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Research Commentary

Moving IS Project Control Research into the Digital Era: The “Why” of Control and the Concept of Control Purpose

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Abstract. In this research commentary, we argue that the current digital era compels a reconsideration and problematization of research on information systems (IS) project control. IS projects are key to the pursuit of digital innovation and transformation activities, and the control of IS projects is central to creating and capturing value from these activities. However, IS project control research has not kept pace with current developments in the digital era. Specifically, we find that existing research has been dominated by an underlying agency theory perspective, which is not attuned to salient aspects of current control settings, such as digital innovation initiatives, and thus restricts our understanding of IS project control. To address this shortcoming, we problematize core assumptions underlying existing IS project control research and draw on stewardship theory to present an alternative set of assumptions complementing the prevalent agency theory perspective; introduce the concept of control purpose (*why*); offer empirical support for its conceptual distinction between value-appropriation and value-creation control purposes; and develop a research agenda that helps move IS project control research into the digital era.

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Keywords: IS project control • digital era • problematization • agency theory • stewardship theory • control purpose • value appropriation • value creation • research agenda

1. Introduction

We are currently experiencing an era in which increasingly advanced and pervasive digital technologies fuel an arguably unprecedented wave of innovation and transformation in organizations and in society as a whole (Yoo et al. 2012, Legner et al. 2017, Lanzolla et al. 2018). Although digitalization initiatives take different organizational forms, information systems (IS) projects represent one key vehicle for the pursuit of digital innovation and transformation activities (cf. Kane et al. 2016, Nambisan et al. 2017). For example, IS projects are typically the key building blocks of large-scale, multiyear digital transformation programs (Gregory et al. 2015, Smith and Watson 2019) and a common way to organize digital innovation endeavors (Henfridsson and Bygstad 2013).

Thus, although the digital era introduces greater diversity in how IS projects are constituted (Fitzgerald et al. 2014, Kane et al. 2016, Lifshitz-Assaf et al. 2019), the control of these projects remains central to creating and capturing value from digitalization initiatives.

Organization and management theorists have recently emphasized the importance of understanding control in the context of today’s organizations and challenges (Chen et al. 2009, Cardinal et al. 2017, Pfeffer 2018), highlighting that control research has not kept pace with the dramatic changes ushered in by the digital era (Hagel et al. 2010, Kirsch and Choudhury 2010, Cardinal et al. 2017). For example, Cardinal et al. (2017, p. 560) argue that “research in the control domain [...] appears to over rely on theories and approaches based on an understanding of

organizations that dates back to the 1950s, 1960s, and 1970s, thereby limiting our ability to better understand organizations and advise managers today and in the future.” In effect, control research in general and IS project control research in particular has been dominated by an underlying agency theory perspective (Cardinal et al. 2017), which implies that the purpose of control is to ensure that project stakeholders refrain from opportunistic, self-interested behavior and act in accordance with organizational goals (e.g., Kirsch 1996, Choudhury and Sabherwal 2003, Tiwana and Keil 2009).

Further, we argue that key characteristics of the current digital era place new, unmet demands on the research area.¹ In particular, nowadays, digital innovation and transformation efforts represent a top priority for many organizations (Yoo et al. 2010, Barrett et al. 2015, Huang et al. 2017, Kappelman et al. 2019). This has led to the establishment of new work practices, which engender a *blurring of roles*; it is no longer the case that “IT does IT, on a short leash,” but rather, business and IT experts work collaboratively toward common goals, pursuing digitally enabled business opportunities (Woodard et al. 2013, Urbach et al. 2017, Tumbas et al. 2018). Also, with the emergence of the digital era, the focal challenges of IS projects have progressively shifted: from delivering commodity services to driving *platform innovation* (Yoo et al. 2012, Gregory et al. 2018); from following linear processes with predetermined end states to engaging in *open-ended experimentation* and *continuous innovation* (Baldwin and Von Hippel 2011, Lanzolla et al. 2018); and from relying on stable, often hierarchical control structures to leveraging dynamic networks and multiactor *platform ecosystems* (Tiwana et al. 2010, Markus and Loebbecke 2013, Majchrzak et al. 2016). Furthermore, the wide adoption of digital technologies in everyday life along with their growing direct societal impact (Yoo 2010, Gannon 2013) has led to the *consumerization of IT* (Harris et al. 2012), which refers to the process whereby changing practices and expectations of consumers influence IT-related activities of workers and managers in organizations (Gregory et al. 2018). Another societal aspect concerns the values and priorities of the *changing workforce* as well as the need for *increased specialization*, which create additional control challenges (e.g., Gewald et al. 2017, Gregory et al. 2018).

Relatedly, it should be noted that, when studying and theorizing about digital-era phenomena, IS scholars have foregrounded aspects such as the creation of digital platforms and ecosystems (Tiwana et al. 2010, Wareham et al. 2014) and pursuit of digital innovation (Yoo et al. 2012, Henfridsson and Bygstad 2013) while backgrounding IS projects as the classic organizational form of conducting IT-related activities.

Still, when looking “under the hood” of digitalization initiatives, we find that work is typically organized in project teams and that IS project arrangements—although probably being more varied in the digital era—remain ubiquitously present and important in a wide range of contexts (cf. Fitzgerald et al. 2014, Kane et al. 2016, Lifshitz-Assaf et al. 2019). Our research commentary’s focus on IS projects, thus, harmonizes well with the digital-era challenges highlighted and, at the same time, provides distinct boundary conditions for our theorizing (Rivard 2014).

Based on these developments and observations as well as recent critique of control theory in general (Cardinal et al. 2017), we argue that fundamental assumptions of IS project control research need to be problematized, that the traditional research focus on agency concerns is too narrow a conceptualization of control as an organizational phenomenon, and that this narrow focus risks inadvertently obscuring other important purposes of IS project control activities in the digital era. Indeed, although extant research addresses the questions of *what* controls are used and *how* they are enacted (Wiener et al. 2016), we argue that the field has yet to engage meaningfully with the broader question of *why* controls are used. This argument is supported by control research in other fields, which points to value creation as another important purpose of control that complements the agency focus on value appropriation (Gulati and Singh 1998, Dekker 2004, Gulati et al. 2012). Specifically, Gulati and Singh (1998, p. 783) highlight a control purpose related to value-creation requirements, arguing that even if two parties “have complete confidence in each other and face no appropriation concerns whatsoever [...], they must still coordinate the division of labor and the interface of activities and products between them.” Considering value creation as a purpose of control activities also finds theoretical support in stewardship theory, which offers a complementary perspective on control by portraying the “agent” as an intrinsically motivated steward working toward a common overall goal (Donaldson 1990, Davis et al. 1997, Sundaramurthy and Lewis 2003).

Consequently, we believe that IS project control research needs to be reinvented for an era in which collaborative value creation is increasingly prevalent (Woodard et al. 2013). At the same time, value-appropriation concerns continue to be important, particularly in traditional IS project settings. This means that we need to understand two different rationales for IS project control, and we need to understand them as of varying prominence in control activities. Therefore, in this research commentary, we (1) use the problematization method (Alvesson and Sandberg 2011) to challenge key agency theory assumptions underlying existing IS project control research and draw on

stewardship theory to present an alternative set of assumptions; (2) introduce and offer empirical support for the concept of *control purpose* (*why*), which we conceptualize in terms of the distinction between value-appropriation and value-creation purposes; and (3) build on this conceptual expansion to develop a research agenda that helps move IS project control research into the digital era.

2. The Why of Control and the Concept of Control Purpose

2.1. IS Project Control and Agency Theory

In the IS project control literature as well as in related literature in contributing disciplines (e.g., organization theory, management, marketing), control is defined as any attempt to ensure that individuals behave in a manner consistent with organizational objectives (e.g., Ouchi 1979, Jaworski 1988, Kirsch 1996, Choudhury and Sabherwal 2003, Tiwana 2010). To regulate or adjust the behavior of the controllee(s), the controller selects control mechanisms representing formal and informal control modes and combines them into a portfolio of controls (Kirsch 1997, Choudhury and Sabherwal 2003), referred to as control configuration and corresponding to the question of *what* controls are used on IS projects. More recently, drawing on a comprehensive literature review, Wiener et al. (2016) identified three focal research themes (control choices, effects, and dynamics) and offered an expanded theoretical framework for IS project control distinguishing between control configuration (*what*) and control enactment (*how*). The latter is defined as “the interaction between the controller and the controllee through which the controller implements formal controls and/or promotes informal controls” (Wiener et al. 2016, p. 755). It is conceptualized in terms of two contrasting control styles (authoritative versus enabling).

Despite the theoretically and practically relevant advances in the control literature, we argue that the research field has yet to engage meaningfully with the broader question of *why* controls are used in IS projects. We suggest that this deficiency can be remedied by expanding the field’s perspective on the underlying control purpose (see Table 1). The impetus for our argument is that, to this point, agency theory has been the most commonly used theory in control research (Cardinal et al. 2017), including research on the control of IS projects. The strong focus on agency theory implies that the purpose of control activities is to target problems, such as moral hazard (i.e., lack of agent effort) and adverse selection (i.e., misrepresentation of agent abilities) (Levinthal 1988, Eisenhardt 1989, Nilakant and Rao 1994) in order to mitigate concerns that participants may wrongfully appropriate value from IS projects.

Considering the historical and institutional context of IS projects, it makes sense that IS project control research shows this strong focus on value-appropriation concerns. Research on the control of IS projects emerged in the 1990s—with seminal articles by Henderson and Lee (1992) and Kirsch (1996, 1997)—and was strongly influenced by research focusing on the principal-agent dilemma in organizational control (e.g., Ouchi 1979, 1980; Eisenhardt 1989). During this time, many IT departments were under pressure to constantly justify themselves and their work. For example, skeptical business executives questioned the size of IT budgets, the role of chief information officers (CIOs), and whether IT really created value (e.g., Earl and Feeny 1994, Carr 2004). Arguably, a number of infamous IS project failures involving companies such as Bank of America, McDonalds, and Nike (e.g., Nelson 2007) and the outsourcing movement—sometimes seen as a remedy for internal IT underperformance (Grover et al. 1994, Lacity et al. 1995)—also contributed to shaping an IT-related control environment focused on agency concerns (Hirschheim and Klein 2012).

Today, however, we are in an era in which the blurring of organizational roles and boundaries as well as collaborative value creation are increasingly prevalent (e.g., Tumbas et al. 2018) and in which digital innovation and transformation represent a top priority for many firms (e.g., Woodard et al. 2013, Barrett et al. 2015, Kappelman et al. 2019). This has led control researchers to question the extent to which agency assumptions are still realistic in the digital era (Cardinal et al. 2017). In particular, it has been argued that agency theory’s “economic model of man”—viewing agents as individualistic, opportunistic, and self-serving—is excessively narrow (Eisenhardt 1989, Donaldson 1990, Bosse and Phillips 2016, Wu and Saunders 2016). Agency theory should, thus, be complemented with other theories to broaden theorizing efforts and better capture the complexity of organizations (Eisenhardt 1989, Cardinal et al. 2017).

2.2. Digital-Era Characteristics Challenge Core Agency Theory Assumptions

In this section, we use Alvesson and Sandberg’s (2011) problematization method to challenge key assumptions central to agency theory and prevalent in the IS project control literature.² In particular, we articulate core assumptions, evaluate them against key characteristics of the digital era, and then draw on stewardship theory to present an alternative assumption grounding (see also Table 2).

First, a central assumption of agency theory is that goal incongruence between principal and agent is typically unavoidable (Donaldson 1990, Bosse and Phillips 2016, Wu and Saunders 2016). This assumption reflects a traditional view of organizations with

Table 1. Key Control Questions

Question	Related concept	Definition	Conceptualization
What?	Control configuration (in terms of control <i>modes</i>)	The control mechanisms that constitute the control portfolio (Kirsch 1997, Choudhury and Sabherwal 2003)	Formal control modes (input, behavior, and outcome control) and informal control modes (clan and self-control)
How?	Control enactment (in terms of control <i>style</i>)	The interaction between controller and controllee through which the controller implements and/or promotes controls (Gregory et al. 2013, Heumann et al. 2015, Wiener et al. 2016)	Authoritative control style (unilateral style with limited controller–controllee interaction) and enabling control style (bilateral style seeking frequent controller–controllee interaction)
Why?	Control purpose	The intentions that underlie the controller’s configuration (<i>what</i>) and enactment (<i>how</i>) of controls	Value-appropriation purpose and value-creation purpose (see Table 3)

corporate business units in a “customer” role and internal IT units in a “supplier” role, emphasizing bounded roles and work division (e.g., Yoo et al. 2010, Urbach et al. 2017) and conflicting interests and goals across roles (Franz and Robey 1984). However, the “digital revolution” has arguably enhanced the importance and changed the role of companies’ IT units, which are now increasingly requested to partner with business units and integrated into cross-functional teams pursuing digital innovation and transformation projects (Woodard et al. 2013, Urbach et al. 2017). This implies that business and IT experts share common goals (Tumbas et al. 2018), which corresponds with the underlying assumption of stewardship theory that agent motives are basically aligned with the objectives of the principal (Davis et al. 1997, Sundaramurthy and Lewis 2003) and the organization in general (Hernandez 2012). The stewardship assumption that agents work toward a collective goal also applies to IS projects conducted in the context of platform ecosystems, which have emerged as a central focus of innovation in the digital era (Yoo et al. 2012). In such multiactor ecosystems, the platform provider often shares common interests and goals with external contributors who use the platform as a

foundation for developing complementary and innovative products and services (Yoo et al. 2012).

Second, agency theory holds the assumption that information asymmetry between principal and agent is categorically negative (Wu and Saunders 2016). Specifically, information asymmetry is viewed as an opportunity for agents to use their superior knowledge for selfish goals and hide their opportunistic behaviors from the principal (Jensen and Meckling 1976, Eisenhardt 1989, Miller and Sardais 2011, Bosse and Phillips 2016). This assumption, however, does not consider how the digitalization of work leads to practices that are increasingly knowledge-intensive and specialized (Jonsson et al. 2018). Nor does it consider how ill-defined problems, coupled with the need for continuous innovation, require growing reliance on diverse and heterogeneous sources of knowledge, including external experts (Yoo et al. 2012). As a consequence, in a digital-era context, we also need to take into account how information asymmetry “adds to the expertise” (Donaldson 1990, p. 377) and allows IS project participants to perform knowledge-intensive work better. In fact, information asymmetry has, for example, been shown to be positively related to the effectiveness of information security services (Wu and Saunders 2016).

Table 2. Digital-Era Characteristics vs. Theoretical Assumptions

Common characteristics of IS projects in the digital era ^a	Agency theory assumptions ^b	Alternative assumptions based on stewardship theory ^b
Blurring of organizational boundaries and roles, platform innovation	Goal incongruence unavoidable (individualistic self-interest and opportunism of agent)	Congruence with common overall goal (steward acts for collective interests)
High knowledge intensity and specialization	Information asymmetry between principal and agent is categorically negative	Information asymmetry among actors may be neutral or positive
Changing workforce (knowledge workers and millennials)	Extrinsically motivated agents	Intrinsically motivated stewards
Continuous innovation, open-ended experimentation	Short-term focus	Long-term orientation
Platform ecosystems, IT consumerization	Stable hierarchical relationships	Dynamic network structures

^aBased on Tiwana et al. (2010), Baldwin and von Hippel (2011), Yoo et al. (2012), Barrett et al. (2015), Cardinal et al. (2017), Gregory et al. (2018), and Tumbas et al. (2018).

^bBased on Eisenhardt (1989), Donaldson (1990), Davis et al. (1997), Hernandez (2012), and Wu and Saunders (2016).

Third, given its economic model of human behavior, agency theory carries the assumption of extrinsically motivated agents (Jensen and Meckling 1976, Sundaramurthy and Lewis 2003). Recent research, however, highlights the increasingly complex relationship between knowledge workers (e.g., in IS projects) and organizations in the digital, post-industrial economy (Bechky and Chung 2018). For example, studies find that knowledge workers tend to value their jobs not only for monetary compensation, but also for professional growth opportunities (e.g., Wu and Saunders 2016). This is consistent with stewardship theory's assumption of intrinsically motivated and self-actualizing stewards who display high levels of commitment and involvement (Donaldson and Davis 1991, Sundaramurthy and Lewis 2003, Miller and Sardais 2011, Wu and Saunders 2016). On a related note, some studies suggest that intrinsic motivation has assumed heightened intensity with the emergence of millennials (Singh et al. 2012, Cates 2014), who now comprise the largest segment of the U.S. workforce (Calk and Patrick 2017).

Fourth, agency theory assumes a fixed, short-term orientation of the principal with an explicit focus on compliant agent behaviors (Miller and Sardais 2011, Wu and Saunders 2016) and an implicit focus on the organizational impact imposed on the triple constraints of budget, time, and functionality (Kirsch 1996). This assumption seems to fit well with traditional IS projects, designed to progress in a linear fashion (e.g., waterfall approach) toward predefined goals (e.g., Kirsch 2004). However, it seems less attuned to many current project settings that often employ agile development approaches or are characterized by a focus on digital innovation along with open-ended experimentation (Baldwin and Von Hippel 2011, Lanzolla et al. 2018). In contrast, stewardship theory assumes a long-term time orientation with a commitment to continuity (Hernandez 2012, Wu and Saunders 2016). This long-term orientation based on continuity is arguably a more representative view of many IS projects in the digital era, in which the "increased pace [...] has resulted in a situation in which innovation needs to be continuous, relentless, and fast" (Yoo et al. 2012, p. 1405). It also allows for the development of trust, which is characteristic of a stewardship relationship (Sundaramurthy and Lewis 2003).

Fifth, and finally, agency theory builds on the implicit assumption of stable, hierarchical control relationships between principals (superiors) and agents (subordinates) (cf. Jensen and Meckling 1976, Levinthal 1988, Eisenhardt 1989, Donaldson 1990). This assumption is challenged by several emerging digital-era phenomena, such as the growing importance of platform ecosystems (e.g., Bharadwaj et al. 2013, Majchrzak et al. 2016) and the increasing consumerization of

IT (e.g., Yoo 2010, Gregory et al. 2018), which have led to complex and dynamic structures that are increasingly network-based, spanning intra-, inter-, and extraorganizational boundaries and contexts (Barrett et al. 2015, Gregory et al. 2018, Jonsson et al. 2018).

2.3. Value-Appropriation and Value-Creation Purposes of IS Project Control

Although we do *not* argue that the field has moved from an era in which agency theory assumptions were valid to one in which they are not, we do argue that the changing focus and nature of IS projects in the digital era places novel and unmet demands on the control of such projects. This argument is also reflected in control research outside of IS, which highlights two central control problems, namely the management of *value-appropriation* concerns and of *value-creation* requirements (e.g., Gulati and Singh 1998, Dekker 2004). Value-appropriation concerns arise "from the uncertainties associated with future specifications, cost uncertainties, and problems in observing [participants'] contributions, all of which aggravate the potential for moral hazards" (Gulati and Singh 1998, p. 788). They are related to the problem of harnessing value, for example, in the context of mergers and acquisitions or strategic alliances (Priem et al. 2013). In contrast, value-creation requirements arise from anticipated difficulties associated with integrating the critical and unique skills and knowledge of a diverse set of stakeholders in task execution. Value creation, thus, gives rise to concerns that are distinct from value-appropriation concerns (Gulati and Singh 1998). However, as is the case with strategy research (Priem et al. 2013) and control research in general (Cardinal et al. 2017), the majority of IS project control research has focused on value appropriation while underemphasizing value creation. Therefore, the time for a "rebalancing" of research attention is at hand (Cardinal et al. 2017).

Interestingly, these distinctive control problems are arguably embodied in one of the earliest definitions of IS project control, from Kirsch (1997, p. 215), which states that control encompasses managerial activities "to ensure progress by fusing together the complementary roles and capabilities of [IS] project participants" and to motivate "individuals to work in accordance with organizational goals and objectives." The first aspect of this definition emphasizes value-creation requirements ("fusing together"), and the second focuses on value-appropriation concerns ("work in accordance"). However, definitions in subsequent studies typically refer only to making individuals work in accordance with organizational goals, thus emphasizing value-appropriation concerns (also see the results of a secondary case analysis summarized in the next section as well as Online Appendices A and B).

To further our understanding of the two central control problems highlighted, we introduce the concept of control purpose to the IS project control literature. Focusing on the question of *why*, we define control purpose as the intentions that underlie the controller's configuration (i.e., control modes) and enactment (i.e., control style) of controls and conceptualize this concept in terms of the distinction between value-appropriation and value-creation purposes (see Table 3).³ The control purpose of value appropriation relates to agency theory. With a value-appropriation purpose, controls aim at safeguarding investments from being appropriated by opportunistic controllees (Dekker 2004) and, thus, at minimizing agency concerns (Gulati and Singh 1998). By contrast, the control purpose of value creation relates to a stewardship model of human behavior, which views agents (i.e., stewards) as pro-organization and trustworthy and their motives as being basically aligned with the objectives of the principal (Davis et al. 1997). Also, stewards are intrinsically motivated, tend to identify with their organization and internalize its mission (Sundaramurthy and Lewis 2003), and work toward the long-term welfare of others (Hernandez 2012). This perspective emphasizes control activities focused on creating value by means of cooperation, coordination, facilitation, and guidance (e.g., Donaldson 1990, Davis et al. 1997) rather than on appropriating value by means of supervising, monitoring, compliance, rewarding and/or sanctioning. Stewardship theory, thus, adds a distinct perspective to control theory that is able to explain motivational and situational reasons behind the exercise of control not captured by agency theory (Donaldson 1990). Such a perspective also considers how the use of controls can create value by fostering collaboration and allowing for the joint mobilization of resources to meet organizational demands (Hernandez 2012). Thus, the stewardship perspective enables a more complete understanding of control activities and their different purposes in IS projects.

It should be noted that Gulati and Singh (1998) as well as Dekker (2004) refer to the control problems of value appropriation and creation in the specific

context of interorganizational relationships (e.g., strategic alliances). In contrast, our focus is at the project level and is clearly located within the boundaries of control theory.⁴ In this regard, two central assumptions related to the theoretical boundaries of the proposed control purpose concept need to be mentioned (cf. Rivard 2014). First, a contextual assumption is that value-appropriation concerns and value-creation requirements apply to both internal and external (e.g., outsourced or platform-based) IS projects. Second, in line with Dekker (2004), we make the conceptual assumption that the two focused control purposes apply to all control modes and styles. That is, controls addressing value-appropriation concerns as well as controls addressing value-creation requirements may be represented as either formal or informal control modes and may be enacted with an authoritative or enabling control style. For example, using an enabling control style, including its repair and transparency features, controllers can capture additional information and make controllees aware of the big picture in order to mitigate agency concerns, such as information asymmetry and goal incongruence (value-appropriation purpose). The features of an enabling control style can also be used to facilitate cooperation and knowledge transfer among different stakeholder groups (value-creation purpose).

2.4. Empirical Manifestations of Different Control Purposes in IS Projects

To empirically support our arguments, especially those pertaining to the existence of different control purposes in IS projects, we performed a content analysis of case studies from 21 articles included in an earlier review of the literature (Wiener et al. 2016) (refer to Online Appendix A for a description of how the analysis was conducted).⁵ First, we examined from what theoretical perspective control was defined in the analyzed articles. Here, we found that—except for Kirsch (1997)—all articles explicitly adopt an agency perspective to define control, emphasizing control as any attempt to ensure that IS project participants act in accordance with organizational goals (see Online Appendix B, Table B1, for each article's definition of control).

Table 3. Purposes of IS Project Control

	Value-appropriation purpose	Value-creation purpose
Control problem	Value-appropriation concerns (e.g., goal incongruence, information asymmetry, adverse selection, moral hazard)	Value-creation requirements (e.g., knowledge exchange and transfer, task complexity, and interdependencies)
Control focus	Supervising, monitoring, compliance, rewarding, and/or sanctioning	Cooperation, coordination, facilitation, and guidance
Overarching goal	Harnessing value	Maximizing value
Underlying theory	Agency theory	Stewardship theory

Notes. Based on Malone and Crowston (1994), Crowston (1997), Gulati and Singh (1998), Sundaramurthy and Lewis (2003), and Dekker (2004).

This finding supports our claim that the theoretical focus of existing IS project control research is on managing value-appropriation concerns.

Second, we analyzed the content of each case study. Unsurprisingly, all 21 articles report empirical manifestations of value-appropriation concerns as the underlying purpose of IS project control activities. Interestingly, however, our analysis also reveals that all articles, except for one, report manifestations of control activities addressing value-creation requirements. As an example, Kirsch (2004) reports on the use of control to mitigate typical agency concerns, including information asymmetries, goal incongruence, and risk of moral hazard; however, she also empirically describes how controls were used to further collaboration, facilitate knowledge transfer among stakeholders, and manage interdependencies and complexity, thus supporting value creation (see Online Appendix B, Table B2, for a summary of the secondary case analysis results). This suggests that value creation was indeed another purpose of control activities in the IS projects reported on empirically even though it was not theorized. Put differently, the genie of control purpose is already out of the magic bottle, but has, until now, escaped detection.

3. A New Agenda for IS Project Control Research in the Digital Era

Contrasting the traditional focus on value appropriation in IS project control research, the theoretical arguments put forward in this research commentary, along with the results of our secondary case analysis, suggest that value creation is an important control purpose in IS projects, especially in the digital era. This era's emphasis on value creation through collaborative efforts (e.g., Henfridsson and Bygstad 2013, Svahn et al. 2017, Tumbas et al. 2018) and its broadening range of IS project arrangements (e.g., Gregory et al. 2015) strongly motivates a clear articulation of new research directions that explicitly consider both value-appropriation and value-creation purposes of IS project control. We, thus, join scholars from other fields (Gulati and Singh 1998, Dekker 2004, Gulati et al. 2012, Cardinal et al. 2017) in identifying the need for a new control research agenda that looks beyond the traditional focus on agency concerns to better understand control activities.

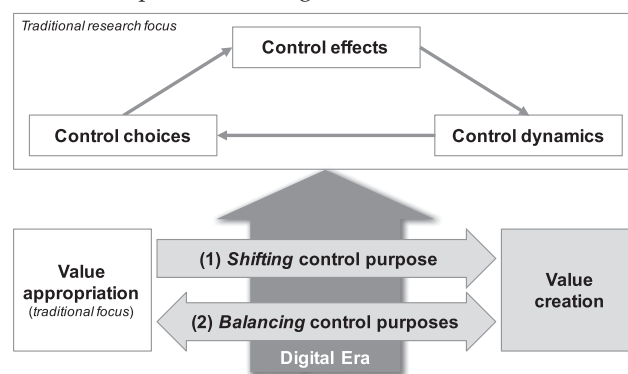
In this section, we outline a new agenda for IS project control research that builds on the control purpose concept as well as key characteristics of the digital era. In particular, the proposed research agenda highlights two overarching themes that emerge from the conceptual distinction between value-appropriation and value-creation control purposes. First, as shown in Section 2.2, although common characteristics of IS

projects in the digital era challenge core assumptions of agency theory, they correspond with stewardship theory assumptions, indicating a *shifting control purpose* toward value creation. Second, although digital-era characteristics place new, unmet demands on the control of IS projects, this does not imply that agency concerns are no longer relevant in such projects, pointing to the increasing need for *balancing (different) control purposes*. Although we recognize that other, incremental avenues of research may stem from the evolving control challenges identified in this commentary, we suggest that the opportunities outlined have the potential not only to build on the past foundation of IS project control research, but also to push it toward exciting new avenues for research. In the following, we discuss the two overarching themes, present sample research questions, and relate them to three focal themes of existing IS project control research (Wiener et al. 2016)—namely control choices, control effects, and control dynamics (see Figure 1).

3.1. Theme 1: Shifting Control Purpose

In the digital era, IS projects are increasingly embedded in complex intra-, inter-, and extraorganizational value networks, including large-scale digital transformation programs (Gregory et al. 2015) and multiactor platform ecosystems with a particular focus on digital innovation (Yoo et al. 2012). A key control challenge in such project settings pertains to the design of control structures that permit effective coordination (Barrett et al. 2015); that is, structures facilitating effective action and authorizing project participants to act (Donaldson 1990, Donaldson and Davis 1991). For example, Yoo et al. (2012, p. 1402) highlight that an important “implication of distributed innovation with pervasive digital technology is that innovation increasingly requires that others be enabled to innovate as well.” Therefore, the changing context and nature of IS projects in the digital era not only triggers a shift away from hierarchical control

Figure 1. A New IS Project Control Research Agenda: Control Purposes in the Digital Era



structures toward network-based structures along with blurring of organizational roles and boundaries, but it also necessitates a shift in controls targeted at value appropriation toward controls targeted at value creation, prompting new questions about how controls are configured and enacted.

3.1.1. Control Choices. Although context factors, such as behavior observability and project stakeholders' IS and business domain knowledge, have been found to affect control choices (e.g., Kirsch 1996, 1997), the relative importance of some of these factors seems to diminish with an underlying value-creation control purpose. For instance, in the digital era, massive amounts of process and behavioral data are continuously generated (Cable and Birkinshaw 2017), including detailed data on programmer activities that are recorded in software development platforms. However, from a value-creation point of view, it might not make sense to make extensive use of these data for monitoring even though they provide high behavior observability (Cable and Birkinshaw 2017). This is because, with a value-creation control purpose, the controller would be less motivated to invest time and effort to closely monitor controllee behaviors. The controller might also want to signal that the controller does not harbor suspicions of opportunistic behavior. Consequently, important research questions include the following: How does a value-creation control purpose influence what controls are chosen? How do the determinants of control choices differ in value creation–dominated IS project control settings, such as digital innovation initiatives, compared with settings dominated by value-appropriation concerns?

Similarly, although a controller holding a position of superior authority is generally more inclined to use an authoritative control style (Wiener et al. 2016), this relationship might not hold in IS projects in which control activities are driven by an underlying value-creation purpose; that is, the controller may still opt for an enabling control style despite her superior formal position. The use of an enabling style potentially carries several benefits for value creation, such as allowing for control adjustments through the repair and transparency features of such a control style (Adler and Borys 1996, Wiener et al. 2016) as well as improving the conditions for controllee task execution by facilitating knowledge transfer from controller to controllee (Chua et al. 2012, Gregory et al. 2013). On the other hand, a value creation–focused manager might sometimes opt for an authoritative control style in order to ensure efficient task execution (Wiener et al. 2016). A current example of such a situation would be when an experienced CIO pushes through a proof-of-concept study in a directive way in order to progress quickly and create a short learning cycle that

facilitates further digital strategy development. On this basis, an important research question is the following: How does a value-creation control purpose affect the enactment of controls, specifically in terms of the controller's use of an authoritative or an enabling control style?

3.1.2. Control Effects. The shifting control purpose in digital-era IS projects from appropriating to creating value—along with the underlying assumption of a longer-term orientation of control activities that distinguishes stewardship theory from agency theory (Wu and Saunders 2016)—opens up new research streams on a broader set of control effects and outcome variables. In particular, adopting a value-creation perspective “unchains” IS project control research from agency theory's explicit focus on compliant controllee behaviors (e.g., Jensen and Meckling 1976, Eisenhardt 1989) and its implicit focus on the triple constraints of budget, time, and functionality. It, thus, enables researchers to link IS project control activities to digital-era characteristics and phenomena, such as the convergence and generativity observed in digital innovations and, ultimately, the value created through distributed and/or combinatorial innovations (Yoo et al. 2012). For instance, digital innovations are unlikely to emerge from IS projects when the controller's control purpose does not match the control context. Specifically, in innovation-focused project settings (e.g., Henfridsson and Bygstad 2013, Svahn et al. 2017), controls targeted at reducing value-appropriation concerns are likely to foster compliance but hamper innovative behavior (Su et al. 2016). In addition, they involve unnecessary investments in monitoring and surveillance when controllees are acting as stewards (Donaldson 2008). In such settings, controllers must especially emphasize value creation-oriented controls (Donaldson 1990). Therefore, an important research question is the following: how does a value-creation control purpose influence legitimacy perceptions of control choices and, thus, the effectiveness of controls in innovation-focused IS project settings?

Further, the control purpose concept may contribute to a better understanding of how control activities relate to knowledge processes in IS projects (Turner and Makhija 2006). For instance, controls targeted at managing value-appropriation concerns primarily trigger information flows to the controller. In contrast, controls targeted at managing value-creation requirements are more likely to promote the transfer of controller knowledge to the controllees (e.g., through task specifications) (Choudhury and Sabherwal 2003) as well as knowledge transfer/exchange among controllees (e.g., through colocation) (Chua et al. 2012). Also, a value-creation control purpose seems to be better attuned to the tacit and sometimes unsystematic nature of knowledge-generation processes

in general (Nonaka 1994, Turner and Makhija 2006). It is also better attuned to the increasingly dynamic nature of digital-innovation projects in which varying and diverse sources of knowledge “are fluidly combined [...] and replaced in some emergent trajectory toward a goal or problem resolution” (Yoo et al. 2012, p. 1402). Relatedly, Ransbotham and Kiron (2017) show how knowledge flows in the digital era have moved away from senior managers and toward specialists, including developers working on data-analytics and business-intelligence initiatives. Thus, an interesting question is the following: How does a value-creation control purpose (as opposed to a value-appropriation purpose) relate to different types of knowledge processes in IS projects?

Studying the control of IS projects from a value-creation perspective might also yield novel insights into how project controllers can contribute to a positive work environment and, thus, to the ultimate goal of employee well-being. For example, Pfeffer (2018) vividly describes how current management practices—often targeted at agency concerns—not only harm company performance, but also literally sicken and kill employees by limiting work autonomy and creating workplace stress. Among other things, such negative socio-emotional consequences are likely to occur when the controller’s control purpose leads to close monitoring and surveillance of controllee behaviors even though the controllee is intrinsically motivated to act in the best interests of the controller, which is typical for stewardship (Davis et al. 1997). IS professionals are knowledge workers who, in general, are more likely to assume the role of stewards (Wu and Saunders 2016). Thus, the risk of value appropriation-oriented controls leading to frustrated and stressed out controllees seems to be particularly pronounced in the context of IS projects that are characterized by a high proportion of knowledge workers (Pawlowski et al. 2007). It, thus, becomes important to address the following question: How does a value-creation control purpose facilitate the motivation of IS project participants and their perceptions of the work environment?

Additionally, the shifting purpose of IS project control activities in the digital era toward the creation of value (Su et al. 2016), along with the growing consumerization of IT (Harris et al. 2012, Gregory et al. 2018), direct attention to the mounting societal impact of IS projects (Yoo 2010, Gannon 2013). The importance of the societal impact relates closely to stewardship behavior. According to Hernandez (2012), stewards often take a broader view of the organization in relation to its environment and are consequently attentive to the needs of a broader set of stakeholders. For instance, consider the perspective of a Facebook manager overseeing an IS project tasked with developing

a “fake news” detection mechanism for the firm’s social media platform. Here, it appears to be of paramount importance to not only control for the creation of internal value (e.g., resulting from linking the new platform feature with new advertising opportunities and revenue streams), but also to control for the creation of societal value (i.e., effective prevention of spreading disinformation over the social media site). Thus, an important research question is the following: How can the use of a value creation-oriented control approach account for potential tensions between the creation of company internal value and societal value?

3.1.3. Control Dynamics. In the digital era, the rising importance of platform ecosystems in the context of digital innovation (e.g., Yoo et al. 2012)—in conjunction with the increasing embeddedness of IS projects in such ecosystems—leads to interesting questions regarding the dynamics of IS project controls targeted at value creation. For example, discussing implications of distributed innovation, Yoo et al. (2012, p. 1402) suggest that the notion of organizational incentives, which at least partly overlaps with the notion of controls, “may come to be understood as less of a structural feature of the organization and as more of an adaptive emergent coordination mechanism.” In this regard, Lanzolla et al. (2018, p. 379) point out that “digital platforms have become a venue to host innovation dynamics but they evolve themselves.” It, therefore, becomes important to examine research questions such as the following: What are the implications of constantly evolving control contexts, such as multiactor platform ecosystems, on value creation-oriented control dynamics in IS projects that fuel innovation trajectories?

3.2. Theme 2: Balancing Control Purposes

Although common digital-era characteristics contribute to a shift in the purpose of IS project control activities toward the creation of value, the need to control for value-appropriation concerns in such projects is not going away. In other words, although many IS projects in the digital era tend to have more disruptive or explorative natures, more traditional IS projects continue to be controlled and evaluated according to the triple constraints of cost, time, and functionality (e.g., Bloch et al. 2012, Ko and Kirsch 2017). Therefore, it can be argued that IS project control is becoming even more important because of the increased business and strategic impact of IT. At the same time, it is becoming more challenging because of the need to balance different control purposes in response to a wider range of control challenges (cf. Tilson et al. 2010, Su et al. 2016).

3.2.1. Control Choices. As indicated, digital technologies generate massive amounts of process and

behavioral data with the potential to be used by management as a monitoring tool (Cable and Birkinshaw 2017, Gal et al. 2017). In particular, advanced technologies have the ability to increasingly monitor specific details of individual employees' activities, including their time availability, whereabouts, interpersonal interactions, and task productivity (Kellogg et al. 2006, Newell and Marabelli 2015, Galliers et al. 2017). In this regard, Bennis (2013, p. 635) contends that digital technologies are "going to fundamentally change every leader's life [as] leaders at every level of the organization will know what is going on every minute of the 24-hour day." However, although these new digital capabilities and the resulting transparency appear to be helpful from both a value-appropriation and a value-creation point of view, they still bear the risk of "driving" organizations, including IS projects, into a "totalitarian surveillance state" (Bennis 2013). It, thus, becomes important to investigate research questions such as the following: How do new digital capabilities for monitoring and control affect different control purposes and, thus, managers' control choices in IS projects? How can managers leverage these new capabilities in a way that carefully balances value-appropriation concerns and value-creation requirements?

3.2.2. Control Effects. In the digital era, the evolving workforce arguably requires managers involved in IS projects to master a larger variety of control practices and considerations. Most notably, by 2025, millennials will constitute 75% of the total workforce (Donston-Miller 2016). Some existing research describes millennials as intrinsically motivated (Singh et al. 2012, Cates 2014), indicating their potential to serve as good stewards of corporate assets (Donaldson and Davis 1991). Other studies also highlight that millennial workers "seek actualization through challenging and meaningful work" (Calk and Patrick 2017, p. 131); "want a job that fuels their sense of purpose and a manager who shows them how their efforts advance the company's mission" (Hoffman 2018, p. 43); "are egocentric, especially when it comes to their expectations regarding the workplace" (Gewald et al. 2017, p. 68); and "have a significantly higher likelihood of turnover compared with their older counterparts" (Ertas 2015, p. 417). These generational traits suggest that exercising control over an evolving workforce increasingly made up of millennials calls for managers to carefully balance a value-appropriation control purpose (e.g., to counter egocentric tendencies) with a value-creation control purpose, for example, to avoid negative socio-emotional side effects of control activities, such as controllee demotivation, disengagement, frustration, stress, or mistrust (e.g., Sundaramurthy and Lewis 2003, Cram et al. 2016). One possible

explanation for the occurrence of such negative side effects, which have been only sparsely acknowledged in IS project control studies (Cram et al. 2016, Wiener et al. 2016), relates to the dilemma the controller and the controllee face when they have divergent expectations about the nature of the control relationship (Davis et al. 1997). For example, although a seasoned IS project manager's focus may be on harnessing value (agency relationship), a millennial project worker is likely to expect a focus on growing potential value and self-actualization (stewardship relationship). This mismatch can generate frustration on the side of the controllee as the controllee questions the legitimacy of the enacted controls (Cram and Wiener 2018) and eventually can lead to alienation and antiorganizational behavior (Davis et al. 1997). Also, over time, because of the feeling of being over-controlled, an intrinsically motivated controllee is likely to have less and less desire to act as a steward, and the controller-controllee relationship then inevitably moves toward an agency relationship (Pastoriza and Ariño 2011). Alternatively, stewards may simply disagree on the overly rigid control regime imposed by the controller acting from an agency perspective, which may consequently lead to conflicts between controller and controllee (Perrow 1986) and a vicious cycle of "suppressed stewardship" and tighter controls fueled by value-appropriation concerns (Sundaramurthy and Lewis 2003, p. 403). These kinds of situations are already manifested in recent IS project control studies, including the one by Narayanaswamy et al. (2013), who show that divergent perceptions of control appropriateness contribute to control and performance problems. However, they are even more accentuated by the shifting values of the millennial workforce (Cable and Birkinshaw 2017). In this regard, relevant research questions include the following: How can IS project managers balance different control purposes to motivate and ensure goal-directed efforts by the incoming generation of controllees? How do divergent controller-controllee expectations about the nature of the control relationship influence the effectiveness of IS project control activities? How do such divergent expectations lead to the emergence of negative socio-emotional side effects?

3.2.3. Control Dynamics. With the emergence of the digital era, the focal challenges of IS projects have progressively shifted from delivering commodity services to driving platform innovation (Yoo et al. 2012, Gregory et al. 2018) as well as from following linear processes with predetermined end states to engaging in open-ended experimentation and continuous innovation (Baldwin and Von Hippel 2011, Lanzolla et al. 2018). From a control perspective, these shifting challenges also imply that IS project controllers

need to increasingly and dynamically balance different control purposes. For example, in IS projects embedded in platform ecosystems, there is the need to keep control over third-party developers (value-appropriation purpose) while, at the same time, encouraging their creativity (value-creation purpose) (e.g., Yoo et al. 2012, Schrieck et al. 2018). Relatedly, studying the evolution of digital infrastructures, Tilson et al. (2010, p. 755) point to “conflicts between existing and emerging control regimes” and note that the dynamic relationships “between generativity [value-creation purpose] and control [value-appropriation purpose] remain poorly understood.” In this regard, the control purpose concept enables fine-grained characterization of control dynamics (cf. Tilson et al. 2010), thereby providing more nuanced insights into why such dynamics occur. Also, the relative unpredictability of digital innovation processes makes control dynamics more important and prevalent because shifts, retakes, and false starts are likely to be more frequent in innovation-focused IS projects than in more traditional (waterfall) projects (Henfridsson et al. 2014). Here, considering the underlying control purpose may help explain differences in control dynamics across project settings and stages as well as contribute to a deeper understanding of the conditions that cause control relationships to spiral out of control (Sundaramurthy and Lewis 2003) or trigger control adjustments in response to critical project encounters (e.g., Gregory et al. 2013). Therefore, relevant research questions are the following: How and why do control purposes shift in innovation-focused IS project settings? How do general temporal patterns in control purposes vary across different project settings?

Furthermore, the digitalization of work, along with the need for continuous innovation, drives the growing reliance on diverse and heterogeneous knowledge sources (Yoo et al. 2012). Working across and managing the relationships among increasingly diverse stakeholder groups not only adds to the complexity of IS projects (cf. Pagani 2013, Gregory et al. 2018), but it also creates the need to balance different control purposes. For instance, as an IS project progresses, the relationships between controller and controllees evolve, and competence and/or goodwill trust may develop or deteriorate (e.g., Das and Teng 2001). Although competence trust is primarily related to value-creation requirements, goodwill trust primarily relates to value-appropriation concerns (Dekker 2004). This means, for example, that, once the controller learns to trust in the controllee’s goodwill, the controller reduces the use of value appropriation-oriented controls, which are also costly to implement and risk harming the controller–controllee relationship (Dekker 2004). In this regard, several characteristics of digital innovation are likely to relate to and

influence the evolving relationship. For example, the experimental nature and commonly collaborative approach in digital innovation settings typically involves short learning cycles (e.g., Yoo et al. 2010, Henfridsson et al. 2014), allowing controllers to constantly reassess their relationship with the controllee. It, thus, becomes important to answer research questions such as the following: How do dynamics in controller–controllee relationships trigger shifts in control purposes and vice versa?

Table 4 summarizes these highlighted questions for future research on the purpose of IS project control activities in the digital era.

4. Concluding Remarks

Informed by recent studies in the accounting and organization literature and drawing on agency and stewardship theories, this research commentary contributes to the IS literature by introducing the concept of control purpose (value appropriation versus value creation) and by building on this conceptual expansion to present a new agenda for IS project control research. The motivation for this effort is a result of the evolving nature of IS projects within the context of the digital era.

The control purpose concept expands the conceptual toolbox available to IS researchers and helps problematize why controllers use controls. It, thus, enables us to better understand why particular control modes and control styles are selected in IS projects as well as to reconcile inconsistencies in prior literature concerning the effects of and changes in IS project control activities (cf. Rivard 2014). Even more importantly, it offers a route for IS project control research to meaningfully engage with new types of IS projects, including digital innovation initiatives, which tend to be more concerned with collaborative value creation than traditional projects. Through this, the control purpose concept opens up promising avenues for future research and prompts new research questions for IS project control researchers to address as outlined in the previous section. Adding to this, the control purpose concept can also inform future research in control contexts beyond IS projects. For instance, as organizations, such as Uber and UPS, increasingly rely on mobile apps and sensor technologies to monitor and guide worker behavior, the control purpose concept might help explain why some technology-mediated control approaches are more effective than others (cf. Vieira da Cunha et al. 2015, Wiener and Cram 2017, Goldbach et al. 2018).

On the basis of the arguments and evidence put forward in this commentary, we believe that future research should employ data to assess controllers’ underlying intentions (i.e., their control purpose) in addition to assessing the modes of selected controls (control configuration) and the style in which these

Table 4. Control Purpose Concept and Opportunities for Future Research (Sample Research Questions)

	Theme 1: <i>Shifting</i> control purpose	Theme 2: <i>Balancing</i> control purposes
Control <i>choices</i>	• How does a value-creation control purpose influence what controls are chosen? • How do the determinants of control choices differ in value creation-dominated IS project control settings, such as digital innovation initiatives, compared with settings dominated by value-appropriation concerns? • How does a value-creation control purpose affect the enactment of controls, specifically in terms of the controller's use of an authoritative or an enabling control style?	• How do new digital capabilities for monitoring and control affect different control purposes and, thus, managers' control choices in IS projects? • How can managers leverage these new capabilities in a way that carefully balances value-appropriation concerns and value-creation requirements?
Control <i>effects</i>	• How does a value-creation control purpose influence legitimacy perceptions of control choices and, thus, the effectiveness of controls in innovation-focused IS project settings? • How does a value-creation control purpose (as opposed to a value-appropriation purpose) relate to different types of knowledge processes in IS projects? • How does a value-creation control purpose facilitate the motivation of IS project participants and their perceptions of the work environment? • How can the use of a value creation-oriented control approach account for potential tensions between the creation of company internal value and societal value?	• How can IS project managers balance different control purposes to motivate and ensure goal-directed efforts by the incoming generation of controllees? • How do divergent controller-controllee expectations about the nature of the control relationship influence the effectiveness of IS project control activities? • How do such divergent expectations lead to the emergence of negative socio-emotional side effects?
Control <i>dynamics</i>	• What are the implications of constantly evolving control contexts, such as multiactor platform ecosystems, on value creation-oriented control dynamics in IS projects that fuel innovation trajectories?	• How and why do control purposes shift in innovation-focused IS project settings? • How do general temporal patterns in control purposes vary across different project settings? • How do dynamics in controller-controllee relationships trigger shifts in control purposes and vice versa?

controls are put into practice (control enactment). This implies that such research needs to carefully distinguish between controller intentions (control purpose) and behaviors (control modes and style used). Also, when operationalizing the control purpose concept, researchers need to be mindful of potential differences in backward- and forward-looking intentions. In other words, controllers may respond differently when asked about why they used a particular control mode/style (*backward* looking) as opposed to why they are going to use this control mode/style (*forward* looking).⁶

Relatedly, future research on the purpose of control activities needs to take into account that a single control mechanism may fulfill the dual purpose of addressing value-appropriation concerns and value-creation requirements simultaneously. For example, McBride (2008, p. 2395) notes that a control “may be used to achieve a primary objective as well as a secondary objective.” Similarly, discussing the role of generativity in digital infrastructures, Tilson et al. (2010, p. 755) point to the emergence of new forms of control, such as “the ability to define an API serving [...] at the same time both regulating behavior [value-appropriation purpose] and enabling access [value-

creation purpose].” Still, from the perspective of a single controller, one of the two control purposes (i.e., either value appropriation or creation) is likely to dominate at any particular point in time, depending upon the specific control situation. Thus, future studies should employ methodologies, such as action design research (Sein et al. 2011) and longitudinal case studies, that enable rich data collection on controls as a problem-solving mechanism.

Moreover, although we theoretically establish value appropriation and creation as the two main categories of the control purpose concept (Gulati and Singh 1998, Dekker 2004), it is possible that additional categories exist. Therefore, future research could seek to identify other theories, such as complexity theory, institutional legitimacy theory, and the resource-based view (Cardinal et al. 2017), which provide alternative perspectives and, thus, may inform other control purposes. By adding new facets to the control purpose concept and by refining the two categories proposed in this study, further insights can be generated for researchers and practitioners alike.

In conclusion, in this research commentary, we make the case for the importance of acknowledging

and addressing the concept of control purpose. For practitioners, the distinction between value-appropriation and value-creation control purposes offers a new way of thinking about *why* different control modes (*what*) and control styles (*how*) should be used under various circumstances as well as why some current control approaches may not be effective. For scholars, incorporating the concept of control purpose into their theory toolbox can help them find new phenomena to study, improve the explanatory capacity of theoretical models, reconcile inconclusive results from prior studies, and advance the study of IS project control into the emerging challenges of the digital era.

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Endnotes

¹ We are grateful to the editors and reviewers and, in particular, to one anonymous reviewer for prompting us to develop the argument about IS projects in the digital era.

² We recognize that the discourse on agency theory itself is ongoing (e.g., Bosse and Phillips 2016).

³ The two focused control purposes are directly connected to dominant ideas in related literature and, thus, strongly supported by prior studies from other fields (Gulati and Singh 1998, Dekker 2004, Laursen and Salter 2014). Although additional purposes might exist, our focus provides a theoretically well-motivated basis for studying control purposes in the context of IS projects.

⁴ This also distinguishes our focus from the topic of project management, which encompasses a multitude of activities other than control, such as leadership and team processes (e.g., Kerzner 2009).

⁵ The review article did not point to any surveys or other quantitative studies that measured different control purposes.

⁶ We thank an anonymous reviewer for pointing out the important distinction between controller intentions and behaviors as well as potential differences between backward- and forward-looking intentions of controllers.

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