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THE VIEW FROM THE TOP – HOW SENIOR EXECUTIVES EXERCISE CONTROL OVER INFORMATION SYSTEMS PROJECTS TO ENHANCE PERFORMANCE

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Research paper

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Abstract

Exercising control over information systems (IS) projects is a challenging task. This seems to be particularly true for senior executives who commonly represent key project owners and who are ultimately held accountable for project performance despite their scarce time and often limited project-related knowledge. While prior studies have almost exclusively focused on the role of line and project managers in controlling IS projects, this study aims to contribute new theoretical insights by focusing on the role of senior executives. Specifically, our study explores how different control styles and modes used by senior IT executives relate to the performance of IS projects. Based on a survey with 92 participants, we find that executives' use of an enabling control style is positively related to IS project performance. In contrast, the use of an authoritative control style is found to be negatively related to performance, but still seems to play a critical role in successfully enacting formal controls. Moreover, the study results show that only senior IT executives' use of input control significantly and positively affects IS project performance, indicating that prior results on the effectiveness of different control modes do not easily translate to the specific context of our study.

Keywords: Senior executives, IS project control, Control styles, Control modes, Project performance.

1 Introduction

Information systems (IS) projects represent a key vehicle for organizational development and change through the deployment of information technology (IT) resources. Market research firms estimate that companies will spend a total of $3.5 trillion on IT investments in 2017 (Gartner, 2017), much of which is allocated towards IS project initiatives that aim to deliver enhanced value, innovation, and automation to the enterprise. However, a significant proportion of IS projects fail completely or do not meet organizational expectations, leading to considerable financial losses for organizations worldwide. For example, the CHAOS Report by the Standish Group (2012) shows that only 39% of IS projects succeeded, while 18% of these projects were cancelled prior to completion (or completed but never used) and another 43% were delivered late, over budget, and/or with reduced features.

An important managerial tool to increase the chances of IS project success is exercising control, which is defined as any attempt to align individual behaviors with organizational objectives (Choudhury and Sabherwal, 2003; Das and Teng, 1998; Kirsch, 1996; Ouchi, 1979). Since the early work of Henderson and Lee (1992), research on IS project control has grown to cover a wide range of aspects and issues, including control modes (e.g., Kirsch, 1996, 1997), control amounts (e.g., Rustagi et al., 2008), control styles (e.g., Gregory et al., 2013; Wiener et al., 2016), control in internal and outsourced settings (e.g., Choudhury and Sabherwal, 2003; Gopal and Gosain, 2010), and control in specific IS project contexts, such as agile IS development (e.g., Harris et al., 2009; Maruping et al., 2009).

Traditionally, the study of IS project control has drawn heavily on the concept of control modes (i.e., input, behavior, outcome, clan, and self-control), but more recent literature has increasingly considered the role of control styles (e.g., authoritative vs. enabling). Relatedly, the great majority of existing IS project control studies focus on how 'middle' managers (e.g., line and project managers) exercise control *within* an IS project (Mähring, 2002). In contrast, the question of how senior IT executives—such as Chief Information Officers (CIOs), IT Vice Presidents, and IT Department Heads—exercise control *over* IS projects remains largely neglected (Mähring, 2002; Soh et al., 2011). Related research finds that senior and middle managers employ similar control modes, while the use of control styles are found to differ between the two groups (Heumann et al., 2015). Nevertheless, aside from a small number of exceptions, prior IS project control studies remain silent on the control tactics used by top-level managers, as well as the antecedents and the effectiveness of these tactics. In response, our study seeks to better understand how different control tactics used by senior IT executives help achieve successful outcomes on large, complex IS projects.

Senior IT executives play a fundamental role in IS project oversight as they commonly represent key project owners who are ultimately held accountable for the performance, and especially the failure, of an IS project. Although IS project managers and other stakeholders are also critically important, we suggest that control enacted by senior IT executives is distinct in three respects. First, executives are less likely to get deeply involved in any single project due to other competing responsibilities, whereas a project manager can be fully dedicated to a particular initiative. As a result, senior IT executives are unable to observe first-hand the performance of tasks by subordinates and instead rely on others to provide them with the relevant project information. Second, although senior IT executives commonly have a solid base of technical knowledge, they are likely to be less technically proficient than IS project managers and staff since the technologies used and produced in IS projects are subject to fast-moving fashion waves and hype cycles (Baskerville and Myers, 2009). Finally, executives typically have a broader strategic vision of how IS projects link to organizational objectives than IS project managers typically do, which provides for different expectation-setting and responsibility assignments for staff. Together, these three factors highlight the unique task characteristics, knowledge requirements, and role expectations that senior IT executives face, which past research finds to be the primary drivers of control choices (Choudhury and Sabherwal, 2003; Kirsch, 1997; Kirsch et al., 2002). As a result, we suggest that the existing IS project control literature, with its focus on viewing middle managers as the controller, is limited in its ability to apply useful insights into the control tactics adopted by senior IT executives.

Against this backdrop, there is an important theoretical and practical impetus for research that focuses on the control of IS projects from a top-management perspective. In this context, our study aims to contribute novel empirical insights on the control tactics that senior IT executives use to exercise control over IS projects, such as application development/maintenance and standard-software implementation projects. Specifically, we pose the question: *how does a senior IT executive's choice of control styles (and control modes) relate to the performance of an IS project?* To address this question, we collected survey data from 92 senior IT executives (including CIOs, IT Vice Presidents, and IT Department Heads) regarding their experiences on a recently completed IS project in their organization, for which they served as the project sponsor and/or sat on the project steering committee.

The remainder of the paper is structured as follows. The next section provides a theoretical overview of IS project control, including control styles and modes. We then develop our research hypotheses and outline our methodology in terms of data collection, construct measures, and descriptive statistics. This is followed by an analysis of the hypothesis test results and a discussion of the contributions and implications of our study.

2 Theoretical Background

2.1 IS Project Control

The control of IS projects has a rich research history, which has traditionally focused on the linkages between contextual project factors (e.g., behavior observability and outcome measurability of a task), the selection/configuration of controls (e.g., the implementation of a policy, managerial monitoring of staff), and the resulting impact on IS project performance (Cram et al., 2016a; Kirsch, 1996; Tiwana and Keil, 2009; Wiener et al., 2016). In general, research findings suggest that controllers choose to implement a portfolio of controls based on the identified project context factors, which influences controllee behavior and contributes to improved project performance (Cram et al., 2016a; Kirsch, 1997). Recent studies have increasingly considered supplementary aspects of IS project control characteristics to also include considerations of how and why controls change over time (Cram et al., 2016b; Gregory et al., 2013), as well as the socio-emotional impact of controls on staff members (e.g., Chua et al., 2012; Piccoli and Ives, 2003).

The core motivation of employing control within IS projects is to achieve performance benefits, including project efficiency (e.g., Gopal and Gosain, 2010; Keil et al., 2013) and quality (e.g., Maruping et al., 2009). Although many studies do report positive links (e.g., Henderson and Lee, 1992; Keil et al., 2013; Maruping et al., 2009), other research finds that controls can have either no effect or even a negative effect on IS project performance (Tiwana, 2010; Tiwana and Keil, 2009).

2.2 Control Modes and Styles

In attempting to reconcile why some controls are more effective than others in driving performance, IS control research has sought to clarify the different ways that control activities can be optimally configured within IS projects. The most traditional and commonly employed framework is that of control modes, which classifies controls into five categories: input, behavior, outcome, clan, and self-control (Jaworski, 1988; Kirsch, 1996; Ouchi, 1978, 1979). These modes are further grouped into two higher-level categories of formal control (input, behavior, outcome control), which are oriented around performance evaluation and rewards, and informal control (clan, self-control), which increasingly focus on social norms. Definitions and examples for each of the five control modes are noted in Table 1.

In recent years, a new classification framework—control style—has been introduced as a complementary perspective to classify IS project control activities. Wiener et al. (2016) suggest that whereas control modes (and amounts) help clarify 'what' control activities are employed, it stops short of explaining 'how' those controls are put into place. In response, the concept of control style refers to the manner in which the controller and controllee interact when enacting the control (Gregory et al., 2013; Gregory and Keil, 2014; Wiener et al., 2016). Two categories of control style have been defined in the literature: enabling and authoritative (Wiener et al., 2016). An enabling control style relies on controller-controllee collaboration and interaction, whereas an authoritative control style draws on a bureaucratic, top-down management approach (Gregory et al., 2013; Gregory and Keil, 2014). Two key features distinguish enabling from authoritative control styles: repair and transparency (Adler and Borys, 1996; Wiener et al., 2016). Repair refers to the anticipation of control-activity breakdowns and the capability to fix them. In an enabling control style, repair is viewed positively by welcoming controllee feedback, while an authoritative control style considers any deviation by controllees as negative. The second feature is transparency, which refers to the visibility of controls in the context of a project. Whereas an enabling style seeks to provide transparency on the rationale for why controls are in place, an authoritative control style is more concerned with formulating the instructions and duties of controllees. Definitions and examples for the two contrasting control styles are also noted in Table 1.

	Category	Definition	Example
Control Modes	Input (Formal)	Managing the resources that are used as inputs to project activities	Controller introduces a training program to update the technical skills of controllees.
	Behavior (Formal)	Establishing and monitoring procedures and rules	Controller requires the IS project team to adopt an agile development methodology.
	Outcome (Formal)	Establishing output targets for controllees and then monitoring their achievement	Controller requires developers to deliver a predefined quota of source code per week.
	Clan (Informal)	Using social mechanisms (e.g., shared experiences) to influence controllee behaviors through shared norms and values	Controller schedules a series of offsite team-building events to facilitate socialization among IS project team members.
	Self (Informal)	Allowing a controllee to set their own goals and monitor their own behavior	Controller grants quality-assurance staff the autonomy to determine what software testing procedures should be undertaken.
Control Styles	Enabling	Achieving controllee compliance through collaboration and interaction (repair and transparency features)	Controller and controllee discuss the effectiveness of weekly project update meetings and work together to refine how management can obtain accurate updates.
	Authoritative	Enforcing controllee compliance through bureaucracy and top-down commands (lack of repair and transparency)	Controller unilaterally determines that the weekly updates are insufficient and implements mandatory daily progress reports.

Table 1. Control mode and style overview (adapted from Choudhury and Sabherwal, 2003; Cram et al., 2016a; Kirsch, 1997; Wiener et al., 2016)

2.3 The Role of the Controller

As noted above, the controller plays a fundamental role in selecting and enacting controls. Most past research (e.g., Henderson and Lee, 2002; Gregory and Keil, 2014; Kirsch, 1997; Tiwana and Keil, 2009) positions the controller as a middle manager, such as an IS project manager, and the controllees as the members of the IS project team. Although this level of analysis focuses on an important controller-controllee dyad that exists *within* a project, past commentators have noted the relevance of other controller groups, and senior IT executives in particular, who provide control *over* IS projects (Mähring, 2002; Soh et al., 2011). One exception is a recent study by Heumann et al. (2015), which finds that senior and project managers use similar control modes but differ in terms of how they enact corresponding control mechanisms (i.e., in terms of their control styles).

Two key factors are commonly cited as contributing to control choices: task characteristics (e.g., behavior observability) and controller/controllee knowledge (Kirsch, 1997). Generally, senior IT executives are likely to differ from IS project managers in each of these areas, as a more senior organizational role is likely to limit a manager's ability to closely oversee daily project activities (low behavior observability) and ability to maintain deep technical capabilities (controller's technical knowledge). We suggest that by primarily focusing on the tactics adopted by middle managers, a notable gap currently exists in the IS project control literature regarding what controls upper managers employ over IS projects, how they enact them, and how effective they are in influencing performance. In response to the on-going pattern of IS project failures, our study seeks to address this gap in order to better understand how the control tactics used by senior IT executives can help enhance the performance of IS projects. Building on previous work by Heumann et al. (2015), our study primarily focuses on the control styles used by such executives. However, we also consider the use of control modes in forming our hypotheses, which we discuss next.

3 Hypothesis Development

3.1 Control Styles and IS Project Performance

The controller's use of a particular control style (i.e., enabling or authoritative) depends, among other things, on power asymmetries between controller and controllees, stemming from differences in formal authority and project-related knowledge (Wiener et al., 2016). In IS projects, relevant knowledge includes both business-domain knowledge and technical knowledge (e.g., on information technologies and development methodologies used in the project). In this regard, senior IT executives exercising control over IS projects represent an interesting case as they have superior formal authority but also tend to lack the specific domain and technical knowledge required in a given project (Loch et al., 2016). The latter implies that executives are likely to compensate for their knowledge gaps by using an enabling control style (Hekkala and Urquhart, 2013; Heumann et al., 2015). More specifically, enacting controls in an enabling style provides senior IT executives with relevant controllee feedback (repair), which can trigger and facilitate learning processes. At the same time, using an enabling control style, senior IT executives give controllees regular feedback on their performance and provide them with regular updates on relevant developments in the broader project context (transparency), thereby also facilitating learning processes on the part of the controllees (Adler and Borys, 1996). Hence, an enabling control style can be expected to positively affect the performance of an IS project.

Moreover, the distinctive features of an enabling control style (repair and transparency) create an environment conducive to the development of trust between controller and controllees, thereby encouraging subordinates to openly discuss project performance problems with the senior IT executive overseeing the IS project (Tiwana, 2010). Adding to this, by empowering controllees, the executive's use of an enabling control style can help prevent, or at least mitigate, negative socio-emotional side effects of control activities (Wiener et al., 2016). For example, prior studies show that control-related side effects such as controllee demotivation, lack of commitment, resistance, and stress diminish individuals' task performance, and ultimately project performance (e.g., Cram, 2011; Govindarajan and Fisher, 1990; Ivancevich, 1970; Lawrence and Robinson, 2007).

The performance-enhancing effect of an enabling control style is also in line with the results of earlier studies in a variety of control contexts including IS development projects (Remus et al., 2016), equipment technology design (Adler and Borys, 1996), new product development (Jorgensen and Messner, 2009), and restaurant chain management (Ahrens and Chapman, 2004). Thus, we propose:

H1: Senior IT executives' use of an enabling control style positively affects the overall performance of an IS project.

Despite their potential lack of project-related knowledge, senior IT executives still have superior formal authority derived from their position in the organizational hierarchy (Pfeffer, 1992). Hence, senior executives are likely to use an authoritative control style (Adler and Borys, 1996; Ahrens and Chapman, 2004; Jordan and Messner, 2012), although they may not have the appropriate knowledge to use such a control style successfully (Wiener et al., 2016). In other words, by virtue of the position they hold, executives may feel no need to seek controllee feedback (repair) and/or provide controllees with contextual information (transparency). Consequently, senior IT executives using an authoritative control style will not engage in close interactions with the controllees but rather focus on enacting controls in a unilateral way (Gregory et al., 2013). While the lower 'investment' associated with an authoritative control style can save valuable time (Gregory and Keil, 2014), it is still questionable under what conditions the use of an authoritative control style will have a positive effect on the overall performance of an IS project. In this context, Wiener et al. (2016) argue that the controller's project-related knowledge moderates the link between an authoritative control style and IS project performance. This suggests that executives, who may lack relevant project knowledge, are in an unfavorable position to successfully enact IS project controls in an authoritative control style. Therefore, the enacted controls may even misguide controllees, thereby diminishing project performance.

Furthermore, lacking repair and transparency features, a senior IT executive's use of an authoritative control style may lead to control-legitimacy concerns among controllees, and ultimately to negative socio-emotional side effects of control activities (Wiener et al., 2016). For example, a lack of shared understanding between controller and controllees may result in communication breakdowns, conflicts, and resistance behaviors (Gregory et al., 2013; Gregory and Keil, 2014), which in turn will have a negative effect on project performance. We thus suggest:

H2: Senior IT executives' use of an authoritative control style negatively affects the overall performance of an IS project.

3.2 Interaction between Control Styles and Control Modes

Beyond their direct performance effects (see H1 and H2), control styles also interact with the employed control modes to influence IS project performance. Here, we argue that the repair and transparency features of an enabling control style are compatible with the characteristics of informal controls (i.e., clan and self-controls) (Wiener et al., 2016). Specifically, both an enabling control style and informal control emphasize the importance of social interaction and motivational aspects, and thus represent 'people strategies' (Gregory and Keil, 2014). First, the promotion of clan control is based on the development of shared norms and values, which in turn guide controllee behaviors (Kirsch et al., 2010). Establishing shared norms and values facilitates controller-controllee interactions, and thus the use of an enabling control style, for example, when senior IT executives ask controllees for feedback (repair). At the same time, regular feedback loops and information updates (transparency) provide controllees with opportunities to identify acceptable behaviors, and controllers with opportunities to enforce such behaviors (ibid). Second, the promotion of self-control is based on the controllees' intrinsic motivation as well as their individual standards and objectives (Kirsch, 1997). In this regard, self-control appears to be an integral feature of an enabling control style. For example, using such a control style, senior IT executives allow controllees to deviate from prescribed behaviors if required by unforeseen work contingencies. Also, executives' use of an enabling control style provides controllees with relevant project-context information, thereby empowering them to exercise effective self-control (Choudhury and Sabherwal, 2003; Kirsch, 1997).

On the other hand, lacking repair and transparency features, senior IT executives' use of an authoritative control style appears to be less compatible with the use of informal controls (Gregory and Keil, 2014; Tiwana, 2010). However, the use of such a control style may still facilitate the enactment of formal controls by making one-directional demands that clearly specify and communicate the enacted controls (Adler and Borys, 1996). As a consequence, controllees are more likely to understand and stick to the inputs, behaviors, and outcomes defined by formal controls. In contrast, senior IT executives' use of an enabling control style involves the risk of creating unnecessary distraction in the control-enactment process, thereby potentially confusing controllees and blurring their understanding of what the controller expects them to do (Wiener et al., 2016). Adding to this, at least some controllers may actually expect executives to make decisions and give clear commands because of their superior position in the organizational hierarchy (Hekkala and Urquhart, 2013). Hence, we propose:

H3: While (a) senior IT executives' use of informal controls (i.e., clan and self-controls) positively moderates the relationship between an enabling control style and IS project performance, (b) their *use of formal controls (i.e., input, behavior, and outcome controls) positively moderates the relationship between an authoritative control style and IS project performance.*

The resulting research model and hypotheses are presented in Figure 1.

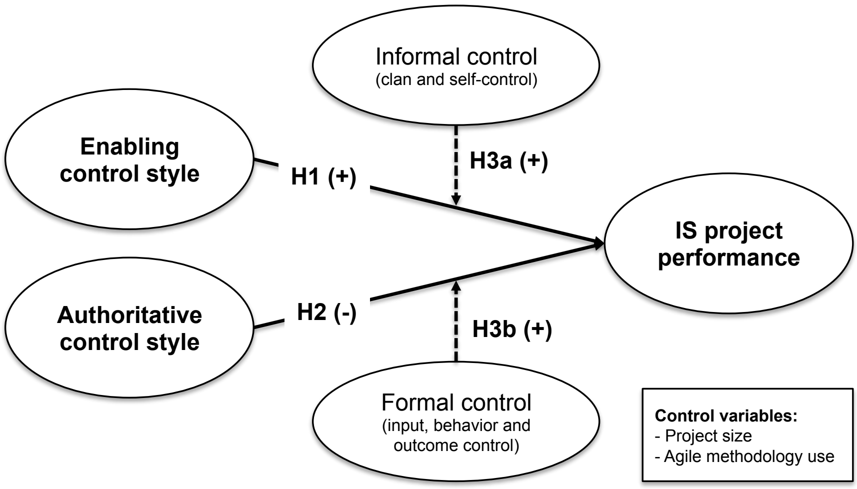

Figure 1. Research model

4 Research Methodology

4.1 Data Collection

We developed a survey instrument to test our hypotheses. The initial instrument was pretested with three researchers (not part of the author team) with considerable experience in the design of online surveys. The pretest resulted in minor adaptations in the survey flow and wording. To identify senior IT executives willing to participate in our survey, we used the support of a market research firm with access to a large pool of professionals. A similar approach has been used in prior IS research (e.g., Lowry and Moody, 2015; Posey et al., 2010). The use of online panels is advantageous due to the anonymity that it grants participants, as well as the broad spectrum of individuals that can be contacted (Lowry and Moody, 2015). Respondents were required to currently serve as a CIO, IT Vice President, Head of IT Department, or other senior IT executive in order to participate in the survey. Also, we excluded executives who work for companies with fewer than 250 employees.

The survey was set up online using Qualtrics and data was collected in summer 2016. Respondents were asked to refer to one recently completed, major IT project in their organization (e.g., application development, ERP implementation), for which they served as the project sponsor and/or sat on the project steering committee. The respondents then had to provide information about the IS project context, (control) interactions with the IS project manager, IS project performance as well as general information. The questions in the questionnaire were randomized and it was ensured that respondents had to evaluate every single item. In total, 92 senior IT executives completed the questionnaire.

4.2 Construct Measures

All latent variables were measured reflectively with multiple items. All items were rated on seven-point Likert scales using 'strongly disagree' and 'strongly agree' anchors. To measure control modes we used items from Snell (1992) (input control), Tiwana and Keil (2009) (behavior and self-control), and Kirsch et al. (2002) (outcome and clan control), and adapted them to the context of our study. To assess project performance, we adopted items from Wiener et al. (2015; based on Kirsch, 1996; Gopal and Gosain, 2010). Their items consider performance in terms of both project efficiency (i.e., cost and time) and project quality (e.g., user satisfaction). While control styles are often conceptualized as end-points on a continuum (Adler and Borys, 1996), more recent research suggests that contrasting control styles can coexist (cf. Gregory and Keil, 2014). Hence, we adopted items from Oates (2010) to measure an authoritative control style, while items from Remus et al. (2016) were adapted to measure an enabling control style. The construct items are shown in Table 3 in the Appendix.

To transform our research model into a structural equation model as well as to test our hypotheses, we used SmartPLS 3 (Ringle et al., 2015). We assessed the measurement model with a maximum of 1,000 iterations and the structural model with a bootstrap size of 5,000 subsamples (Hair et al., 2011). PLS path modelling was chosen due to its capability to perform predictive analyses (Fornell, 1992). Also, PLS is remarkably stable even at relatively low sample sizes (Gefen et al., 2011). In addition to the full model comprising all main variables and control variables, we ran separate models to test for the interaction effects (H3). For modeling the interaction terms, we followed Chin et al.'s (1996) recommended approach to standardize all indicators reflecting the main and moderator constructs. This approach lowers the correlation between the product indicators and their individual components, and thus helps avoid computational errors.

We evaluated the reliability and validity of all constructs as follows: To check item reliability, we analyzed the outer loadings of each item. Consistent with Hair et al.'s (2014) recommendation, we only deleted items with outer loadings between 0.4 and 0.7 when deleting these items led to an increase of composite reliability (CR) or average variance extracted (AVE) above the suggested thresholds of 0.6 and 0.5, respectively. The deletion of two additional items further increased discriminant validity. Altogether, this led to the exclusion of one outcome control item, one behavior control item, one clan control item, one input control item, two authoritative control style items, and three enabling control style items. All other measures exceeded the critical CR threshold of 0.7 (Fornell and Larcker, 1981), indicating internal reliability. The AVE for each construct was greater than 0.5, establishing convergent validity for all scales (ibid). Also, each construct shared more variance with its assigned items, and the loadings of all construct items were greater than their cross loadings with other constructs, establishing discriminant validity (ibid). Finally, to check for common method bias, we conducted Harman's one-factor test (Podsakoff et al., 2003) and performed a pairwise correlation analysis (Bagozzi et al., 1991). Both tests did not reveal any indications of common method bias.

We added two control variables to our research model to test for alternative explanations. Specifically, we included the use of an agile project methodology and the size of the project team as control variables. Previous research finds that both agile-methodology use (e.g., Boehm and Turner, 2003; Nerur et al., 2005; Port and Bui, 2009) and project team size (e.g., Pressman, 2001) are related to IS project performance. We also included other demographic variables (e.g., age) but none of them had a significant effect on project performance. We thus excluded these variables from the main analyses.

4.3 Descriptive Statistics

Our sample included data from 92 IS projects. Almost half of these projects dealt with application development (47.8%), one third was concerned with implementing standard software (33.7%), and the rest dealt with application maintenance (18.4%). 75% of the projects were run internally, whereas 25% were outsourced or used a hybrid sourcing model. 18.5% and 33.7% of the IS projects followed a waterfall and an agile methodology, respectively, while 47.8% did not follow any common development process. The sample was well balanced in terms of project team sizes: up to 10 team members (5.6%), 10-29 members (35.8%), 30-49 members (23.9%), 50-99 members (19.5%), and more than 100 members (15.2%). The large majority of projects lasted between 6 and 24 months (81%). With regard to the senior IT executives who filled in the survey questionnaire: All respondents worked for US-based companies. Most of them had worked for their company between 3 and 10 years (73%); 24% even reported to have worked at their company for more than 15 years. The majority of the executives was between 30 and 39 years old (53.2%), while about one third was 40 years or older (32%).

5 Data Analysis and Results

To test our hypotheses, we applied the hierarchical approach suggested by Carte and Russell (2003). First, we analyzed the relationships between the control variables and the dependent variables (step 1); we then added the main effects (step 2), and finally the interaction terms (step 3). The results are presented in Table 2. Please note main effects cannot be interpreted in the presence of interaction terms (step 3), where they represent conditional simple effects (Jaccard and Turrisi, 2003). Hence, the interpretation of the main effects must be restricted to step 2.

		Step 1: Control variables		Step 2: Main effects		Step 3: Interaction terms	
	Construct	*ß*	*t*	*ß*	*t*	*ß*	*t*
	Project size	0.173	0.869	-0.058	0.903		
	Agile methodology	0.108	0.786	**0.142****	**2.438**		
	Clan control (CC)			0.054	0.516		
	Self-control (SC)			0.111	0.983		
	Input control (IC)			**0.322*****	**2.965**		
	Behavior control (BC)			0.167	1.420		
	Outcome control (OC)			-0.011	0.088		
H1	Enabling control style			**0.280***	**1.934**		
H2	Authoritative control style			**-0.137***	**1.657**		
H3a	CC x Enabling control style					**-0.104***	**1.731**
	SC x Enabling control style					-0.001	0.119
H3b	IC x Authoritative style					**0.295****	**2.384**
	BC x Authoritative style					**0.169****	**2.209**
	OC x Authoritative style					**0.189****	**2.284**
	R^2 (%)	4.9		60		60.0-64.4	

Notes: Significant effects in boldface. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; two-tailed test. Interaction effects were tested separately; therefore, interaction effects are shown in step 3 without corresponding main effects.

Table 2. Hypotheses test results (effects on IS project performance)

In step 1, none of the two control variables shows a significant effect on IS project performance. Altogether, the control variables explain 4.9% of the variance in project performance. In step 2, the main effects are added. H1 and H2 refer to the effect of an enabling and an authoritative control style, respectively, on IS project performance. Both control styles have a significant effect on performance, though on a low significance level ($p < 0.1$). While an enabling control style is positively related to IS project performance ($\beta = 0.280$, $t = 1.934$, $p < 0.1$), an authoritative control style is negatively related to performance ($\beta = -0.137$, $t = 1.657$, $p < 0.1$). Thus, H1 and H2 are supported. Interestingly, even though not hypothesized, out of the five control modes, only one mode (input control) shows a significant and positive effect on IS project performance ($\beta = 0.322$, t-value = 2.965, $p < 0.01$). All other control modes do not show significant performance effects. After adding the main effects, the effect of one control variable (agile methodology) becomes significant. Overall, the main effects explain an additional 55.1%-points in performance variance beyond the control variables.

In step 3, the interaction terms are added. H3a and H3b pertain to the effects of informal control and formal control, respectively, on the links between the two control styles and IS project performance. Clearly, all interaction terms with regard to formal control and an authoritative control style are significant ($p < 0.05$), thus supporting H3b. With regard to informal control, only clan control significantly affects the relationship between an enabling control style and project performance. However, the interaction effect is weak and negative ($\beta = -0.104$, $t = 1.731$, $p < 0.1$). This means that clan control in combination with an enabling control style seems to diminish project performance, which runs counter to what we hypothesized in H3a.

In order to assess the strength of the significant interaction effects, we calculated the effect size f^2 as $[R^2_{\text{interaction terms}} - R^2_{\text{main effects}}] / [1 - R^2_{\text{interaction terms}}]$ (Cohen, 1988). Effect sizes from 0.02, 0.15, and 0.35 are regarded as weak, moderate, and strong, respectively (Chin et al., 1996). All four moderators constitute weak effects, ranging from 2.9% (clan control) to 12.4% (input control). Altogether, our model explains up to 65% of the variance in IS project performance. The interaction term accounted for an increase in explained variance of up to 4.4%-points beyond the main effects. The four significant interaction effects are visualized in Figure 2 below.

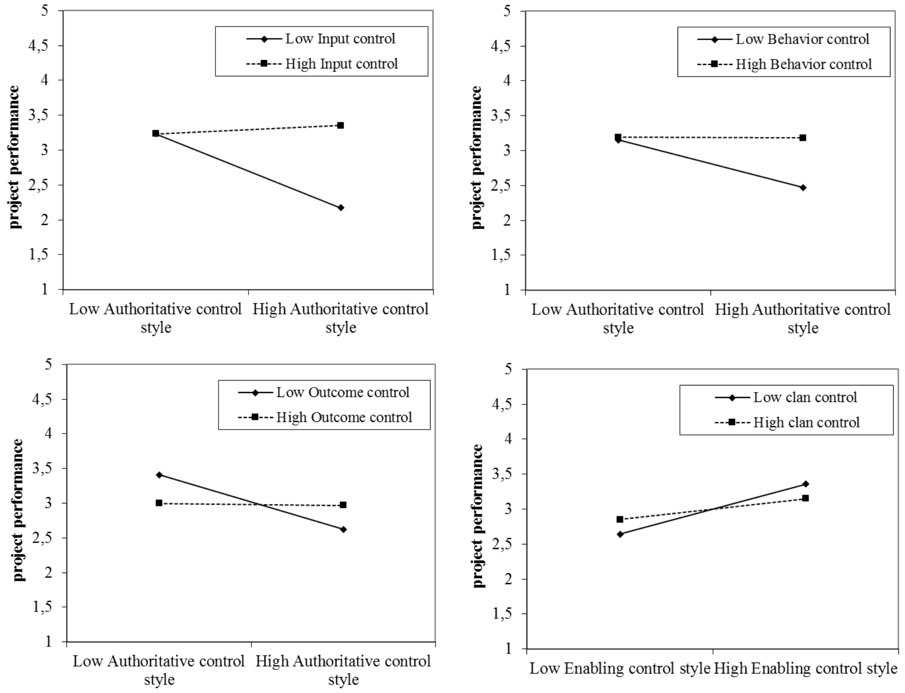

Figure 2. Interaction plots

The interaction plots show that formal controls can offset the negative performance effect of an authoritative control style on IS project performance (see three plots at the top and bottom-left). More specifically, the interaction plots suggest that high use of an authoritative control style is detrimental to project performance if the controller makes only low use of formal control. On the other hand, in the case of high formal-control use, the performance effects of an authoritative control style remain constant. The interaction plots also provide additional insight with regard to the counterintuitive, negative interaction effect between clan control and an enabling control style on the performance of an IS project (see Table 2). Generally, the corresponding interaction plot (bottom-right) shows that greater use of an enabling control style is beneficial to project performance. However, the interaction also indicates that the performance effect of an enabling control style is stronger when controllers combine this control style with low clan-control use than when they combine it with high clan-control use.

6 Discussion

Prior research has produced a considerable body of knowledge on the control of IS projects. The study at hand contributes to this knowledge by offering novel insights on project control tactics used by senior IT executives, who face the paradoxical challenge of being ultimately accountable for the performance, and the potential failure, of an IS project despite having scarce time and often limited project-related knowledge (Loch et al., 2016). Based on a survey with 92 senior IT executives, we find empirical support for three of our four research hypotheses (H1, H2, and H3b). In particular, we find evidence for the positive relationship between executives' use of an enabling control style and IS project performance, as well as for the performance-enhancing effect of an authoritative control style when combined with the use of formal control modes. In the following, we discuss the contributions of our study and their implications for theory and practice.

A main contribution of our study lies in providing empirical support for the relationship between senior IT executives' control styles and IS project performance. Specifically, the study results suggest that executives' use of an enabling control style is positively related to the performance of an IS project. This finding is in line with existing research, which argues that the use of an enabling control style allows senior IT executives to compensate for their knowledge gaps (Hekkala and Urquhart, 2013; Heumann et al., 2015) by empowering controllees (Adler and Borys, 1996) as well as by encouraging them to give feedback on the enacted controls and openly discuss problems (Tiwana, 2010). Ultimately, the latter will also motivate controllees to provide the controller with complete and truthful information about the project status in a timely manner (Loch et al., 2016).

Furthermore, the results of our study suggest that although an authoritative control style is generally found to have a negative effect on IS project performance, senior IT executives' use of such a control style still seems to play a critical role in successfully enacting formal controls. In particular, our results suggest that heavy reliance on an authoritative control style is detrimental to performance in IS projects where executives make only limited use of input, behavior, and/or outcome controls (see interaction plots in Figure 2). Put differently, the use of an authoritative control style complements the use of formal control modes, which can be at least partly explained by related research findings in prior literature. For example, Hekkala and Urquhart (2013) find that "project members often resorted to formal authority as a means of getting things done" (p. 92). On a related note, Loch et al. (2016) highlight that senior executives must provide subordinates with clear guidance on the project direction without allowing "too many voices".

Taken together, the study results suggest that senior IT executives need to be able to blend different control styles in order to successfully enact control over IS projects. In this context, Gregory and Keil (2014) find that assigning a tandem of two IS project managers using contrasting control styles (bureaucratic vs. collaborative) helps achieve superior IS project performance and flexibility. Our study extends and contextualizes this finding by showing that, in the specific case of senior IT executives enacting control over IS projects, a single manager can increase her control effectiveness by switching between contrasting control styles. More specifically, our results suggest that executives should rely on an enabling control style, but switch to an authoritative control style for enacting formal controls. The latter may also help executives make the most effective use of their limited time. While an authoritative control style is characterized by limited interaction between controller and controllee, the repair and transparency features of an enabling control style necessitate frequent controller-controllee interaction, which can make the use such a control style very time-consuming (Wiener et al., 2016). Thus, a promising path for future research is to conduct in-depth case studies that explore how senior IT executives blend different control styles (over time) to compensate for their knowledge gaps and time constraints, and ultimately, to enact effective control over IS projects.

Finally, another important study contribution relates to senior IT executives' use of different control modes and their effects on IS project performance. Here, an overarching finding of our study is that the results of prior IS project control studies do not seem to translate to the specific context of senior IT executives acting as controllers. Specifically, while existing research finds empirical evidence for the performance-enhancing effects of behavior, outcome, clan, and self-control in internal project settings (e.g., Henderson and Lee, 1992; Keil et al., 2013; Liu et al., 2010; Tiwana and Keil, 2009), our study does not reveal any significant relationships between the use of these four control modes and the performance of IS projects. Rather, we find empirical support for a positive and significant relationship between senior IT executives' use of input control and IS project performance. Our study thus highlights the particular importance of input control from the perspective of senior IT executives. This finding is in line with related studies in neighboring disciplines, which find that the use of input control positively affects organizational performance (Jaworski, 1988; Snell, 1992). In contrast, prior IS project control research seems to largely neglect input control, thereby viewing projects as in essence 'closed' systems with given resources (Wiener et al., 2016). Against this backdrop, IS project control researchers should incorporate input control as a fifth control mode in future studies. By doing so, they may, for example, develop novel insights on how decisions pertaining to resource allocation and manipulation influence the performance of IS projects.

From a practical perspective, the results of our study suggest that, where possible, senior IT executives should use an enabling control style. Using such a control style not only helps improve IS project performance, but may also help build a positive, open-minded control environment and thus positively affect the relationship between executives and their subordinates. For IS projects where executives believe that the use of an authoritative control style is warranted, it should be employed in combination with input and outcome controls in order to maximize IS project performance. This combination allows for a straightforward, goal-setting approach, while still providing a degree of controllee autonomy. However, senior IT executives should still be careful in their use of an authoritative control style. Although our results suggests that this control style positively interacts with formal controls, they also indicate that an authoritative control style can diminish the overall performance of an IS project.

7 Conclusions and Future Work

The results of our study should be interpreted with several limitations in mind. These limitations also point to promising avenues for future research. First, although our data analysis revealed that senior IT executives' use of formal control modes (input, behavior, and outcome control) has a positive and significant effect on the link between an authoritative control style and IS project performance, the size of these interaction effects was rather weak (below 0.15). Therefore, future research is needed to confirm and better understand the observed interaction patterns. Relatedly, there may be other factors, not included in this study, that (positively) moderate the effectiveness of an authoritative control style, such as the controllees' power-distance orientation (Wiener et al., 2016). Second, senior IT executives may be inclined to describe their control style as more enabling (and less authoritative). To reduce the risk of response bias, future studies should try to collect data from both sides of the control dyad. Such studies may also reveal new insights into how differences in controller and controllee perceptions influence the effectiveness of employed IS project control tactics (Narayanaswamy et al., 2013). Third, to measure clan control, we adopted well-established items from previous research (Kirsch et al., 2002). Given that these items are primarily concerned with the degree of controller integration into the core project team (clan), they may neglect important aspects of how senior IT executives enact clan controls. This could be a potential reason for the non-significant main effect of clan control on IS project performance as well as the counterintuitive, negative interaction effect between an enabling control style and clan control (H3a) observed in this study. For example, while a senior IT executive may not attempt to become a "regular" member of the project team, she may still attempt to promote a team environment conducive to the exercise of clan controls. We thus encourage future research on how to conceptualize and measure the use of clan controls on different managerial levels (e.g., project manager vs. senior executive). Finally, past work in IS project control suggests that control styles can change over time (Gregory et al., 2013). Future research may uncover valuable insights into the factors that influence such changes by conducting longitudinal studies that examine how and why senior IT executives alter their control style during the course of an IS project.

In conclusion, this study explored how senior IT executives' use of different control styles and modes relates to the performance of IS projects. We find that the use of an enabling control style is positively related to IS project performance, while the use of an authoritative control style is negatively related to performance. As well, our study provides empirical evidence that executives' use of formal controls positively moderates the link between an authoritative control style and project performance. Against this backdrop, this research represents a first step towards a deeper understanding of how senior IT executives can exercise effective control over IS projects, in comparison to the traditional context of middle managers exercising control within such projects.

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Appendix: Construct Items

Construct	**Items** (seven-point Likert scales)
Enabling control style (Remus et al., 2016)	(1) During my interactions with the IS project manager, I tried to enable her/him to identify a well-operating project process; (2) When interacting with the IS project manager, I attempted to enable her/him to identify opportunities for improving the project process; (3) In my discussions with the IS project manager, I provided her/him with regular feedback on the performance of the IT project; (4) I provided the IS project manager with additional insights by discussing best practices with her/him; (5) I made the IS project manager aware of how the project fits into the 'bigger picture'; (6) I provided the IS project manager with information about the overall project context; (7) In my discussions with the IS project manager, I appreciated her/his feedback on real-work contingencies.
Authoritative control style (Oates, 2010)	(1) It was often necessary to make decisions without consulting the IS project manager; (2) The IS project manager learned to not question my judgment, as I rarely back down when I am truly passionate about something; (3) I needed to push the IS project manager into completing work to a high enough standard; (4) I ensured that the IS project manager followed through with my decisions.
Clan control (Kirsch et al., 2002)	(1) I actively participated in project meetings to understand the project team's goals, values, and norms; (2) I placed a significant weight on understanding the goals, values, and norms of the IT project team; (3) I attempted to be a 'regular' member of the IT project team; (4) I attempted to understand the project team's goals, norms, and values.
Self-control (Tiwana and Keil, 2009)	(1) The IS project manager self-managed the project process; (2) The IS project manager set specific goals for the project without my involvement; (3) The IS project manager defined specific procedures for project activities without my involvement.
Input control (Snell, 1992)	The IS project manager received substantial training before she/he assumed responsibility for the project; (2) I have gone to great lengths to establish the best possible staffing procedure for the IT project; (3) The IS project manager had to undergo a series of evaluations before she/he was appointed; (4) I take pride in the fact that we assigned the best people to the IT project.
Behavior control (Tiwana and Keil, 2009)	(1) I expected the manager of the IT project to follow an understandable written sequence of steps toward accomplishing project goals; (2) I expected the IS project manager to follow a written sequence of steps to ensure the project met stakeholder requirements; (3) I expected the IS project manager to follow a written sequence of steps to ensure project success; (4) The IS project manager was assessed on the extent to which the project team followed existing written plans, procedures, and practices.
Outcome control (Kirsch et al., 2002)	(1) I placed significant weight upon timely completion of the IT project; (2) I placed significant weight upon project completion within budgeted costs; (3) I placed significant weight upon project completion to the satisfaction of users and other stakeholders; (4) I used pre-established targets as benchmarks for evaluating the performance of the IT project; (5) I evaluated the IS project manager's performance by the extent to which project goals were accomplished, regardless of how the goals were accomplished.
Project performance (Wiener et al., 2015)	(1) The deliverables of the IT project were completed on time; (2) The IT project deliverables were completed within budgeted costs; (3) The outcomes of the IT project met the requirements; (4) The project outcomes were of high quality; (5) Project stakeholders were satisfied with the outcomes of the IT project.

Table 3. Construct operationalization