderson and Lee, 1992; Kirsch et al., 2002; Liu et al., 2008).

A considerable body of research in the Information Systems (IS) field has focused on identifying the antecedents of managers' choices of specific control modes (Wiener et al., 2016) or the consequences of exercising control on project- and other types of performance (Gopal and Gosain, 2010; Liu et al., 2017). Recently, scholars have explored the joint effects of control and other factors or activities, including boundary spanning (Gopal and Gosain, 2010), risks (Liu et al., 2017), and methodology use (Maruping et al., 2009a). To date, however, only limited efforts have been made to uncover the underlying processes that translate actual controls into project outcomes. If one views ISD as a teamwork process, and project performance as the outcome of teamwork, then the effects of control mechanisms on teamwork, and thus

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on project performance, remain unclear. The present study addresses this gap in the literature directly.

A high proportion of prior studies of project controls have only examined the extent to which controlees can effectively perform their tasks (Gabriele et al., 2004; Ning, 2017). Due to the highly complex and interdependent nature of contemporary ISD tasks, achieving high project performance demands effective collaboration among team members. Teams must not only accomplish their assigned tasks according to role descriptions (in-role behaviors), but also become integrated and provide assistance to others (extra-role behaviors) (Lubatkin et al., 2006). In terms of the former, individuals' performance tends to be systematically evaluated and rewarded (Van Dyne et al., 1994). On the other hand, extra-role behaviors such as helping team members and providing constructive feedback are not specified by role descriptions, not recognized by formal reward systems, and not a source of punitive consequences if not performed. A few development methodologies (e.g., the agile approach, in which members are requested to assist others by reviewing the code they develop) have sought to embed positive extra-role behaviors. Because such behaviors make important contributions to work-group performance (Podsakoff and MacKenzie, 1997), it is widely accepted that project managers and project owners should actively seek effective mechanisms for stimulating both in-role and extra-role behaviors among project team members. As different modes of control produce distinct effects, this paper argues that choices in how control is exercised have the potential to promote positive extra-role behaviors, and explores this possibility in depth. Specifically, it examines the mediating effects of in-role and extra-role behaviors on the relationship between control and ISD-project performance. In addition, the present research hypothesizes an interactive effect between clan control (informal control) and two formal control mechanisms (behavioral and outcome controls), and tests the effects of exercising multiple control mechanisms simultaneously as well as whether formal and informal controls can be substituted for or complement each other (Cram et al., 2016b; Tiwana, 2010).

A survey approach was adopted to collect data from practitioners that could be used to test the proposed hypotheses. The results are expected to contribute to the project-management and control literature in the following three ways. First, they will shed new light on the relationship between controls and project performance by examining the mediating effects of in-role and extra-role behaviors. Second, by demonstrating the distinct and joint impacts of formal and informal control mechanisms on different types of teamwork behaviors, they can guide project managers' choices of control mechanisms. And third, they will provide new insight into whether control mechanisms may be substitutable or complement each other, based on the interactive effects of such mechanisms on behavior.

The remainder of this paper is organized as follows. The second section reviews the prior literature on control mechanisms and in-role and extra-role behaviors. Section three describes the research model and hypotheses. Section four covers data collection and analysis, while the final section draws conclusions and discusses various implications of the findings.

2. Literature review

This section first reviews control theory, and then prior work on in-role and extra-role behaviors within ISD project teams. Next, it describes the building of the present study's research model, which incorporates behaviors as mediators between control and project performance, and the interactive effects of two general types of control mechanisms. Lastly, it presents hypotheses based on the researchers' expectations regarding the individual and joint effects of control mechanisms on behaviors, and the impacts of behaviors on ISD-project performance.

2.1. Control theory

Control, as exercised by project managers, ensures project progress by fusing together the complementary roles and capabilities of project participants, and by motivating individuals to follow organizational goals and objectives (Henderson and Lee, 1992). Control and trust both direct team members' behaviors. The current literature mainly views the relationship between control and trust as substitutable, supplementary, and detrimental (Costa and Bijlsma-Frankema, 2007; Dennis et al., 2012). Project managers may trust in the abilities of a project team's members, but control mechanisms can provide guidance to team members regardless of whether such trust exists.

Researchers have divided the concept of control into two types – formal and informal – and the first type into two subtypes: behavioral control and outcome control (Eisenhardt, 1985; Kirsch, 1996, 1997; Ouchi, 1979). An outcome-control approach is exercised through pre-specifying the tasks that team members should accomplish within a given timeframe, and evaluates performance based on task-completion information. In a behavioral-control approach, on the other hand, performance is evaluated according to how closely team members follow predefined procedures, methods, and techniques. In other words, outcome control places greater emphasis on whether predefined goals are accomplished, but pays less attention to *how* they are accomplished. Therefore, outcome control is more appropriate for conditions in which controllers can trust controlees to perform the task effectively, e.g., when the latter are knowledgeable (Kirsch, 1997). Behavioral control, in contrast, does not presuppose high levels of effectiveness on the part of controlees, but does require controllers to collect and process relatively large amounts of information about controlees' adherence to the organization's expectations.

The second broad type of control, informal control, can also be divided into two subtypes: clan (group) control and self-control (Eisenhardt, 1985; Jaworski, 1988; Kirsch, 1997). However, since the focus of the present research is on team-level phenomena, only clan control will be considered. Specifically, the "clan" refers to a group of individuals who are dependent on one another; share a set of common goals; and endorse and promote a common philosophy, values, and beliefs (Ouchi, 1980). Both informal control mechanisms affect goal alignment, but via different routes. In clan control, this route comprises the formation of shared norms, values, and beliefs through socialization;

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