

# Bridging IT Competence and Digital Orientation: Exploring the Influence of IT Management and Board IT Competencies on Firm Performance through Digital Orientation

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## Abstract

*A digital orientation (DO) is a crucial aspect of firms' response to the rapidly changing digital landscape. It signifies a firm's commitment and readiness to adopt digital technologies. However, there are significant gaps in our understanding of the drivers and outcomes of DO. This paper aims to address these gaps by investigating two key questions: how do IT management and board IT competencies influence DO, and what is the subsequent impact of DO on firm performance? Grounded in the resource-based view, our study is based on survey data from 75 board directors. Our findings suggest that IT management and an IT-competent board can shape a firm's DO, but the link to firm performance is yet to be established and requires further investigation. This research contributes to the existing literature on the drivers and outcomes of DO and provides practical implications for practitioners seeking to enhance their firm's DO.*

## 1. Introduction

Digital technologies have the potential to revolutionize how firms generate value. However, the success of digital transformations, which are driven by these technologies, is not solely dependent on the technologies themselves, but also on the strategic efforts to facilitate the transformation [1-3]. When a firm effectively combines digital technology and strategic initiatives, it demonstrates a digital orientation (DO) [4-7]. DO is the degree to which a firm integrates digital technologies, strategies, and processes into its overall operations and business model [5]. It represents a firm's mindset and approach to leveraging digital advancements to improve its efficiency, competitiveness, and overall performance [5, 7].

Organizations need to have a clear DO because digital technologies are reshaping the view of IT strategy from one where IT is subordinate to business strategy, focusing on alignment with business strategy to one where IT and business strategy are unified [8]. DO can help firms navigate the challenges and opportunities presented by a rapidly evolving digital

landscape. It serves as an indicator of a firm's commitment and openness to applying digital technologies [5-6] and has been proposed to provide firms with a substantial source of competitive advantage [9, 11]. DO has faced increasing interest in academia and practice [9,10]; however, there are questions regarding the drivers and outcomes of DO (e.g., [5-7]). This exploratory research addresses these gaps by exploring three areas where further knowledge and understanding are needed.

First, despite the acknowledged potential of DO in enabling digital transformation efforts, there is a lack of knowledge on the role of IT management in shaping a firm's DO [12-14]. Strategic decisions in firms are a consequence of top management's values and preferences [15], and as such, top managers should influence a firm's strategic posture towards digital technologies—its DO. There is much support for the impact of top managers on the strategic positioning of firms [13,16], and recent research has started to examine the strategic influence of senior IT management (e.g., [12,17]) and their influence on digital transformation (e.g., [18-20]), and DO [13,16]. However, there appears to be an incomplete understanding of IT management's influence on a firm's DO.

Second, research on boards of directors has pointed to the important role the boards play in IT governance (e.g., [21]) and the role of board IT competency in enhancing IT governance (e.g., [22]). Board IT competency is the set of IT-related knowledge and experience that a director possesses. Board IT governance research identifies serious consequences for digitized organizations when the board is not involved in setting direction toward and being in control of the digital assets [21]. Effective board IT governance, enabled by an IT-competent board, is also linked to better firm performance [22-23]. However, there remains a noticeable research gap regarding the direct exploration of the link between the board and DO. This research aims to address this gap and shed light on the crucial role of IT-competent boards in influencing the firms' DO.

Third, research suggests that firms with a stronger DO strategy are more likely to adopt digital technologies like AI and high-performance computing [8], which are, in turn, conducive to digital transformation and ultimately enhance the firm's ability to meet customer needs and, consequently, performance. However, while an empirical link between DO and different performance outcomes has been proposed, the existing literature on DO has largely examined the influence of DO on firms' innovation performance. Some of these studies have found a positive relationship [4, 9-11, 24-25], and some have not found direct support [26,27]. There has been limited examination of the direct influence of DO on financial performance, and the empirical findings we do have present mixed and inconclusive results. For example, while Kindermann et al. [5] established a direct positive association between these variables, Nasiri [6] did not find support for this direct relationship. Further investigation is necessary, as while evidence from management and strategy research underscores the importance of cultivating strategic orientations for superior firm performance [28], there does not appear to be any conclusive evidence on whether DO enhances firm performance [5,25].

In this study, we address these issues by asking: how do IT management and board IT competencies influence the level of DO, and what is the impact of DO on firm performance? We adopt the resource-based view [29], a theoretical lens grounded in strategic management, and we build on research on strategic orientation to develop our research model. Through a survey of 75 board directors, we test our hypotheses using a partial least squares (PLS) methodology. Our exploratory study contributes to a further understanding of the drivers and outcomes of a firm's DO. First, we flesh out the role of IT management and the board of directors in shaping DO, thereby enhancing earlier findings. Second, we reveal that the relationship between DO and firm performance is complex and not necessarily direct. This adds a building block to the outcome literature and aligns with recent literature.

## 2. Background on Digital Orientation

Strategic orientations are particular conceptualizations of a firm's strategy [28,30-31]. A strategic orientation reflects the overall mindset or approach that shapes the firm's strategic decisions and actions toward superior performance. Such an orientation creates an intangible resource that allows firms to be uniquely competitive [30-31]. Several key strategic orientations—market orientation, entrepreneurial orientation, and learning orientation—have been extensively studied [7]. These three

orientations direct the attention of the firm towards a particular focus. For example, firms with a strong market orientation focus on understanding customer needs and dynamics [32], whereas a willingness to take risks and a focus on innovation characterizes an entrepreneurial orientation [33], and an emphasis on continuous learning and adaptation exemplifies a learning orientation [34]. Quinton et al. [7] proposed DO as a combination of these three orientations. They suggested that firms guided by these orientations are well-positioned to take advantage of the opportunities presented by digital technologies due to their adoption of attitudes and behaviors that foster the use of market insights, innovation, and openness to new ideas.

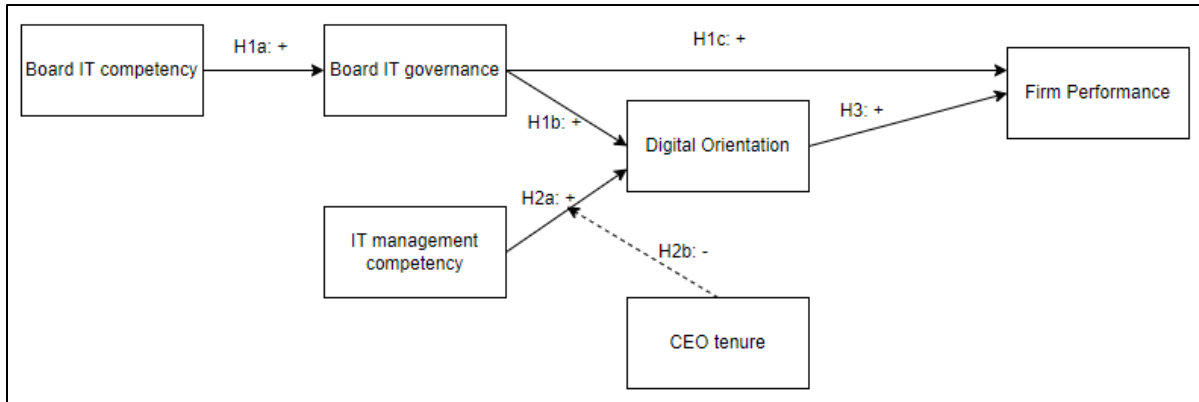
Kindermann et al. [5] acknowledged this research [7] and argued that a new strategic orientation is needed that specifically addresses the "heightened, trans-functional role of digitalization for an organization's strategic orientation" (p. 645). In this study, we adopt Kindermann et al.'s [5] definition of DO:

*"Digital orientation is an organization's guiding principle to pursue digital technology-enabled opportunities to achieve competitive advantage. It encompasses the dimensions of digital technology scope, digital capabilities, digital ecosystem coordination, and digital architecture configuration" (p. 649).*

This definition of DO draws on the strategic alignment model [35] and the key themes of affordances, openness, and generativity that capture the unique implications of digital technologies on organizational processes and outcomes [36]. DO is conceptualized as an organizational-level construct with four dimensions: i) digital technology scope, ii) digital capabilities, iii) digital ecosystem coordination, and iv) digital architecture configuration. These dimensions encompass the technological features of digital technologies and the digital coordination capabilities needed to capture the value uniquely afforded by digital technologies. Pursuing a DO can enable the development and acquisition of new skills, knowledge, and other resources that can contribute to the launch of new products or processes [37]. It can facilitate the implementation of digital technologies, strategies, and processes into a firm's overall operations [2,8]. That is why understanding the drivers and outcomes of DO is so important.

## 3. Research Model and Hypotheses Development

Our research model is presented in Figure 1. We examine the drivers and outcomes of DO to contribute to a nuanced understanding of the influence of IT management and board IT competencies on firms' DO,



**Figure 1. Research Model**

and ultimately firm performance. Based on the resource-based view [29], we view IT management and board IT competencies as valuable and rare intangible capabilities that are difficult to imitate or substitute, and hence provide superior firm performance through an enhanced DO. They are based on individuals' expertise, knowledge, experiences, and the ability to use these characteristics in strategic decision-making. A firm's DO is a function of board and managerial choices—their decision-making. It indicates a firm's openness to and creation of competitive value by adopting digital technologies [4].

The research model first focuses on the importance of the board in establishing the firm's DO. The board's role in IT governance has been seen to enhance the business/IT alignment and, in turn, firm performance (e.g., [38]). However, the growing integration of digital technologies into the organizational processes and routines of firms requires a strategic approach encompassing both technological and organizational elements. This extends beyond traditional examinations of business/IT alignment to the board's role in creating and sustaining the firm's DO. The research model indicates two hypotheses around the relationship between board IT competency and DO. First, based on prior work (e.g., [22,39]) and the resource-based view, we propose that board-level IT competencies are unique, firm-specific competencies that will enable the board to govern IT more effectively.

**H1a:** Board IT competency positively influences boards' IT governance.

Second, we propose that through the execution of their responsibilities boards can enhance their firms' DO. Firms rely on their corporate governance systems, including boards of directors, for developing, approving, and implementing their strategic responses to business challenges [40]. Since in digital firms, IT strategy is inseparable from business strategy and cannot be detached from it [5, 8], we propose that a strong DO requires board input and oversight of management decision-making with respect to digital

technologies; however, the direct link between board IT governance and DO has yet to be examined. Based on the premise that boards executing their governance of IT effectively may help to shift the attention of management to the potential of digital technologies and foster the development of digital technologies, strategies, and processes in a firm, we propose:

**H1b:** Board IT governance positively influences firms' DO.

Research has investigated and found support for the influence of board IT governance on firm performance (e.g., [23,38-39]). Using the perspective of the resource-based view, the basic premise of this research is that board-level IT governance is a valuable and rare intangible capability that is difficult to imitate or substitute, which can help them achieve and even sustain a strategic competitive advantage [23]. Increased board involvement improves managerial decision-making and enables the board to promote and provide oversight of strategic IT initiatives with the potential to add value to the organization [39]. Turel et al. [38] found that board IT governance was found to have a similar effect on firm performance as did strategic alignment. Therefore, we propose:

**H1c:** Board IT governance positively influences firms' performance.

IT management, including CIOs and CDOs, were once perceived as primarily technical roles with a restricted strategic scope; however, this is changing, and IT managers are increasingly becoming prominent members of the top management team. As top management, IT executives can steer management toward digital technologies and innovation [18-20, 41-42] and strengthen a firm's IT competency [43-45]. The limited research in this area based on secondary panel data has found support for the relationship between top management's characteristics and the level of DO—not necessarily IT management specifically. For example, the top management diversity, and the extent to which a top management team is composed of functional executives [16], top management's characteristics (e.g.,

knowledge, skills, and abilities) [13], and the level of IT experience of the top management [14,46]. Therefore, we propose:

**H2a:** IT management competency positively influences firms' DO.

The CEO typically determines the role that IT management will play in strategic decision-making. CEOs who have been CEO for a longer time tend to pay less attention to innovation and are more risk-averse [47-48]. They may also be less open and responsive to new stimuli [15, 48]. Therefore, in firms with long-tenured CEOs, IT management may struggle to shift the attention to DO and to a digital strategy. Therefore we propose:

**H2b:** Having a CEO with high role tenure attenuates the positive influence of IT management competence on firms' DO.

Broadly speaking, the way a firm strategically orients itself can influence firm performance (e.g., [49-50]). Digital technologies have been found to support fundamental organizational changes which lead to financial benefits and competitive advantages for firms (e.g., [2,51]). However, attaining financial success through digital transformation is challenging [2,52] and DO can help to provide the strategic direction needed to reduce operational difficulties [5-6]. However, because research on DO is relatively new, there are mixed findings on the relationship between DO and firm performance [5-6], and because many firms are still trying to figure out their approach to digital transformation, many questions on how DO may help to achieve performance gains remain unanswered [5-6]. Leveraging insights from prior research [1-3], we argue that it is reasonable to expect that an increase in DO is likely to result in a firm's overall capacity to create and capture value from digital technologies by mitigating operational difficulties and any loss of concentrated scope, thus benefiting firm performance. According to the resource-based view, DO represents a valuable resource that enables firms to grasp opportunities as they arise and develop new ideas ahead of competitors [6]. A DO is difficult to transfer, replicate, or copy as it is based on capabilities that are rooted in specific organizational practices and processes. Firms vary in their DOs; thus, it can be viewed as a distinct capability of a firm and a source of competitive advantage. Therefore, we propose:

**H3:** DO positively influences firms' performance.

## 4. Methodology

### 4.1. Sample and Data Collection

We developed a questionnaire that was distributed online to directors on the boards of Sri Lankan

companies by EY Sri Lanka, the Sri Lanka Institute of Directors, and their partners. 100 surveys were completed, 24 were omitted as they were incomplete, and one was an outlier. A final sample size of 75 completed surveys was analyzed for this study. While not a large sample, this was a long survey requiring 15 to 20 minutes to complete, and it is notoriously challenging to get such respondents to complete surveys [15, 66-68]. We consider the sample to be unbiased because it represented a heterogeneous, highly-qualified group. No one industry dominated the responses. Government/state-owned enterprises and publicly traded firms each made up 33% of the sample, followed by privately held (15%), family-owned businesses (12%), and others (6%). The boards were from a variety of sizes (34 percent employing less than 500 employees, half employing 501 to 5,000, and 16 percent employing more than 5000) and 75 percent were more than 20 years old. Furthermore, the respondents appeared qualified to answer the survey questions. For example, 69% had served on the board for which they answered the survey for more than 2 years. Respondents were asked to respond to the survey for the largest organization for which they served on the board.

### 4.2. Measures

We used validated measurement items when available. Board IT competency was measured as a second-order variable composed of IT expertise (15 items) and IT governance mechanisms (12 items) from [39]. IT expertise captures the knowledge dimension of board IT competency (e.g., the board is knowledgeable about IT used in the organizations, IT in general, and technical experts to contact as sources about IT), and the extent of use of IT governance mechanisms, which provides evidence of putting the knowledge into action (e.g., IT is regularly an item on the board agenda, there are regular sessions for outside directors to discuss IT). A scale spanning from "not knowledgeable" = 1 to "very highly knowledgeable" = 5 was used to measure expertise and a scale ranging from "not at all" = 1 to "to a large extent" was used for the IT governance mechanisms.

Board IT governance was measured using 17 items from Jewer and McKay [39], using the same 5-point scale as that used for the IT governance mechanisms. It includes items such as whether the board monitors IT's contribution to a competitive advantage, the IT risks to which the organization is exposed, and stakeholders' satisfaction with IT. Firm performance was measured based on Wu et al.'s [53] construct, which consists of three aspects of firm performance from the balanced scorecard: financial returns (3 items), customer perspective (3 items), and operational excellence (3

items). We adapted measurement items of the board's assessment of IT management competency from accepted dimensions of the board's level of comfort with management (e.g., [46,54-56]), including the board's assessment of management's competence, reliability, integrity, and transparency, as these elements are essential for fostering effective leadership. A composite index was used to obtain an overall measure of IT management's competence based on four items rated on a scale from "strongly disagree" = 1 to "strongly agree" = 5 (see Table 1). We adapted Kindermann's [5] qualitative measure of DO based on keywords to a multi-item survey measure using their definition of DO. The respondents were asked to indicate the Please indicate the degree to which their organization is involved in the following scenarios ("not at all" = 1 to "to a large extent") (see Table 1). The tenure of the CEO was measured directly.

### 4.3. Analysis

We adopted PLS statistical analysis using SmartPLS 4. PLS is well suited to our study because our research model employs formative and reflective indicators [57] and due to the small sample size [58-59]. All constructs in our model are reflective, except board IT competency, which is a second-order formative construct of the first-order reflective constructs of board IT expertise and IT governance mechanisms.

We performed exploratory factor analysis for all constructs to identify and validate the measurement items. Items loaded highly on their respective factors (all loadings 0.673 and above), and inter-item correlations on each factor were relatively high. Table 1 shows the mean scores, standard deviations, and loadings for the adapted IT management competence and DO. Due to space limitations, please contact the authors for the values of the other items. As shown in Table 2, their Cronbach's alphas, composite reliability, and average variance extracted (AVE) exceed their recommended thresholds of 0.70 [60], 0.70 [60], and 0.50 [57], respectively. The heterotrait-monotrait (HTMT) ratios were below 0.85, suggesting that discriminant validity was satisfied [61]. We followed a disjoint two-stage approach [62] to analyze the second-order, formative, board IT competency construct. The board IT competency construct met all criteria for a higher-order construct [59] (see Table 3).

### 5. Findings

Figure 2 presents the structural model's results. The hypotheses, path coefficients, and their significance are indicated, as is the R-squared. Board IT competency explains a substantial 64% of the variance in board

involvement in IT governance [59]. As hypothesized by H1a, the path coefficient between these two constructs is positive and significant.

The model explains 44.3% of the variance in DO, which is a moderate amount of explained variance [59]. We note that the paths between board IT governance and IT management competency and DO are positive and significant, showing support for H1b and H2a. The moderating variable, CEO tenure, does not significantly moderate the relationship between IT management competency and DO; thus, H2b is not supported. 45.5% of the variance in firm performance is explained by board IT governance. As hypothesized, the path between board IT governance and firm performance is positive and significant (H1c). However, contrary to H3, the path between DO and firm performance is not significant.

We ran the model including three control variables—firm age [63], firm size [64], and ownership type of the organization [65]. The results show that firm age and size are not statistically significant, but the ownership type is. Performance is higher for public and private firms than for governmental organizations, and they account for some of the variance in performance that was previously attributed to board IT governance. For completeness, we also tested the direct relationship between IT management competence and firm performance; as expected, this relationship was not significant. As a supplemental analysis, we ran the model with DO as a mediator between the two independent variables (board IT governance and IT management competence) and firm performance, and we found a significant relationship between the .01 level and an R-squared of 26 percent. However, when the direct relationship between board IT governance and firm performance is added, there is a suppression effect, and the relationship between DO and firm performance changes to negative and is no longer significant.

Overall, the structural model provides support for H1a, H1b, H1c, and H2a but fails to show significant results for H2b and H3.

### 6. Discussion

This study was conducted with two objectives: first, to explore how IT management and board IT competencies influence the level of DO, and second, to examine the possible impact of DO on firm performance. The results provide empirical evidence to support the first objective. Our findings contribute to the idea that firms need strategic input from IT management and an IT-competent board to develop their DO. With competent IT management and board members' IT

**Table 1. Measurement instrument with items' mean scores, standard deviations (SD), and factor loadings ( $\beta$ )**

Variable	Mean (SD)	$\beta$
<b>IT management competence</b>		
IT management (including the Chief Information Officer, Chief Digital Officer where applicable)...		
...is competent (e.g., is able to reach set goals)	3.64 (1.200)	0.901
...has integrity (e.g., bases its relationship with stakeholders, including the board, on mutual respect)	3.91 (0.824)	0.881
...is transparent (e.g., the board is told when things are going wrong)	3.93 (0.896)	0.912
...is reliable (e.g., is consistent in its communication and actions)	3.89 (0.790)	0.902
<b>Digital Orientation</b>		
Deliberately applies digital technologies (i.e., advanced communications, blockchain, IoT, sensors, virtualization, telemedicine, etc.) to its product or service offerings to create more value, meet customer needs, and generate cash flow	2.68 (0.937)	0.866
Strives to acquire individuals and build, add, or renew competencies that enable it to digitize value-creation processes and outcomes (i.e., AI, analytics)	2.70 (0.880)	0.844
Uses IT to engage in effective coordination processes with stakeholders in the ecosystem	2.93 (0.890)	0.721
Uses established technological and organizational mechanisms that allow it to effectively utilize and repurpose technological components to be responsive to shifts in demand	2.51 (0.954)	0.886

**Table 2. Cronbach's alpha, composite reliability, diagonal elements are the square root of the shared variance between the constructs and their measures (AVE); off-diagonal elements are correlations between constructs**

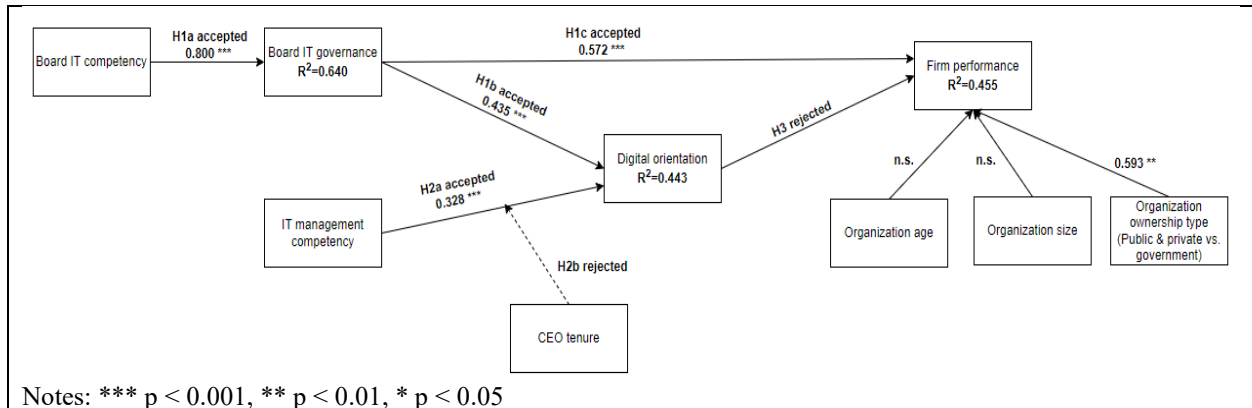
	Cronbach's alpha	Composite reliability	BITE	BITGM	BITG	ITM	DO	FP
BITE	0.951	0.954	<b>0.595</b>					
BITGM	0.940	0.951	0.575	<b>0.611</b>				
BITG	0.972	0.973	0.601	0.799	<b>0.691</b>			
ITM	0.921	0.929	0.591	0.553	0.499	<b>0.809</b>		
DO	0.850	0.861	0.518	0.518	0.604	0.545	<b>0.692</b>	
FP	0.954	0.959	0.460	0.481	0.585	0.349	0.352	<b>0.732</b>

*BITE (board IT expertise); BITGM (board IT governance mechanisms); BITG (board IT governance); ITM (IT management competence); FP (firm performance)*

**Table 3. Higher-order construct validity**

Higher-order construct	Lower-order construct	Outer weight	T statistics/P values	Outer loadings	VIF
Board IT competency	IT expertise	0.481	16.277**	0.852	1.499
	IT governance mechanisms	0.642	14.842**	0.920	1.499

*Notes: \*\*\* p < 0.001*



**Figure 2. Results of the structural model**

competencies, firms in our sample were more likely to i) deliberately apply digital technologies to their product or service offerings, ii) strive to acquire and build digital competencies, iii) use IT to engage with stakeholders in the ecosystem, and iv) repurpose technological components to be responsive to shifts in demand. This supports the large body of research on the strategic influence of top and IT management, and we add to the limited research on the influence of IT management on DO specifically. We build on evidence from prior examinations based on secondary panel data of top management's characteristics and the level of DO (e.g., [13-14,16]) through a survey of direct measures from directors. These prior studies focused on top management in general. In contrast, this study contributes by examining IT management's impact on DO. To our knowledge, this is the first study to analyze the influence of board IT competence and governance on DO. It supports our proposition that IT-competent boards influence the development and implementation of strategic responses using digital technologies.

Regarding our second objective, the results align with Nasiri et al.'s [6] study challenging the notion that DO alone provides successful firm performance. Although Kindermann [5] reported that DO directly influences firm performance, our findings do not support this. Perhaps some of this variation could be attributed to the fact that whereas Kindermann [5] examined large established company filings of S&P 500 listed companies and measured firm performance with profitability, our study was of directors' perception of the performance of their firms in terms of the financial returns, customer perspectives, and operational excellence. Furthermore, one-third of our sample was government/state home enterprises that may be impacted differently by DO than private, for-profit firms.

The current knowledge of the influence of DO on firm performance is largely underdeveloped, and the dearth of evidence and the equivocal results emphasize the need for further empirical investigation into the mechanisms by which DO influences firm performance or the impact of other conditions, such as environmental dynamism [28]. Perhaps DO influences firm performance through innovation performance, as there is support for the link between DO and innovation performance [4,9-11,24-25]. Additionally, perhaps, as Nasiri et al. [6] have found, the effect of DO on firm performance is facilitated by the interconnections with other factors, such as a firm's digital maturity and digital intensity.

## 6.1. Limitations and Future Research

The survey was limited to a sample of 75 board directors in one country. Thus, the generalizability of the findings to other countries and to other boards may be somewhat limited. However, in this study there are several mitigating factors that suggest that the results may largely generalize to other countries. The relationships between board IT competency, IT governance, and firm performance, measured using validated measures and examined in other countries (e.g., Canada [39]), also hold in this study. The sample is representative of the Sri Lankan industries and ownership types, and the size is similar to academic surveys of board directors and top management ([66]—50 CIOs and CTOs; [67]—94 directors; [68]—66 executives; [38]—98 directors and 104 directors). Further, the survey's reliance on directors may result in missed insights; however, this is mitigated by the fact that an important responsibility of directors is to assess management. Ultimately, the issue of generalizability is best addressed through replication in different countries and contexts and including management in the respondent group (i.e., a matched sample). Future work could extend the analysis to include other potential influences, such as the mediation effects of strategic alignment [38] or innovation performance, or the moderation effects of the role of IT in the organization [23], environmental dynamism [28], or a firm's digital maturity [6].

## 6.2. Theoretical and Managerial Implications

First, we add to the general discussion about the strategic importance of IT management (e.g., [12], [17]) and board IT competencies [e.g., 22,69]. We believe this study is the first to empirically explore the influence of both these elements on DO, thus shedding new light on the crucial role of IT management and the board in building DO and answering the call for future research to account for potential managerial and organizational factors that drive DO [5]. These findings supplement and enrich the resource-based view as applied to DO. As a new and growing topic area, they contribute to an increased understanding of why IT management and board IT competencies strengthen a firm's DO, capabilities that are often overlooked in IS research. In particular, this study shows that the drivers of DO should be extended to include the board. This is critical given that the board plays a critical role driving the strategy of an organization, and this includes the DO. An IT-competent board can help shape the DO over and above the value added by an IT-competent management. Given that DO is seen as a prerequisite

for firms to implement digital strategies [5], identifying the drivers behind the DO of firms is crucial.

Second, we contribute by responding to calls for extending empirical research on the performance implications of DO [5,7] and providing further evidence that the relationship between DO and firm performance is complex. Our study is one of the first to use a survey to examine this relationship directly, rather than relying on firms' written communications to measure DO and firm performance (e.g., [5-6]). Such communications might not accurately reflect its actual behavior, as firms could purposefully employ language to convey a more positive DO.

Third, this study makes methodological contributions. As far as we know, we are the first study to operationalize Kindermann et al.'s [5] DO definition. Other studies, such as Arias Perez & Valez [11] or Ranjan [25] used a measure of DO based on an adaptation of Arias-Pérez et al. [10] measure of strategic orientation, which was based on Lu and Ramamurthy's [70] measure of IT capability. The measure used in our study is based specifically on the conceptualization and operationalization of DO. A validated measurement instrument for DO allows researchers to examine DO directly rather than through proxies from firm communications that may not necessarily capture actual behavior [33]. Our analysis provides indicators that this measure represents the theoretical construct "DO" with a meaningful level of precision. That said, testing this measure across a broad spectrum of contexts would be useful.

An understanding of the drivers and outcomes of DO helps managers navigate the complexities of digital transformation. Our results make clear that IT management and board IT competencies drive DO. This underscores the need for boards to consciously cultivate and sustain IT expertise concerning the directors on the board, and to encourage the involvement of IT management in strategic decision-making at the board level. Our findings underline the significance of developing IT management and board IT competencies to fully capitalize on a firm's digital technologies and this warrants the presence of process and skill audits to ensure that the board and management have the appropriate level of competency in this area. The relationships identified in the analysis can help board and IT management decision makers as they reflect on the board makeup and their interactions with each other. Specifically, to implement this recommendation, management should strive to build competent IT management and include them in strategic decision making via both formal and informal processes. Communication and interaction will be

important in this rapidly changing field, and boards should implement mechanisms to engage with business and IT management regularly. For example, making IT a regular item on the board agenda and holding regular sessions to discuss IT. Importantly, boards should themselves develop expertise about IT in general and IT used in the organization, and identify IT experts to contact when needed. They should consider DO when selecting board members and develop institutionalized processes to develop and sustain DO skills and expertise, not relying on ad hoc or individualistic initiatives. The work also sheds light on the link between DO and firm performance, suggesting that there is a need to rethink the possible factors that may influence the outcomes of DO.

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