

IN THE NEED FOR SPEED: THE IS GOVERNANCE DEVIANCE EFFECTS OF IS SPEED MISALIGNMENT

ABSTRACT

The fast-changing and malleable nature of digital innovation requires firms to quickly develop digital offerings, making speed a key capability for success. The speed with which firms can develop, update, and scale digital innovation critically depends on corporate IS functions' speed capabilities in mobilizing and deploying required IS capabilities. Research suggests that, if actual and required IS speed capabilities are misaligned, business functions may deviate from IS governance regulations and implement IS solutions independently. However, traditional wisdom strongly discourages IS governance deviance, raising the question of whether under some conditions deviance can be tolerated to remain competitive. More specifically, the question is under which (mis-)alignment conditions does IS deviance occur and how does it affect firm performance. Drawing on a novel conceptualization of IS speed alignment conditions, we investigate these multifaceted relationships among IS speed (mis-)alignment, IS governance deviance, and firm performance to address inconclusive findings about the alignment–performance relationship. We test our research model using a unique data set from a dyadic field survey of 119 matched pairs of business and IS managers. Using polynomial regression and response surface analyses, we find that the effect of IS deviance is contingent on the type and magnitude of IS speed (mis-)alignment conditions.

Keywords: IS–business alignment, IS governance deviance, digital innovation, IS speed capabilities

“Hell! There ain’t no rules around here! We are tryin’ to accomplish somep’n!”

– Thomas Alva Edison (1847–1931)¹

“It’s the speed at which the landscape is changing through digital, allowing new competitors to play, that makes [digital business] really transformative.”

– Executive cited in Kane et al. (2019)

INTRODUCTION

While speed in decision-making and execution has always been important (Eisenhardt & Tabrizi, 1995; Teece, 2007), the generative and recombinant nature of digital innovation has made speed imperative (Bharadwaj et al., 2013; Huang et al., 2017), as fast-moving firms that are able to rapidly scale and react outperform competitors in digital innovation (Agarwal & Tiwana, 2015; Cusumano et al., 2019; Kane et al., 2019; Venkatraman, 2017). For example, Zoom was able to react rapidly to the unprecedented disruptions caused by Covid-19 by scaling its IT infrastructure faster than competitors, resulting in an extraordinary growth in user base.²

The speed with which firms can develop, scale, and update digital innovations depends critically on corporate IS resources and capabilities³ (Gregory et al., 2018; Huang et al., 2017; Tarafdar & Tanriverdi, 2018). Therefore, the fast-changing nature of digital innovation has amplified the significance of corporate IS functions’ capabilities to mobilize and deploy IS resources in alignment with increased business speed demands (Bharadwaj et al., 2013; Huang et

¹ Cited in Rosanoff (1932, p. 403), “Edison in His Laboratory,” *Harper’s Magazine*, Volume 165, Issue: September. URL: <https://harpers.org/archive/1932/09/edison-in-his-laboratory>.

² Zoom’s user base grew from 10 million users in December 2019 to 200 million users in March 2020, see <https://www.protocol.com/manuals/new-enterprise/how-zoom-scaled-covid19>.

³ Our study follows the understanding that IS resources need “capacities to deploy resources, usually in combination, using organizational processes, to effect a desired end” (Amit & Schoemaker 1993) to generate a competitive advantage. Hence, we use the broader term IS capabilities to include IS resources and we define IS capabilities as the “ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities” (Bharadwaj, 2000, p. 171).

al., 2017). However, many studies report that firms have difficulty adapting traditional IS governance practices to the fast and unpredictably changing requirements of digital innovation (Gregory et al., 2018; Svahn et al., 2017), leading to a “misalignment between [digital innovation] demands in the marketplace and organizational capabilities to respond” (Kohli & Melville, 2019, p. 200).

Research has emphasized that the ability of IS functions to provide IS support in line with business functions’ speed requirements is a critical factor in the alignment (Gregory et al., 2018; Huang et al., 2017). We define IS speed alignment as the degree of congruence between business functions’ desired speed of IS support for digital innovation practices and the actual speed capability of IS functions. Speed capabilities relate to the ability of IS functions to rapidly mobilize and deploy IS resources and determine the speed of project execution. To date, IS speed as a capability of IS functions and an increasingly important element of IS–business alignment has received little systematic and empirical attention, despite its essential role in supporting digital innovations (Bharadwaj et al., 2013; Huang et al., 2017).

Several studies report that traditional “industrial age” IS alignment and governance paradigms are too rigid and inflexible to cope with the new logics of digital innovation practices (Berente, 2020; Coltman et al., 2015; Svahn et al., 2017; Tumbas et al., 2018). Accordingly, business managers often regard enterprise IS as a major constraint for digital innovation because IS functions’ support is perceived as “too slow and inefficient” (Gregory et al., 2018, p. 11). Many corporate IS functions struggle to adapt to the intensified speed required by digital innovation because it requires a fundamental change of traditional capabilities and operational logics that have traditionally focused on providing reliable, cost-effective, and standardized IS support (Saldanha et al., 2020; Tumbas et al., 2018). Research has shown that especially in dynamic environments, IS–business misalignment (hereafter: misalignment) between fast-

changing business objectives and IS-related activities has detrimental effects on firm performance (Sabherwal et al., 2019) and that traditional IS governance practices cannot correct for severe misalignments (Chau et al., 2020). Instead, the tighter the IS-related decision rights, responsibilities, and procedures stipulated in organizational IS governance frameworks, the greater the negative effect on firm performance for severe misalignments (Chau et al., 2020). Hence, traditional top-down, centralized, and conformist IS governance policies and procedures complicate or even aggravate misalignment rather than providing remedies to overcome misalignment (Chau et al., 2020; Svahn et al., 2017).

Anecdotal evidence suggests that business functions increasingly feel empowered to overcome misalignments themselves by using unauthorized IS capabilities independently from IS functions, thus deviating from official IS governance regulations (Fürstenau et al., 2019; Gregory et al., 2018). Importantly, IS research has chiefly emphasized the negative effects of deviating from official IS-related decision rights and responsibilities stipulated in IS governance frameworks (hereafter: IS deviance) and focused on how to avoid and curtail the use and development of unauthorized IS capabilities (e.g., Fürstenau et al., 2017; Zimmermann & Rentrop, 2014). Potential positive effects of IS deviance to overcome severe misalignment have received only scant attention in the literature even though deviance in the presence of misalignment can be potentially beneficial for corporate innovation, as it allows firms to quickly and pragmatically overcome organizational inertia and constraints (Faßauer, 2018; Jarrahi et al., 2017; Vadera et al., 2013).

Taken together, firms face a dilemma when business functions' demand for IS speed capabilities is high and IS speed capabilities are inadequate. Should firms tolerate business functions' IS deviance in certain conditions? Or should they force compliance to IS governance regulations even though this requirement may jeopardize firm success and survival? If deviance

is permitted, what are the performance implications of IS deviance? We address this dilemma by examining largely overlooked firm-level effects of IS deviance. We differentiate between two conditions of IS speed misalignment. *IS speed shortfall* refers to a condition in which IS functions lack required speed capabilities, while *IS speed underutilization* refers to a condition in which IS functions' speed capabilities exceed required speed capabilities (Chau et al., 2020). Differentiating these conditions provides a thorough understanding of when IS deviance occurs and the effect of IS deviance on firm performance, extending the understanding of the limited and contradictory evidence on the relationships between (mis-)alignment, IS governance, and firm performance (Chau et al., 2020; Queiroz, 2017). Hence, our research seeks to answer two major questions: *How does IS speed misalignment influence IS deviance? And how does IS deviance affect firm performance in the presence of IS speed shortfall misalignment?*

Our study investigates these relationships using a dyadic field survey of a unique data set of 119 matched pairs of business and IS managers. We analyzed the data using linear and polynomial regression analyses and response surface modeling—an approach that enables ecologically valid and rich analyses (Chau et al., 2020; Edwards, 2002). Our results show that IS speed shortfall is indeed a major driver of IS deviance and that firm performance increases when business functions deviate from IS governance regulations to correct for IS speed shortfall misalignment. Our findings further show that IS deviance is not only influenced by the extent of misalignment, but more generally by the degree of business functions' demand of IS speed capabilities. Our key contributions are in theorizing and empirically showing that—contingent on the type and magnitude of IS speed (mis-)alignment—the extent of IS deviance and its effect on firm performance differs. Our results have important theoretical and managerial implications for “whether IT governance accounts for contradictory findings on the alignment–performance

relationship” (Chau et al., 2020, p. 1681) and “how... IT governance can be aligned with digital innovation practices” (Gregory et al. 2018, p. 25).

THEORETICAL BACKGROUND

IS Speed Capabilities and Alignment

Speed capability is defined as the organizational ability to execute faster than competitors given the same external conditions (Hawk et al., 2013). Hence, firms with higher speed capabilities can mobilize and deploy resources needed for project completion faster than rivals (Brown & Eisenhardt, 1997; Pacheco-de-Almeida et al., 2015). Organizational speed capabilities are instrumental for achieving competitive advantage and firm survival in various time-critical contexts such as new market entry, continuous innovation, technology leadership, or innovation strategy (Eisenhardt & Tabrizi, 1995; Hawk et al., 2013; Pacheco-de-Almeida et al., 2015; Stalk & Hout, 1990; Teece, 2007). Organizational speed capabilities act as meta- or first-order capabilities that work like a magnifying glass, as they multiply existing organizational capabilities and enable new ones in liaison with existing ones (Pacheco-de-Almeida et al., 2015). Thus, speed capabilities complement other organizational capabilities by improving firms’ ability to accelerate project execution (Karimi & Walter, 2015; Kessler & Bierly, 2002; Pacheco-de-Almeida et al., 2015). Faster decision-making and development cycles also increase innovation outcomes and success (Carbonell & Rodriguez Escudero, 2010; Huang et al., 2017).

Hence, we define IS speed capability as the ability of corporate IS functions to mobilize and deploy IS resources faster than competitors. We argue that IS speed capabilities are important for digital innovation since firms often pursue digital innovation through the rapid recombination of reprogrammable and generative IS resources, where time to market is critical (Bharadwaj et al., 2013; Nambisan et al., 2017; Tambe et al., 2012; Yoo et al., 2010). Therefore, IS speed

capabilities are a *sine qua non* for the rapid and effective orchestration of digital innovation, as IS resources are essential to both the entire digital innovation process and the outcome (Huang et al., 2017; Nambisan et al., 2017).

IS speed capabilities can expedite the innovation process by enhancing organizational decision-making and execution of requisite competitive actions in various ways (Chakravarty et al., 2013; Nambisan et al., 2017). In the early stages of the digital innovation process, IS functions' technical expertise and knowledge exchange with external communities of practice help business functions to accelerate anticipation and sense-making of new technology use cases (Guillemette & Paré, 2012; Kranz, 2021; Tarafdar & Tanriverdi, 2018). Also, IS speed capabilities can accelerate managerial decision-making by providing the infrastructure and tools for generating actionable analytic insights (Brynjolfsson et al., 2011; Tanriverdi et al., 2010). Especially in dynamic environments such as digital innovation, firms have an increased need for enterprise systems that enable them to rapidly acquire, process, share, and analyze information (Bharadwaj et al., 2013; Pavlou & El Sawy, 2010).

At later stages of the digital innovation process, IS speed capabilities enhance organizational capabilities that allow rapid reconfiguration of products and services and redeployment of IS resources to respond to newly discovered and rapidly evolving market opportunities (Henfridsson & Yoo, 2014; Huang et al., 2017; Pavlou & El Sawy, 2010). IS functions can help seize these opportunities by swiftly adapting IS resources to provide timely support for actions such as integrating boundary resources with digital innovation (Eaton et al., 2015), facilitating collaboration with external innovation actors (Constantinides et al., 2018), orchestrating networked supply chains and ecosystems (Nazir & Pinsonneault, 2012), maintaining and updating digital innovation's core infrastructure (Svahn et al., 2017), and scaling digital ventures (Huang et al., 2017).

Firms seek to ensure that IS functions adequately support and shape organizational capabilities needed to achieve their objectives (Benbya et al., 2019; McLaren et al., 2011; Sabherwal et al., 2019). Because of its importance for firms, alignment has perennially been a top managerial priority and a key concern of IS research (Coltman et al., 2015; Kappelman et al., 2021). Owing to the fundamental impact of digital innovation on organizational structures, operations, and capabilities, the quest for continuously achieving alignment in fast-changing environments has gained additional significance (Benbya et al., 2019; Chau et al., 2020; Tallon et al., 2016).

Although several studies suggest that IS speed alignment is essential in digital innovation (Huang et al., 2017; Tumbas et al., 2018), it has received little systematic and empirical attention. We conceptualize *IS speed alignment* as the degree to which IS functions' speed capabilities are congruent with business functions' IS speed demands. We elaborate four conditions of IS speed alignment based on the fit between business functions' demand for IS speed and IS functions' supply of speed capability (Figure 1). As noted earlier, our conceptualization distinguishes between two conditions of speed misalignment: *IS speed shortfall*, where IS functions lack speed capabilities needed to satisfy business functions' speed demands, and *IS speed underutilization*, where the level of IS functions' speed capabilities exceeds the desired level of business functions (Chau et al., 2020). IS speed alignment can also occur at levels that are high (i.e., high demand of IS speed capability and supply) or low (i.e., low demand of IS speed capability and supply). Since prior research has shown that IS deviance is prevalent in the presence of IS misalignment, we focus on the two IS speed misalignment conditions.

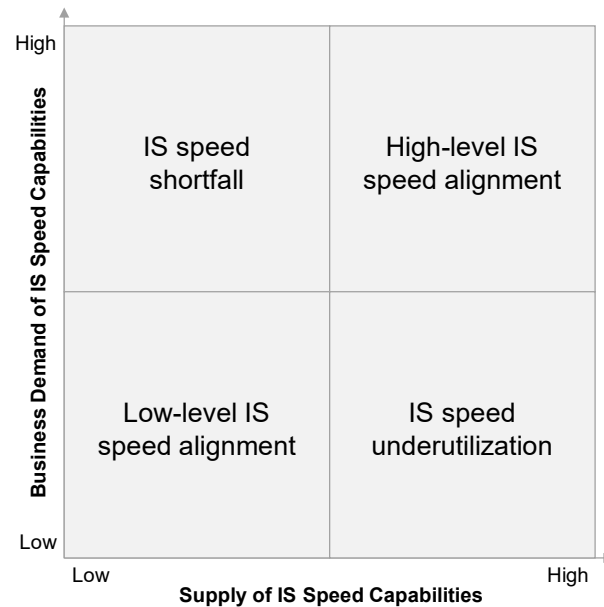


Figure 1. IS speed (mis-)alignment conditions

IS Governance Deviance

Firms specify IS-related decision rights and responsibilities in IS governance frameworks to ensure alignment of organizational objectives and IS-related activities (Gregory et al., 2018). The conventional wisdom is that more effective IS governance helps to correct for misalignment between desired and actual levels of IS support. However, the traditional focus, scope, and patterns of IS governance cannot cope with misalignments that arise owing to the novel demands and profound changes that digital innovation brings about (Gregory et al., 2018; Svahn et al., 2017). In cases in which misalignment is more severe, higher levels of IS governance even disproportionately erode firm performance (Chau et al., 2020). In particular, higher levels of planning and formalized and centralized decision-making in IS steering committees can aggravate misalignment (Chau et al., 2020). Hence, business functions face a dilemma when IS capabilities are misaligned because misalignment cannot be alleviated by IS governance practices

and adapting governance frameworks is a time-consuming and complex task (Gregory et al., 2018).

Anecdotal evidence suggests that business functions increasingly respond to these misalignments by deviating from firms' IS governance regulations by using unauthorized IS resources (Fürstenau et al., 2019; Gregory et al., 2018). Especially for fast-paced digital innovation competition, IS deviance provides business functions with a quick and pragmatic way to compensate for discrepancies between desired and actual levels of IS support (Fürstenau et al., 2019). Today, business functions are empowered to use a myriad of readily available, best-of-breed cloud-based IS services and infrastructures that allow rapid development of digital innovation in a plug-and-play fashion without reliance on internal IS functions as brokers, providers, or gatekeepers (Benlian et al., 2018; Winkler & Brown, 2013). Beyond offering the advantages of time, specialized high-volume providers of cloud computing services and infrastructures such as Amazon Web Services or Salesforce provide cost and quality advantages over enterprise IS solutions (Bygstad, 2017; Gregory et al., 2018).

Although the use of unauthorized IS in the corporate context is not a new phenomenon, its impact and significance has grown as IS deviance expands from the individual to the business function level and more and more critical parts of organizations are affected (Fürstenau et al., 2020; Gregory et al., 2018; Jarrahi et al., 2017). In the past, IS deviance has been perceived as a threat to organizations, while potential benefits of IS deviance have been largely neglected (Fürstenau et al., 2017; Walterbusch et al., 2017). However, research suggests that constructive IS deviance can benefit corporate innovation (Faßauer, 2018; Vadera et al., 2013). Constructive deviance helps to overcome organizational constraints such as rigid policies, roles, practices, resource inadequacy, and a lack of support that impede effective and creative performance (LePine et al., 2005; Vadera et al., 2013). Thus, especially in dynamic competitive landscapes

such as digital innovation IS deviance can empower business functions to act faster, more effectively, and more innovatively when in-house IS speed capabilities do not provide adequate support (Berente & Yoo, 2012; Faßauer, 2018; Vadera et al., 2013).

HYPOTHOSES DEVELOPMENT

From the argument so far, we expect IS deviance to be higher when business functions' speed demand and IS functions' speed capabilities are misaligned. As IS speed capabilities are essential to reinforce established capabilities and develop new dynamic capabilities needed to respond to the new logics of digital innovation (Kane et al., 2019; Karimi & Walter, 2015), business functions faced with IS speed misalignment have strong incentives to deviate from IS governance procedures and implement autonomous solutions in line with their required clock speeds.

Business functions should have no such incentive when demand and supply of IS speed are aligned, as the speed of IS-based decision-making and execution regarding the allocation of IS resources for digital innovation are in sync with business needs and business and IS processes are well orchestrated (Preston & Karahanna, 2008; Sabherwal et al., 2019). As alignment also indicates greater knowledge and use of corporate IS resources of business functions (Hirschheim & Sabherwal, 2001) and greater understanding of digital technologies' potential for digital innovation of IS functions than when IS and business are misaligned, the pace of IS-based decision-making is better aligned with digital innovations' development cycles (Tarafdar & Tanriverdi, 2018). Thus, the level of IS deviance in both IS speed alignment conditions should be equally low, especially since IS deviation comes at the cost of straining business functions' financial and personal resources and risks conflicts and firm compliance.

In contrast, IS speed misalignment creates a condition for business functions to deviate from IS governance. Speed misalignment hinders business functions from reacting in a timely

manner to fast-changing digital innovation needs. As time is of the essence for digital innovation success and no fast cure for misalignment exists (Chau et al., 2020; Sabherwal et al., 2019), IS deviance may be unavoidable for business functions to overcome innovation constraints created by speed misalignment. Correcting for misalignment needs considerable time and resources as it requires overhauling IS governance frameworks, including various stakeholders, before IS functions can begin to redeploy IS resources and absorb new knowledge to build speed capabilities (Chau et al., 2020; Karhade & Dong, 2021; Reynolds & Yetton, 2015). Hence, business functions are more likely to deviate from IS governance procedures to keep pace with market dynamics and ensure firm competitiveness when IS speed capabilities are misaligned to their demands. Thus, we hypothesize that:

H1. *IS governance deviance will be higher when business functions' speed demand and IS functions' speed capabilities are misaligned rather than aligned.*

While we expect that IS speed misalignment generally triggers deviations by business functions, we contend that the effects of IS misalignment conditions will differ. Specifically, we hypothesize that the extent of IS deviance will be greater for IS speed shortfall than for IS speed underutilization. IS function's inability to provide rapid support for digital innovation creates an immediate need for business functions to compensate for a shortfall of necessary IS speed capabilities. The discrepancy between actual IS speed capabilities vis-à-vis business functions' actual needs for successfully developing digital innovation manifests in tasks like scaling and adapting enterprise IS systems to ad hoc change requirements or prototyping and deploying new IS (Fürstenau et al., 2017; Gregory et al., 2018). Responding to increased speed demands requires that IS functions be able to quickly reallocate resources at competitive costs. Business functions'

decisions regarding whether to use official or alternative IS resources hinge on the expected time and effort needed for IS functions to mobilize and deploy IS resources (Fürstenau et al., 2019). A business manager in charge of developing mobile banking innovation strikingly describes a situation of IS speed shortfall (Gregory et al., 2018, p. 11):

“Our experiences of working with our internal IS provider show that they just don’t know how to do it. You have to conduct a preliminary study, which costs heaps of money. If the study is successful, you can eventually start the development but only under the condition that you agree on a reasonable budget. On this last point, we had a number of projects where we ended up throwing up our hands in horror as we recognized that the pricing offered to us was unreasonably high.”

For business functions in immediate need of high IS speed capabilities, overcoming misalignment by established governance practices takes too much time (Benbya et al., 2019; Tallon et al., 2016). Even if IS functions that lack speed capabilities are willing to change the status quo, their ability to provide timely support for digital innovation is often hampered by complex IS architectures and legacy systems with protracted lifespans (Agarwal & Tiwana, 2015; Rolland et al., 2018). As strategic replacement of this “digital debt” is time-consuming and costly, and requires substantial coordination between stakeholders (Karhade & Dong, 2021; Reynolds & Yetton, 2015; Rolland et al., 2018), IS speed shortfall creates a condition for business functions to bypass IS functions and quickly obtain needed IS resources from alternative sources.

At the same time, the possibilities for overcoming impediments caused by enterprise IS have grown substantially owing to the democratization of access to on-demand computing resources, and IS consumerization has increased the IS savviness and literacy of non-IS personnel (Gregory et al., 2018). Today, business functions can compensate easily and rapidly for misalignments by bypassing internal IS functions at an unprecedented pace and scope (Gregory et al., 2018), decreasing the reliance and power of IS functions (Winkler & Brown, 2013). A myriad

of easy to recombine modular IS resources offered by a heterogeneous ecosystem of cloud computing providers allows business functions to develop their own solutions and to overcome the traditional boundaries of corporate IS (Benlian et al., 2018; Y. Yoo, 2012).

In the case of IS speed underutilization, however, we expect business functions to deviate from firms' IS governance frameworks to a lesser extent. Excessive IS speed capabilities that cannot be leveraged by business functions create situations in which business managers are cognitively overloaded by the number and variety of changes and decisions required and the options from which to choose (Karhade & Dong, 2021). Business functions may not have the capacity or the willingness to deal with IS-related topics in a high-speed mode (Peppard, 2018). Thus, an over-emphasis of IS speed capabilities may be too much of a good thing, causing business functions to look for alternative sources of IS support that are more aligned with the required clock speed and *modus operandi*.

Therefore, we expect that both IS speed shortfall and underutilization will cause IS deviance, which will be higher for IS speed shortfall than for IS speed underutilization. Furthermore, we expect a curvilinear, U-shaped relationship between IS speed misalignment and IS governance deviance, indicating that the level of IS governance deviance increases with the extent of misalignment between business demand for IS speed and IS speed supply. Thus, we hypothesize:

H2a. *IS governance deviance will be greater if misalignment is such that business functions' speed demand exceeds IS functions' speed capabilities (IS speed shortfall) than vice versa (IS speed underutilization).*

H2b. *The level of IS governance deviance is curvilinearly related to IS speed misalignment (i.e., taking a U-shape), such that IS governance deviance will be higher at more extreme levels of misalignment.*

By their very nature, innovations depart from known trails, common repertoires of behavior, and the status quo (Schumpeter, 1934; Zhou & George, 2001). Research shows that deviance from rigid corporate rules and role perceptions promotes organizational innovation because it allows out-of-the-box thinking, breaking out of routines, and experimentation (Faßauer, 2018; Vadera et al., 2013). Thus, contrary to the long-established notion that all types of deviance are a threat to organizations (Robinson & Bennett, 1995), constructive deviance is increasingly regarded as necessary to overcome organizational inertia, conformity, and bureaucratic routines that stifle the generation and implementation of novel ideas (Faßauer, 2018; Mainemelis, 2010).

From this perspective, IS governance deviance might produce positive firm performance in the presence of IS speed misalignment, particularly in the case of IS speed shortfall. Deviating from slow, conformist, and rigid IS governance policies and procedures enables business functions to overcome constraints and boundaries created by IS speed shortfall (Reynolds & Yetton, 2015). IS deviance therefore creates the necessary leeway for business functions to innovate more rapidly with digital technology and to overcome rigid structures and routines that are major barriers to the generation and implementation of novel ideas (Galperin, 2002). Hence, we argue that in the presence of IS speed shortfall, IS deviance has a positive effect on firm performance as it allows business functions to improve time to market, quality, and costs of digital innovation. In the case of IS speed shortfall, business functions can fix inadequate in-house IS speed capabilities faster by deviating from rigid and slow governance procedures (Chau

et al., 2020; Gregory et al., 2018). Thus, IS deviance allows business functions to seize entrepreneurial opportunities and to respond to changing market demands more rapidly, which is a key prerequisite for financial success in time-based competition (Tambe et al., 2012). By so doing, firms improve the quality of digital innovation since business functions are not bound to use inappropriate legacy systems with protracted lifespans that constrain the speed and solution space of digital innovation (Lu & Ramamurthy, 2004; Sedera et al., 2016). Instead, business functions are empowered to use and flexibly recombine more suitable on-demand IS resources and tap into external sources of IS knowledge, know-how, and systems that are lacking internally (Agarwal & Tiwana, 2015; Rolland et al., 2018). Finally, IS deviance can also have—at least in the short term—cost benefits for firms in the case of IS speed shortfall, as leveraging external high-scale, on-demand IS resources for digital innovation requires less capital and human resource investment than overhauling inadequate legacy IS resources (Harris et al., 2012; Sedera et al., 2016; Y. Yoo, 2012).

In contrast, we do not expect such positive effects of IS deviance for IS speed underutilization misalignment, because in this condition required IS speed capabilities are available but are insufficiently exploited. Hence, firm performance will not benefit from a duplication of existing but underutilized slack IS speed capabilities, whereas in the case of IS speed shortfall, IS deviance will enhance the time to market, quality, and cost effectiveness of digital innovation, thereby positively affecting a firm's revenue and net margin. Thus, we contend:

H3. *In the presence of IS speed misalignment by IS speed shortfall, IS governance deviance positively influences firm performance.*

RESEARCH METHODOLOGY

Sample and Procedure

We collected data using a matched-pair field survey of business and IS managers of firms located in the USA, the UK, and Germany (the Appendix provides descriptive statistics of the sample). We asked business managers to rate their function's demand for IS speed for digital innovation and to respond to measurement scales of firm performance, industry, age, and size. IS managers rated their IS function's speed capabilities and responded to measurement scales of CIO board membership and IS budget.

We worked with a market research company that randomly sent e-mails to potential subjects working in either a business or an IS function containing a link to the online survey instrument to 500 different firms included in their panel. Business and IS managers received separate e-mails with instructions and unique codes to match responses of the same firm. We excluded responses from firms whose business managers indicated that the impact of digital technology on corporate innovation is marginal. The procedure resulted in 119 matched pairs of business and IS managers (combined response rate: 23.8%). We tested for non-response bias by comparing early and late responses. The mean values of the first and last quartile of responses showed no statistically significant difference, indicating that non-response bias is unlikely.

Measurement

We relied on existing validated scales as much as possible and developed new instruments when necessary. In the end, we developed three new instruments for measures of IS governance deviance, a business function's IS speed demand, and an IS function's speed capability (Table 1). We followed standard psychometric scale development methods to operationalize our constructs, including sorting and rating procedures, interviews with scholars and practitioners to ensure face

and content validity, pre- and pilot testing, and construct validity (MacKenzie et al., 2011). To validate our survey instrument, we conducted a qualitative ($n = 15$) and a quantitative ($n = 36$) pilot study with IS and business professionals and scholars. The final pilot study indicated that the scales' reliabilities were appropriate for further use. After we prepared the survey in English, two translators independently translated the questionnaire into German, with a back-translation into English to confirm that the translation was equivalent (Brislin, 1970).

For IS governance deviance, we developed a five-item scale that covers the life cycle of a digital innovation project from concept development to implementation (Ernst et al., 2010; Kohli & Melville, 2019; Svahn et al., 2017). The scale captures the extent to which a firm's business functions deviate from formal and official IS-related decision rights and responsibilities in digital innovation projects. We adopted a project level of analysis because it is "most directly relevant to innovation speed" (Kessler & Chakrabarti, 1996, p. 1149). The Cronbach's alpha value ($\alpha = .89$) indicated internal consistency of the scale.

Using a matching set of four items, we measured business functions' speed demand vis-à-vis IS functions' speed capability. Business managers rated how important IS speed capabilities are for their business function to implement digital innovation. IS managers rated their IS functions' speed capabilities. The scales capture key areas of IS speed capabilities necessary for digital innovation projects (Bharadwaj et al., 2013; Sambamurthy et al., 2003; Y. Yoo, 2012). The scales' internal consistencies were high (Cronbach's $\alpha_{\text{Business}} = .94$, $\alpha_{\text{IS}} = .89$).

Table 1. Construct Operationalization and Factor Loadings

Construct (key references)	Items	Factor Loading	
		Rated by business managers	Rated by IS managers
Firm performance^a (Bharadwaj, 2000; Santhanam & Hartono, 2003)	Please rate your firm's performance over the last three years on each item, relative to other firms in your industry.		
	Net margin.	.87***	
	Return on assets.	.91***	
	Sales growth.	.88***	
IS governance deviance^b (Ernst et al., 2010; Svahn et al., 2017; Tarafdar & Tanriverdi, 2018)	My business function deviates from formal and official IS-related decision rights and responsibilities in our organization when...		
	...initiating digital innovation projects.	.74***	
	...planning digital innovation projects.	.83***	
	...managing digital innovation projects.	.91***	
	...developing applications for digital innovation projects.	.83***	
	...rolling out applications for digital innovation projects.	.84***	
Business function's demand of IS speed capabilities^c (Bharadwaj et al., 2013; Sambamurthy et al., 2003; Y. Yoo, 2012)	Please rate your business function's IS-related demands for support of digital innovation projects provided by your firm's IS function.		
	Accelerating the speed of new product and service launches.	.92***	
	Accelerating the speed of strategic and operational decision-making.	.93***	
	Accelerating the speed of dynamic supply chain and business networks orchestration that provide complementary capabilities.	.92***	
	Accelerating the speed of sense and respond cycles regarding changes in customer needs, markets and emerging environmental opportunities.	.91***	
IS function's IS speed capabilities^d (Bharadwaj et al., 2013; Sambamurthy et al., 2003; Y. Yoo, 2012)	Please rate your IS function's capabilities for supporting business functions' digital innovation projects, relative to other firms in your industry.		
	Accelerating the speed of new product and service launches.		.86***
	Accelerating the speed of strategic and operational decision-making.		.78***
	Accelerating the speed of dynamic supply chain and business networks orchestration that provide complementary capabilities.		.93***
	Accelerating the speed of sense and respond cycles regarding changes in customer needs, markets, and emerging environmental opportunities.		.87***

Note. Seven-point Likert scales ranged a) from (1) "poorer than most" to (7) "better than most"; b) from (1) "strongly disagree" to (7) "strongly agree"; c) from (1) "not important at all" to (7) "absolutely essential"; d) from (1) "very poor" to (7) "exceptional";
* $p < .05$; ** $p < .01$; *** $p < .001$

We assessed the validity of our measurement scales by checking whether each item significantly loads on the respective construct (Fornell & Larcker, 1981; Gefen & Straub, 2005). Without exception, items had loadings on their expected constructs above the common threshold

of .60 and also had acceptable cross-loadings—indicating convergent and discriminant validity. Also, the average variance extracted (AVE) for each construct largely exceeded .50 and for all constructs the squared correlations between two constructs are lower than the corresponding AVEs, indicating discriminant validity (Fornell & Larcker, 1981). To test for multicollinearity, we computed the variance inflation factor (VIF) values. VIFs are all <3.19, indicating that multicollinearity is not an issue (Hair et al., 2009). Table 2 shows all scales used together with descriptive statistics and psychometric properties.

Table 2. Correlations and Measurement Information

Variable	Range	Mean	SD	CA	CR	AVE	1	2	3	4	5	6	7	8	9	10	11
1 FIP^(a)	1-7	4.70	1.34	.87	.88	.79	.89										
2 DEV^(b)	1-7	4.31	1.43	.89	.90	.69	.33	.83									
3 BSP^(c)	1-7	4.92	1.59	.94	.94	.84	.27	.52	.92								
4 ISS^(d)	1-7	3.99	1.08	.89	.95	.75	-.08	-.15	-.19	.87							
5 SIZE	1-7	3.71	2.04	-	-	-	.17	.04	-.10	.09	1						
6 AGE	0-100	32.16	36.27	-	-	-	.00	-.08	-.27	.09	.57	1					
7 CIO	0-1	.67	.47	-	-	-	.23	.19	.12	-.21	.08	-.07	1				
8 ISB	0-100	7.03	3.37	-	-	-	.19	.12	.17	-.01	.13	-.09	.10	1			
9 GER	0-1	.61	.49	-	-	-	-.02	-.17	-.18	.11	.13	.38	-.37	-.29	1		
10 USA	0-1	.27	.45	-	-	-	.13	.20	.20	-.02	-.10	-.32	.34	.17	-.76	1	
11 UK	0-1	.12	.32	-	-	-	-.14	-.02	-.01	-.14	-.06	-.14	.09	.21	-.46	-.22	1

Note. Seven-point Likert scales ranged a) from (1) “poorer than most” to (7) “better than most”; b) from (1) “strongly disagree” to (7) “strongly agree”; c) from (1) “not important at all” to (7) “absolutely essential”; d) from (1) “very poor” to (7) “exceptional”; SD: standard deviation; CA: Cronbach’s alpha; CR: composite reliability; AVE: average variance extracted. Bold diagonal elements are the square root of AVE. These values should exceed inter-construct correlations (off-diagonal elements) for adequate discriminant validity. FIP: Firm performance, DEV: IS governance IS deviance, BSP: Business function’s demand of IS speed capabilities, ISS: IS function’s IS speed capability, END: Environmental dynamics, SIZE: Firm size (1: < 50, 2: 50-99 employees, 3: 100-499 employees, 4: 500-999 employees, 5: 1.000-2.499 employees, 6: 2.500-9.999 employees, 7: >= 10.000 employees), AGE: Firm age (in years), CIO: CIO board membership (0: No, 1: Yes), ISB: IS Budget (share of turnover), GER: Firm’s headquarter in Germany (0: No, 1: Yes), USA: Firm’s headquarter in USA (0: No, 1: Yes); UK: Firm’s headquarter in UK (0: No, 1: Yes).

We used multi-source measures which is an effective strategy to avoid a potential bias due to common method variance (Podsakoff et al., 2003). However, to ensure that common method variance is not an issue, we performed Harman’s one-factor test. We conducted a principal component factor analysis that included all items of our research model. Results indicate no

extremely dominant factor as the highest variance explained by one factor was 26.98%, well below the critical value of 50%. In addition, we conducted the correlational marker technique (Lindell & Whitney, 2001). As all significant zero-order correlations between our variables remain significant after correcting bivariate correlations between our model variables for the lowest positive correlation with the marker variable, we conclude that common method bias does not constitute a problem.

Analytical Approach and Tests

We test H1, H2a, and H2b using polynomial regression analysis (PRA) and response surface analysis (RSA) as these analyses allow more ecologically valid and richer insights (Edwards, 1994, 2002; Edwards & Parry, 1993). As the relationships between alignment, governance, and performance are dynamic and complex (Luftman et al., 2017; Sabherwal et al., 2019), linear models “may mask critical elements of the interplay between these concepts (Edwards and Parry 1993; Oh and Pinsonneault 2007) and erroneously conclude that alignment paradoxes exist, when in fact they result from theoretically underdeveloped or misspecified models (Gerow et al. 2016; Liang et al. 2017)” (Chau et al., 2020, p. 1681). PRA also allows study of differences between different types of (mis-)alignment, which is impossible with difference scores (Chau et al., 2020; Edwards, 2002).

In our study, polynomial modeling includes measures of business functions’ IS speed demand (X) and IS functions’ IS speed capability (Y), their higher order terms (X², Y²), and their product term (XY) to test their relationship with the dependent variable IS governance deviance (Z), yielding the following equation:

$$(1) \quad Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + e$$

Prior to conducting the PRA, we scale-centered item measures to avoid multicollinearity and increase interpretability (Shanock et al., 2010). We relied on the results of equation (1) to compute the response surface parameters, which we used to formally and visually analyze how (in-)congruence between our predictor variables business functions' IS speed demand (X) and IS functions' speed capability (Y) affect IS deviance (Z) using salient features of the surface. As PRAs “often yield conditions of coefficients that are difficult to interpret” (Edwards & Parry, 1993, p. 1605), RSA enables “a rich and deep understanding of the intricacies of polynomial models” (Venkatesh & Goyal, 2010, p. 286). RSA also helps to visualize relationships among variables in three-dimensional space to uncover novel and complex conditions (Benlian, 2013).

Using the regression coefficients, we calculated and interpreted three main features of the response surface: (1) the stationary point (i.e., the point at which the slope of the surface is zero in all directions), (2) the principal axes (i.e., lines in the X, Y plane perpendicular to one another intersecting at the stationary point), and (3) the slopes along the line of alignment ($Y = X$) and the line of misalignment ($Y = -X$). To estimate the significance levels for stationary points and principal axes, we used bootstrapping with 10,000 samples and the bias-corrected percentile method (Edwards, 2002). To test for the significance of slopes and curvatures along the lines of (mis-)alignment, we used standard regression analyses (Shanock et al., 2010).

For H1, we first tested whether the surface above the line of alignment—that is, where values for business functions' IS speed demand (X) and IS function's speed capabilities (Y) are congruent ($X = Y$) has a constant shape. A constant shape of the line of alignment indicates that all firms whose IS functions' speed capabilities are aligned to business functions' IS speed demand are predicted to have equal levels of IS deviance. For a constant shape to occur, the slope as given by $a_1 = b_1 + b_2$ and the curvature as given by $a_2 = b_3 + b_4 + b_5$ must not differ significantly from zero (Edwards, 2002). Second, we tested whether the surface above the line of

misalignment—that is, where values for business functions' IS speed demand (X) and IS functions' speed capabilities (Y) are opposite ($X = -Y$)—has a U-shape, as this shape would indicate higher levels of IS deviance for IS speed misalignment than IS speed alignment. For a U-shaped surface above the line of misalignment to occur, the curvature of the surface as given by $a_4 = b_3 - b_4 + b_5$ must be positive and significant (Benlian, 2013).

To test H2a and H2b, we analyzed the slope ($a_3 = b_1 - b_2$) and curvature ($a_4 = b_3 - b_4 + b_5$) of the surface above the line of misalignment. For the hypothesized effects to occur, a_3 must be significant and positive, indicating greater levels of IS deviance when business functions' speed demand (X) exceed IS functions' speed capabilities (Y) (i.e., IS speed shortfall, H2a). Additionally, a_4 must be significant and positive, indicating a curvilinear U-shape along the line of misalignment as hypothesized in H2b (Benlian, 2013).

We tested H3 by a multi-group analysis using linear regression. We build upon our conceptualization of IS speed (mis-)alignment conditions (Figure 1) to assign each firm to one of the four conditions. We used the median values of business functions' demand of IS speed capabilities (BSP) ($\bar{x} = 5.5$) and IS functions' speed capability (ISS) ($\bar{x} = 4.0$) to split our sample into four groups, as depicted in Figure 2.

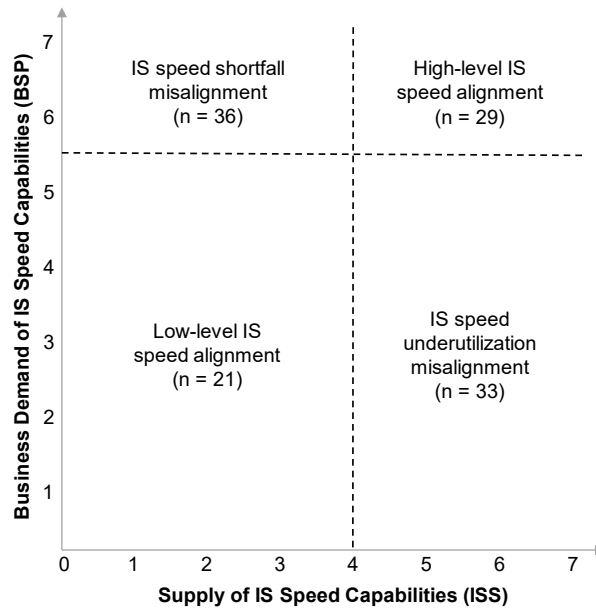


Figure 2. Median Splits

RESULTS

The results from the PRA and RSA are presented in Table 3 and Figure 3. As illustrated in Figure 3, the response surface has a concave bowl shape with the stationary point at $X_0 = 8.41$, $Y_0 = -4.38$ and the secondary principal axis ($Y = p_{20} + p_{21}X$) with an intercept $p_{20} = 1.0$ and the slope $p_{21} = .64$.

Table 3. Results from Polynomial Regression

Non-standardized regression coefficients						
Dependent variable	X_{b1}	Y_{b2}	X^2_{b3}	XY_{b4}	Y^2_{b5}	R^2
IS governance deviance	.497***	-.132**	.078	-.188**	.165**	.399***

Note. X = Business functions' IS speed demand; Y = IS function's speed capability, XY = interaction of X and Y.
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

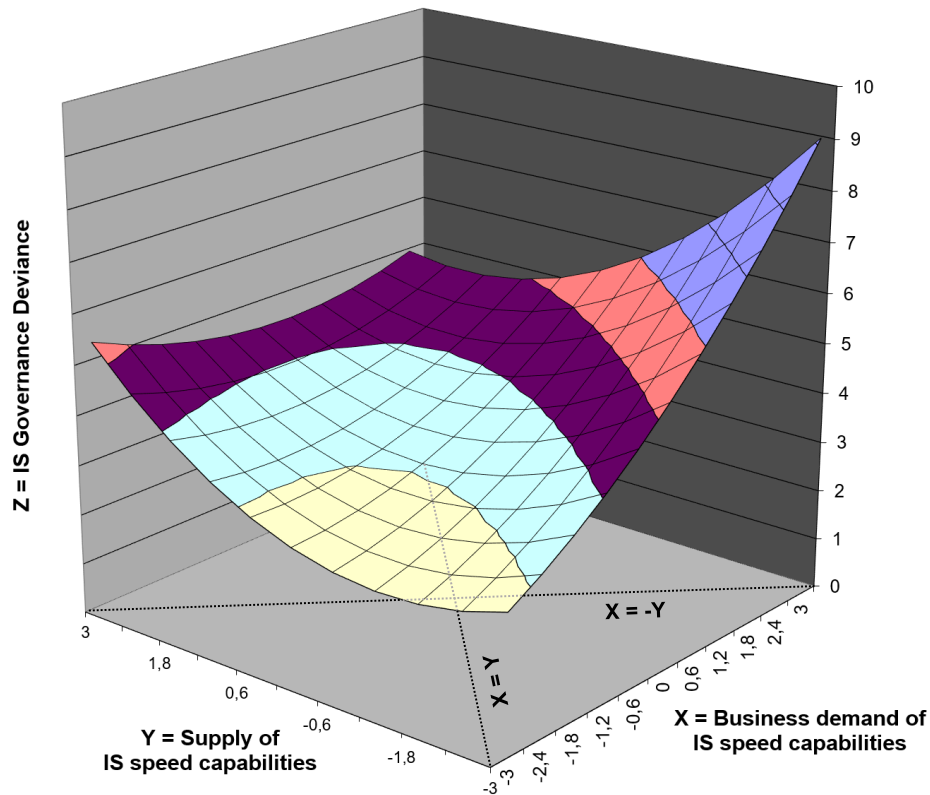


Figure 3. Response Surface

As the response surface in Figure 3 shows, the surface along the line of alignment ($X = Y$) is linearly increasing, as indicated by the significant slope ($a_1 = .37, p < .05$) and the nonsignificant curvature ($a_2 = .06, p > .05$). Hence, H1 is rejected, as the values for slope and curvature of the surface above the line of alignment suggest a linear main effect of the predictor variable X on the outcome variable IS deviance instead of a constant shape. To further analyze this unexpected result, we examined the cross-section at the line of alignment (Figure 4a) and performed a Bonferroni post-hoc analysis to compare the differences between the four (mis-) alignment conditions. Results reveal that the level of IS deviance differs significantly among groups with high levels of business functions' speed demand (i.e., IS speed shortfall and high-

level IS speed alignment) and low levels of business functions' speed demand (i.e., IS speed underutilization and low-level IS speed alignment) ($F(3,115) = .10.788, p < .001$; Figure 5).

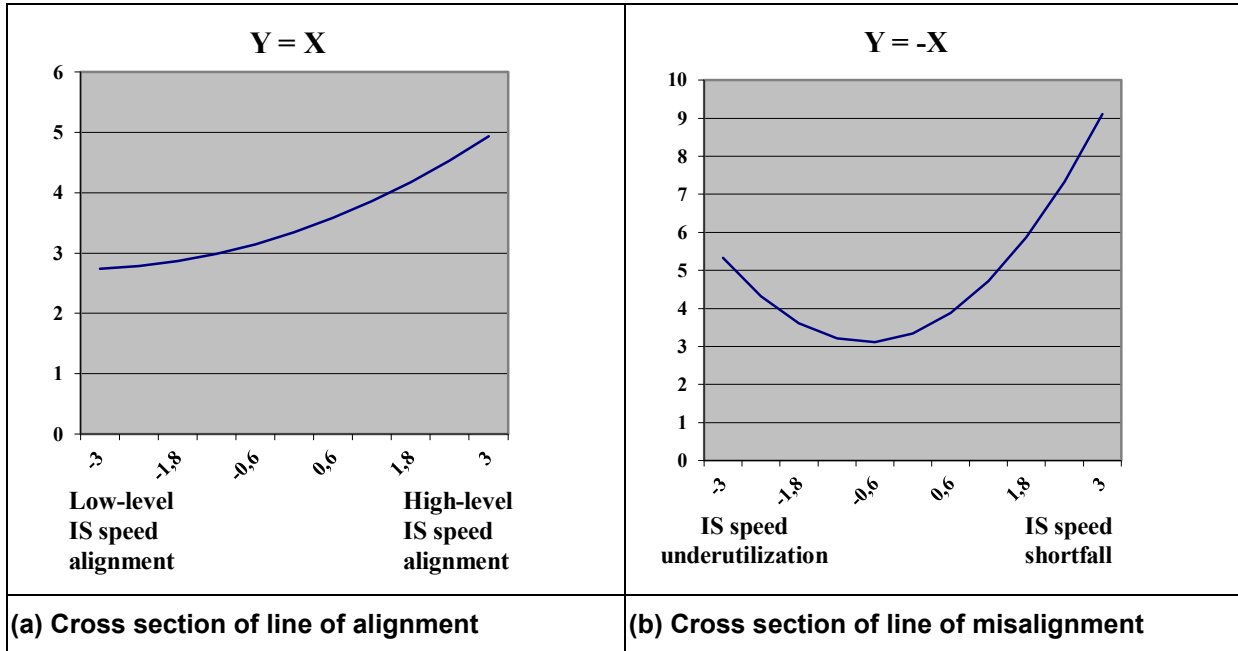


Figure 4. Cross-sections

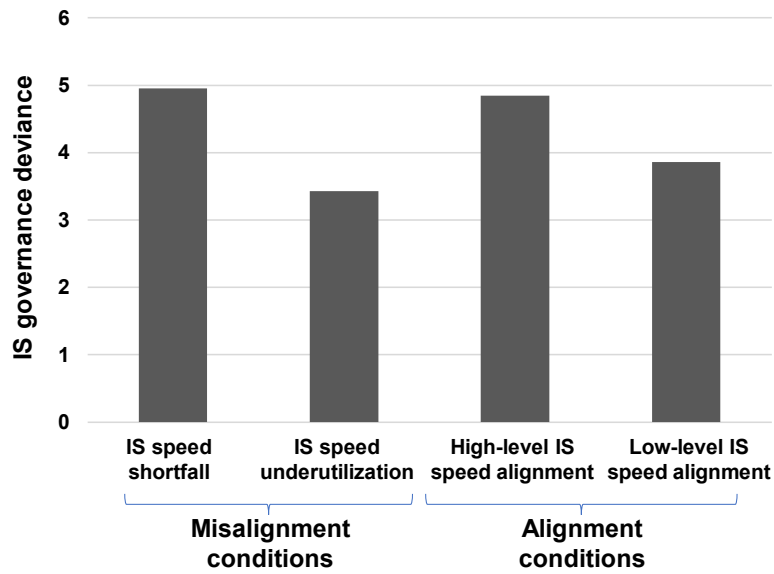


Figure 5. Plots of Means for Different (Mis-)alignment Conditions

We find support for H2a and H2b. As illustrated in Figure 3, the surface is concave, showing curvilinear relationships. The slope of the surface along the line of misalignment is significant and positive ($a_3 = .63, p < .001$), indicating that the level of IS governance deviance is higher for IS speed shortfall misalignment than IS speed underutilization misalignment. Thus, H2a is supported, as the level of IS deviance increases more strongly for more extreme levels of IS speed shortfall misalignment. The significant and positive curvature ($a_4 = .43, p < .001$) further indicates a U-shaped curve along the line of misalignment (Figures 3 and 4b). This curve shows that IS deviance increases with both increasing levels of IS speed shortfall misalignment and increasing IS speed underutilization misalignment, while the level of IS deviance at the midpoint of the line of misalignment is lower. Thus, the magnitude of misalignment matters and H2b—that IS deviance is highest at more extreme points of the misalignment continuum—is supported.

H3 tests the performance effect of IS deviance given IS speed shortfall misalignment. Table 4 shows the results of a multi-group analysis using linear regression analysis, which not only allows testing of the effect of IS deviance on firm performance for the condition of IS speed shortfall misalignment but also permits examination of the effect under the other conditions of IS speed (mis-)alignment (Figure 2). The results show that IS deviance has a positive influence on firm performance ($\beta = .518, p < .01$) in the IS speed shortfall condition, as hypothesized in H3. Results also indicate a moderately positive effect of IS deviance on firm performance in the high-level IS speed alignment condition.

Table 4 Results from Multi-group Analyses

	Misalignment Conditions		Alignment Conditions	
	(1) IS speed shortfall	(2) IS speed underutilization	(3) High-level IS speed alignment	(4) Low-level IS speed alignment
IS governance deviance	.518***	-.070	.304*	.265
Firm size	.712**	.021	.232	-.137
Firm age	-.362	-.099	.121	-.022
IS budget	-.019	.130	.127	.106
CIO board membership	-.153	.221	-.034	.457*
Germany	.045	.802***	-.676*	.403
USA	-.024	.624*	-.279	.187
R²	.433	.322	.541	.386

Note. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

DISCUSSION

The increasing emphasis on digital innovations and the importance of speed dictates re-examination of the traditional approach to IS governance, alignment, and firm performance (Chau et al., 2020; Gregory et al., 2018). We explore the complex relationships that are unattainable by conventional linear models and alignment measurement approaches (Benbya et al., 2019; Chau et al., 2020; Coltman et al., 2015; Tallon et al., 2016). In particular, we asked whether firms should tolerate business functions' IS deviance in certain conditions or force compliance to IS governance regulations even though this approach may jeopardize firm success and survival.

We found that different conditions of IS speed (mis-)alignment differently influence the extent of business function IS deviance. The level of IS deviance in the IS speed shortfall condition (insufficient IS speed capabilities) was significantly higher than for IS speed underutilization misalignment (excessive IS speed capabilities). Unexpectedly, however, we also

found greater levels of IS deviance in the high-level alignment condition. This finding suggests that when faced with fast-moving digital innovation challenges, business functions often resort to additional, unauthorized IS capabilities, even if their IS function is adequate to meet the speed demand. This response indicates that the level of IS deviance is affected by not only the extent of (mis-) alignment between our predictor variables but also the magnitude of business functions' IS speed demand *per se*.

Second, our findings show that IS deviance in the presence of IS speed shortfall misalignment leads to better firm performance. We also found a moderately positive effect of IS deviance on firm performance in the high-level speed alignment condition. Our study is one of the first studies to theorize and empirically demonstrate that IS deviance on the level of business functions can increase firm performance contingent on the type of (mis-)alignment. Therefore, our study responds importantly to calls in the literature on resolving contradictory findings on the alignment–performance relationship by considering IS governance and non-linear effects (Chau et al., 2020) and “into how... IT governance can be aligned with digital innovation practices” (Gregory et al. 2018, p. 25).

Theoretical Contributions and Implications

Our findings offer three key theoretical contributions with several implications for research. First, our findings suggest that the extent of IS deviance depends on the magnitude and type of IS speed (mis-)alignment. Although prior research has frequently suggested that IS speed capabilities are a critical factor of alignment (Huang et al., 2017; Tumbas et al., 2018) and that IS deviance is an increasingly prevalent phenomenon to overcome a lack of speed capabilities, especially regarding digital innovation (Fürstenau et al., 2019; Gregory et al., 2018), we did not know how different conditions of IS speed (mis-)alignment are linked to IS deviance. Our study provides needed theoretical and empirical clarity. Using polynomial regression and response surface analyses in

conjunction with a novel conceptualization of IS speed (mis-)alignment, we could unravel the complex relationships between (mis-)alignment conditions and IS deviance. Since we measured actual (as opposed to planned) alignment by using a dyadic research design, our study refrained from the use of contested alignment measures such as profile deviation and thus better accounts for the growing complexity of IS alignment, thereby increasing the ecological validity of our results (Benbya et al., 2019; Gerow et al., 2014).

In particular, our findings clearly demonstrate that the more severe the shortfall of required IS speed capabilities, the more prevalent the IS deviance. Thus, our empirical results support anecdotal evidence of the critical importance of IS functions' ability to rapidly mobilize and deploy IS resources to support digital innovation (Huang et al., 2017; Tumbas et al., 2018) and of the need for business functions to obtain IS capabilities from unauthorized sources to independently correct for IS speed shortfall (Gregory et al., 2018). An unexpected result was that IS deviance also occurred in the high-level IS speed alignment condition. This finding may indicate business functions' neglect of IS functions' speed capabilities, which is frequently grounded in a lack of relational governance. This disregard impedes communication, knowledge sharing, and collaboration between IS and business functions (Benlian & Haffke, 2016; Fürstenau et al., 2019; Peppard, 2018). Fast-changing environments that put business functions under high time pressure aggravate these problems, as building and maintaining a shared understanding requires time (Sabherwal et al., 2019). Also, business functions under high time pressure may refrain from using in-house IS capabilities because bureaucratic and protracted corporate-level governance procedures are known for slowing down IS-related decisions and execution and for ineffectively allocating resources because of top management's widespread lack of IS attention, involvement, and knowledge (Cao et al., 2013; Peppard, 2018; Reynolds & Yetton, 2015; Tiwana & Kim, 2015).

Second, our findings suggest that the effect of IS deviance on firm performance is contingent on the type of IS speed (mis-)alignment. Our simultaneous attention to IS deviance, firm performance, and different (mis-)alignment conditions brings much-needed precision to how we examine the relationship between IS governance and firm performance (Chau et al., 2020; Gerow et al., 2014; Queiroz, 2017). To date, only limited alignment research has investigated “whether IT governance [or its deviance] accounts for contradictory findings on the alignment-performance relationship” (Chau et al., 2020, p. 1681) and has gone beyond studying linear relationships and single respondent surveys (Gerow et al., 2014). Our study addressed these shortcomings and the results show that the level to which business functions deviate from corporate IS governance rules and mandates strongly influences how (mis-)alignment conditions affect firm performance. Hence, our findings suggest that, to resolve inconclusive findings regarding the alignment-performance relationship, an essential consideration is the extent of organizational actors’ deviance from corporate IS governance frameworks and the different conditions of (mis-)alignment (Gerow et al., 2014; Queiroz, 2017). Owing to IS resources’ consumerization and democratization (Gregory et al., 2018), business functions have ample opportunities to quickly acquire urgently needed IS capabilities without relying on internal IS functions as gatekeepers. In light of our findings, recent results indicating alignment’s positive effect on performance in dynamic environments and negative effect in munificent environments need to be reconsidered, as they may be linked to the extent of IS deviance (Sabherwal et al., 2019). Correspondingly, when studying the role of IS functions for digital innovation, research must take into account the actual sources of IS capabilities used for digital innovation to avoid misleading interpretations of results (Tarafdar & Tanriverdi, 2018).

Finally, our results suggest that IS deviance positively influences firm performance when business functions lack the required IS functions’ speed capabilities. Hence, our study offers a

new perspective on IS deviance. Hitherto, research has focused on analyzing negative outcomes of individual-level IS deviance (Fürstenau et al., 2019; Fürstenau et al., 2017; Gozman & Willcocks, 2015), but has neglected investigation of potential positive outcomes of IS deviance on the firm level. Our findings show that from a firm-level perspective, accepting IS deviance of business functions is more beneficial than to impair digital innovations' time to market and quality by constraints of IS speed shortfall. Hence, our study is the first to show that—at least in the shorter term—IS deviance is an effective strategy to offset inadequate IS support when the competitive environment demands speed.

We also found a positive (although weaker) effect of IS deviance on firm performance in the high-level IS speed alignment condition. Like the IS speed shortfall condition, this condition is characterized by business functions' high demand of IS speed capabilities. The positive effect of business functions' IS deviance on firm performance for both conditions implies that when competitive environments are turbulent and dynamic, the resulting high demand of IS speed capabilities requires additional IS capabilities. In high-velocity environments a “100 percent IS alignment will not be possible all of the time” (Vessey & Ward, 2013, p. 295), as a natural time delay occurs when adapting established IS systems to novel requirements (Agarwal & Tiwana, 2015; Rolland et al., 2018). Our results imply that, owing to that time delay, business functions that have a high demand for IS speed capabilities to keep up with rapidly changing market needs will temporarily bridge the IS speed capability gap by using additional IS resources.

Hence, in fast-paced competitive environments, IS deviance can be seen as a rational choice—or at least a necessary evil—that, while not ideal from a mere IS perspective, is essential for the firm performance (Vadera et al., 2013). However, to argue that IS governance deviance is a desirable state would be naive. Many studies have described the drawbacks and risks that deviation entails regarding IS security, architectural complexity, interoperability, compliance, and

efficiency (Bossert & Laartz, 2016; Fürstenau et al., 2017; Silic & Back, 2014). However, IS deviance may be a transitional solution that allows business and IS functions to bridge the capabilities gap between more stable equilibrium and more revolutionary periods that fundamentally change firms' basic conditions of activity (Romanelli & Tushman, 1994).

Our findings also imply that through IS deviance, business functions generate IS-based value, whereas a large body of research has found no such evidence for IS capabilities managed by IS functions (Chae et al., 2014; Melville et al., 2007; Mithas et al., 2013). Thus, our results suggest that, *ceteris paribus*, the more critical IS speed capabilities are for digital innovations' time to market, the more firms will benefit from granting business functions autonomy from centralized IS governance frameworks to obtain required IS capabilities more flexibly. Additional benefits can be obtained by, to the extent possible, moving IS decision-making authority regarding the prioritization of needed IS capabilities to where the relevant knowledge resides, as this change minimizes delays (Tiwana & Kim, 2015) and accelerates digital innovations' critical time to market. More autonomy and responsibility will also help business functions recognize and correct for a lack of IS speed capabilities faster than relying on conventional governance routines that degrade firm performance even further when misalignment is severe (Chau et al., 2020; Reynolds & Yetton, 2015).

Practical Implications

Digital innovation requires new approaches to mitigate the tensions between IS governance force-fitting (i.e., strictly abiding to standard approaches) and an uncontrolled proliferation of unauthorized IS systems and point-to-point connections (Gregory et al., 2018; Reynolds & Yetton, 2015). Our results indicate that a disciplined approach of IS deviance can strike a balance between these paradoxical tensions. On the one hand, a disciplined IS deviance approach should

enable business functions to tap into alternative IS capabilities in areas that require fast exploration and competitive responses and cannot be adequately supported by internal IS functions' speed capabilities. On the other hand, instead of bypassing IS functions autonomously, a disciplined IS deviance approach should emphasize openness and transparency such that IS functions are informed whenever business functions use or deploy IS capabilities outside of established IS governance frameworks. Thus, disciplined IS deviance would mitigate the trade-off by permitting business functions to quickly obtain required IS support for digital innovation and contain risks and problems associated with IS deviance.

IS functions would then be able to recognize and correct for misalignments earlier and monitor unauthorized IS solutions such that organization-wide IS governance risks and problems can be minimized. Importantly, this approach would foster closer collaboration and relationships between IS and business functions. These relational governance mechanisms are crucial to correct for misalignments and are more effective than structural and procedural governance mechanisms (Chan, 2002; Chau et al., 2020). Increased transparency about unauthorized IS systems used by individual business functions would also help IS functions to avoid the "silofication" of organizational IS architectures (Fürstenau et al., 2019). Transparency would also facilitate smoother reintegration of digital innovations built on unauthorized IS solutions with legacy IS systems in later stages, ensuring firm-level architectural consistency (Bossert & Laartz, 2016).

However, disciplined IS deviance can only mitigate the problems arising from an increasing mismatch between rigid IS governance routines and growing IS speed demands for dynamically evolving digital innovation in the shorter term. In the long run, firms will need to fundamentally adjust corporate IS governance frameworks and architectures to the groundbreaking changes digital innovation and transformation entails by shifting to more

modular, platform-based models of IS architecture and governance (Gregory et al., 2018; Sebastian et al., 2017; Teubner & Stockhinger, 2020), pervasive cross-functional IS-business collaboration models (Drews et al., 2017; Peppard, 2018), or structural separation of digital innovation initiatives (Svahn et al., 2017).

However, when devising novel IS governance approaches that limit IS deviance to the extent possible, IS and business managers need to consider the dualities between stability and flexibility and centralization and decentralization, which are “fundamentally interdependent—contradictory but also mutually enabling” (Farjoun, 2010, p. 202; Fürstenau et al., 2019; Tilson et al., 2010). An approach to reconcile these paradoxes in practice is to reorganize corporate IS architectures and governance to “mirror” the modular, layered architecture of digital innovation (Hund et al., 2021; Teubner & Stockhinger, 2020). Like the architecture of digital innovation that allows for quick (dis-)integration and recombination of modules based on standardized interfaces and unbounded growth in scale and scope, enterprise IS can resolve opposing demands by using a stable IS infrastructural backbone controlled by IS functions that enables business functions to autonomously use infrastructural services as a platform for building digital innovation (Gregory et al., 2018; Sebastian et al., 2017; Teubner & Stockhinger, 2020). These more “lightweight” enterprise IS infrastructures are likely to decrease IS deviance because they facilitate rapidly scaling and integrating external IS services and actors (Bygstad 2017) and allow business functions to leverage recombination and generativity of internal and external IS capabilities for digital innovation.

Limitations and Future Research

Our study has limitations that are important to consider and that should be addressed by future research. First, our cross-sectional research design cannot account for temporal cause-and-effect

relationships. Thus, longitudinal research should analyze how alignment changes over time and should extract a more detailed picture of the effect of endogenous and exogenous triggers that cause these shifts. Longitudinal studies could also increase understanding of the long-term effects of IS governance deviance on firm performance and on IS-based indicators such as architectural complexity. Second, our analyses rely on data obtained from key informants. Although we made sure that respondents were qualified to answer the questionnaire, we cannot exclude individual biases. Thus, future research could enhance the validity of our results by increasing the number of respondents from the same firm or by employing qualitative methods. Third, although our sample size is greater than samples in similar studies (Chau et al., 2020), a larger sample of matched pairs would be desirable. While gathering matched pair data is demanding, compared to alternative approaches a matched pair design yields important benefits, such as reducing common method variance bias to a minimum. Fourth, our data collection was geographically confined to highly developed Western countries, where legacy IS systems are more prevalent than in less developed markets. Thus, our results may not be generalizable until future research examines technical and cultural differences. Fifth, owing to a lack of data, we could not control for whether the observed effects vary for different functional departments such as marketing, R&D, or supply chain management. Thus, future research may focus on specific business functions to expose potential discrepancies among functions.

Our study provides a useful analytical tool to study different (mis-)alignment conditions, and we hope that our investigation fosters further research at the intersection of digital innovation, IS–business alignment, and IS governance. We believe that a promising undertaking would be to empirically assess the effects of more autonomous IS–business collaboration methods and arrangements on alignment for digital innovation (Drews et al., 2017). Also of benefit would be an in-depth analysis on the effects of managerial, technical, and personal IS

capabilities on IS functions' speed capability. An interesting inquiry in this regard would be investigation of how born-digital startups ensure that IS capabilities are continuously aligned to their frequently pivoted strategies and business models and how these methods can be transferred to incumbent organizations (Huang et al., 2017; Tumbas et al., 2015).

CONCLUSION

Importantly, not all IS deviance needs to be avoided. Our study shows that when IS speed capabilities are not sufficiently provided, IS deviance can indeed produce positive outcomes on the firm level. That finding, however, does not mean that firms can actively encourage IS deviance, as in an era of digital innovations more nuanced approaches to IS governance are called for. Future research should seek to reveal how firms can manage IS governance in a dynamic, multi-dimensional way, recognizing changing and multi-layered needs of IS speed capabilities in different pockets in organizations. Our study offers a useful starting point for future research on IS governance and firm performance in the age of digital innovation.

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APPENDIX

Sample demographics

Total sample	n=238 ¹	Percentage	Total sample	n=119 ²	Percentage
Gender			Firm size (employees)		
Female	60	25.2%	< 50	26	21.8%
Male	178	74.8%	50-99	6	5.0%
Age			100-499	66	21.8%
			500-999	27	22.7%
Min	23		1,000–2,499	7	5.9%
Max	69		2,500–9,999	7	5.9%
Mean	42		>= 10,000	20	16.8%
20–25	3	1.3%	IT Budget (share of turnover)		
26–35	74	31.1%	<= 3 %	21	17.6%
36–45	87	36.6%	4 - 6 %	32	26.9%
46–55	45	18.9%	7 - 9 %	37	31.1%
56–65	21	8.8%	10 -12 %	22	18.5%
> 66	8	3.4%	> 13 %	31	5.9%
Organizational tenure			CIO board membership		
<= 3 years	59	24.8%	No	39	32.8%
4-9 years	67	28.2%	Yes	80	67.2%
10-15 years	67	28.2%	Industry		
16-20 years	21	8.8%	Manufacturing	21	17.6%
> 20 years	24	10.1%	Banking/Finance	15	12.6%
Country			Insurance	15	12.6%
Germany	73	61.3%	Consulting	14	11.8%
USA	32	26.9%	Computers/Software	10	8.4%
Great Britain	15	11.8%	Other	44	37.0%
			Business managers' functional area		
			Supply Chain Management	29	24.4%

Top Management	21	17.6%
Marketing & Sales	21	17.6%
Production	14	11.8%
Finance & Accounting	7	5.9%
Human Resources	6	5.0%
Procurement	6	5.0%
R&D	5	4.2%
Other	10	8.4%

Note. ¹ individual respondents, ² matched pairs