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# Digital orientation: Conceptualization and operationalization of a new strategic orientation

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ABSTRACT

Although there is ample evidence that digital technologies are strategically important for value creation, extant literature lacks holistic concepts that capture an organization's strategic orientation concerning digital innovation and transformation initiatives. This study integrates recent digitalization themes with IT business alignment research to conceptualize a new strategic orientation construct: digital orientation. The construct is manifested in four dimensions which we operationalize for computer-aided text analysis. We validate the construct based on 6498 shareholder letters from large US firms over 16 years. Building upon the resource-based view, we validate the digital orientation construct by linking it to firm performance. Our findings advance the literature on strategic orientations and bring the domains of strategy and information systems closer together. The novel digital orientation construct and the validated measurement instrument lead to many new research opportunities.


## 1. Introduction

The increasing prevalence of digital technology is fundamentally transforming how businesses create value. A recent practitioner study by Kane et al. (2015) revealed that around 90% of firms across sectors and countries expect digital technologies and digitalization to impact their business. According to these findings, however, it is not only technology, but also strategy, that drives proper digital transformation and ultimately provides competitive advantage. This view is in line with research on strategic orientations. Based on the resource-based view, such research suggests that organizations' strategic directions explain superior performance, as they shape the way organizations create and adapt behaviors and resources (Gatignon & Xuereb, 1997; Newbert, 2007). In domains not specifically related to digitalization, strategic orientations, such as market orientation (e.g., Narver & Slater, 1990) and entrepreneurial orientation (e.g., Covin & Slevin, 1989), have been extensively studied as individual or complementary sources of competitive advantage (Schweiger et al., 2019).

Despite the scholarly attention that both digitalization and strategic orientations have received, our understanding of how organizations build and/or benefit from a digitally enabled strategic orientation remains surprisingly incomplete. This is noteworthy as such a digital orientation provides organizations with strategic directions for nurturing and implementing specific digitalization strategies and selecting appropriate digitalization initiatives. As stated by Kohli and Melville (2019), digital strategic initiatives do not "occur in a vacuum within organizations" (p. 202). Digital value creation is subject to an unprecedented scope and degree of openness, often driven by generative and unpredictable processes and contingent on the specific affordances of digital technologies (Nambisan et al., 2019). We argue that this capacity of digital technologies to change traditional competition logic stimulates distinct and novel ways of managerial and organizational alignment that are not captured by previously established strategic orientations or combinations thereof (Quinton et al., 2018). Digital

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business strategy research focuses on the alignment or fusion of information technology (IT) strategy with business strategy (Bharadwaj et al., 2013), emphasizing the all-encompassing impact digital technologies have on the functioning of organizations (Drnevich & Croson, 2013). Nevertheless, prior research in this stream does not holistically mirror the heightened, *trans*-functional role of digitalization for an organization's strategic orientation. Extant empirical digitalization work primarily relies on case studies, single-point-in-time surveys, key informant inquiries, or historical data on IT investments, whereas there is a lack of generalizable and longitudinal investigations (cf. Vial (2019) for an overview). Therefore, advancing knowledge on a specific digital orientation of organizations and developing measures that enable longitudinal research is crucial for both academia and practice. A concept delineating a digitally enabled strategic orientation can aid researchers in better understanding which characteristics lead to competitive advantage across firms (Yoo et al., 2010). Practitioners can benefit from assessing how to guide value extraction from digital technology and determining whether particular digitally oriented strategies really affect their industry, or if they are merely fads (Muro, Liu, Whiton, & Kulkarni, 2017).

In this study, we seek to address these issues by asking: how does a digital orientation manifest itself and how can it be measured? Based on an analysis of the idiosyncrasies of digital technologies and related organizational processes, we propose a novel concept capturing an organization's digital orientation manifested by four interrelated dimensions. We apply the established procedures for construct development of MacKenzie et al. (2011) and draw on McKenny et al. (2018) and Short et al. (2010) for the operationalization of the multidimensional construct. Specifically, we operationalize digital orientation with a computer-aided text analysis (CATA) dictionary that allows us to conduct large-scale and longitudinal studies. CATA is an established approach for research on other strategic orientations (e.g., Short et al., 2010; Zachary et al., 2011). Based on CATA, scholars can examine their research questions empirically using standardized text reports from firms (Barr, 1998; Short et al., 2010). Drawing on a sample of shareholder letters from firms listed in the S&P 500 between 2001 and 2016, we develop and validate the digital orientation construct. Finally, in line with previous theorizing on strategic orientations (Gatignon & Xuereb, 1997), we propose and empirically show a positive relationship between an organization's level of digital orientation and its performance.

This study contributes to research in the following ways. First, we conceptualize a new strategic orientation that accounts for the considerable impact that digital technologies have on organizations. We present a concept for an organization's digital orientation that integrates the recent digitalization themes proposed by Nambisan et al. (2019) with traditional IT business alignment research (Henderson & Venkatraman, 1999). We scrutinize how digital orientation goes beyond the combination of extant strategic orientations by capturing how organizations leverage the scope of digital technologies, create or adapt digital capabilities, coordinate digital ecosystems, and reconfigure digital architectures to achieve competitive advantage. Second, our findings offer a fresh perspective on the resource-based view for the digital age. In particular, the digital orientation concept helps to specify the types of digital resources that need to be aligned for the firm to build a basis for superior performance. By providing empirical evidence for the positive performance effect of digital orientation, we demonstrate the benefits of digitalization processes at the level of the strategic orientation. Third, we develop and validate a measurement instrument for the digital orientation concept. Thus, our operationalization paves the way for further large-scale and longitudinal empirical studies on the topic of digitalization.

## 2. Conceptual background

To establish a new construct, three requirements must be met (MacKenzie et al., 2011). First, the construct must be characterized appropriately; second, a suitable measurement model for the indicators is necessary; and third, evidence that the indicators measure the focal construct must be provided. We address these requirements by following the scale development procedure of MacKenzie et al. (2011). We first provide a conceptualization of the multidimensional digital orientation construct based on extant literature. We derive the concept from the general definition of strategic orientations and characterize it with regard to digital technology's idiosyncratic nature. Based on that, we define the construct's dimensions and arrive at the general definition of digital orientation. Finally, we operationalize it by creating and validating a content analysis dictionary following the procedures of Short et al. (2010) and McKenny et al. (2018).

### *2.1. The need for a new strategic orientation*

Over the past three decades, research in management, strategy, and beyond has provided ample evidence of the positive impact that strategic orientations have on firm performance (Schweiger et al., 2019). According to Zhou et al. (2005), a strategic orientation "reflects the firm's philosophy of how to conduct business through a deeply rooted set of values and beliefs that guides the firm's attempt to achieve superior performance (Gatignon & Xuereb, 1997)" (pp. 44–45). Strategic orientations have been conceptualized for various domains, including market orientation (e.g., Narver & Slater, 1990), learning orientation (e.g., Sinkula et al., 1997), entrepreneurial orientation (e.g., Covin & Slevin, 1989), and technology orientation (e.g., Gatignon & Xuereb, 1997). Following the resource-based view of the firm (Barney, 1991), strategic orientations represent valuable intangible capabilities that are difficult to imitate, and hence provide sustained competitive advantage (Schweiger et al., 2019).

This study proposes digital orientation as a strategic orientation of firms that caters to changes induced by digital technology. *Digitization* is the technical "process of converting analog signals into a digital form", while *digitalization* is the "sociotechnical process of applying digitizing techniques to broader social and institutional contexts that render digital technologies infrastructural" (Tilson et al., 2010, p. 749). Our concept emphasizes the sociotechnical process of digitalization, which leads to changes at the individual, social, and institutional levels (Nambisan, 2017). Scholars emphasize the novel challenges that firms face when engaging in digitalization initiatives (e.g., Yoo et al., 2012). A core premise of related studies is that the nature of digital technologies differs fundamentally from that of nondigital technologies (Kallinikos et al., 2013). Such differentiating features include the reprogrammability of digital technologies, which means that devices' functional logics can be separated from their physical embodiments (Yoo et al., 2010). This feature provides flexible use of digital devices and a large array of functionalities (ibid.). Further, storing any kind of analog signals as binary code (0 and 1) enables a "homogenization of all data" that facilitates a high degree of combinability for various types of data (Yoo et al., 2010, p. 726).

The unique and novel characteristics of digital technology raise the question of whether previously studied types of strategic orientation are effective on their own at driving and supporting today's strategic digitalization initiatives. In response to this question, Quinton et al. (2018) propose a strategic orientation—which they name digital orientation—that is a combination of market orientation, entrepreneurial orientation, and learning orientation. However, Schweiger et al. (2019) suggest that the potential benefits of harnessing the complementarities among these three strategic orientations are not necessarily limited to, nor do they specifically address themselves to, digitalization contexts or technology-induced change in general. While a combination of strategic orientations offers advantages in dynamic environments, we argue that the growing pervasiveness of digital technologies is gradually eroding the competitive advantage that previously studied strategic orientations can provide, either on their own or jointly. This necessitates a novel strategic orientation specifically capturing firms' digital orientation. Our reasoning becomes clear in light of three interrelated themes that, according to Nambisan et al. (2019), broadly capture the implications of digital technologies on organizational processes and outcomes. These themes are *affordances*, *openness*, and *generativity*.

First, because of the malleable nature of digital technology (Yoo et al., 2012), the *affordances*—the action potential and the opportunities that related devices provide—depend on the specific user or use case (Nambisan et al., 2019). Digital technology is not fixed or immutable, but changes dynamically (Yoo et al., 2012) depending on who uses it and under what circumstances this happens. The current conceptualizations of technology orientation do not fully account for the dependency between digital technologies and contexts of their use. The mere use of digital technologies is a necessary condition but not a sufficient one for success in digital markets. As stated by Nambisan et al. (2019), consideration of digital technologies' affordances helps "explain how and why the same digital artifact […] may lead to different innovation […] outcomes in different use contexts" (p. 4).

Second, in the context of digital technologies, resource agency becomes less centralized (Nambisan et al., 2017). Yoo et al. (2012) have hence conceptualized digital value creation as inherently distributed in nature. As a firm's value propositions increasingly depend on the contributions of other actors in large and heterogeneous ecosystems (Nambisan et al., 2019), enabling other organizations to create value becomes imperative (Ethiraj, 2007). The new scope of *openness* that results from these interdependencies challenges the basic notions of previously established strategic orientations. For instance, showing a high degree of risk-taking behavior, which is part of having an entrepreneurial orientation, does not necessarily translate into superior innovation and performance if an organization is unable to mobilize and coordinate the ecosystem surrounding its value proposition. Analogously, divergent degrees of learning orientation among ecosystem participants might hamper competitive success.

Third, value creation using digital technology is no longer a well-bounded phenomenon. Even after their launch, digital or digitally enabled products and services can continue to evolve (Nambisan et al., 2017). For instance, firms with digital products or services often publish application programming interfaces or software development kits that allow third-party providers to create additional functionalities or content. As a result, product and service boundaries are less fixed, and innovation processes have become prone to greater levels of unpredictability (Nambisan et al., 2017). This characteristic of digital innovation has been referred to as *generativity*, which is "a technology's overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences" (Zittrain, 2006, p. 1980). This notion of fluidity in value creation (Yoo et al., 2010) appears to be at odds with the assumptions of largely fixed product and service boundaries that were adopted for previous types of strategic orientations. For instance, in a digitized world, exploiting market opportunities by following the market orientation framework requires responsive organizational structures and processes; tailored strategic responses are hard to anticipate in this setting (Yoo et al., 2012). Instead of fixed boundaries, the modularization and interoperability of organizations' offerings become a main concern (Tiwana, 2015).

As a consequence of the presence of these three themes—affordances, openness, and generativity—the underlying assumptions and scope of digitalization initiatives go beyond those of previously conceptualized and studied strategic orientations. While the prior strategic orientations can be complementary (Schweiger et al., 2019), combining them does not result in guiding principles fully aligned with digitalization, digital innovation, or competitive advantage in a digitized world. Hence, there appears to be a discrepancy between the conceptualizations of established strategic orientations and the phenomenological underpinnings of digitalization. In this study, we seek to address this discrepancy by proposing a novel conceptualization of digital orientation that complements, but is not constituted of, previous strategic orientations. As predicted by the resource-based view (Barney, 1991), pronounced levels of this novel orientation should yield competitive advantage and superior firm performance.

### 2.2. Conceptualizing digital orientation

Given the three key themes presented by Nambisan et al. (2019), we argue that digitalization prompts close integration of strategic elements. First, value creation processes and technological structures become increasingly accessible to external parties. As a result, product and service boundaries are rendered fluid, and interfaces gain in importance (Yoo et al., 2010). To reap the potential benefits of openness and generative processes, close alignment between the firms' internal functioning and their organizational and technological environment is required. Thus, conceptualizing digital orientation demands integrating *internal* and *external elements of strategy*. Second, as digital technology use steadily increases, tight coupling between specific sets of technologies and organizational processes and routines becomes critical (Leonardi, 2011). This necessitates a fusion of *technological* and *organizational elements of strategy* that goes beyond previously studied mechanisms of IT business alignment, in which IT strategy is often regarded as subordinate to or different from business strategy (Bharadwaj et al., 2013).

Such a strong emphasis on integrating along the internal/external as well as the organizational/technological elements of strategy has already been proposed in the strategic alignment model (SAM) of Henderson and Venkatraman (1999). In depicting firm strategy along these elements, the SAM suggests four domains of strategy—internal/technological, internal/organizational, external/technological, and external/organizational—which mutually shape each other, and need to be aligned. The three key themes as defined by Nambisan et al. (2019) not only suggest that this alignment view is particularly valuable for understanding the processes of digitalization, but also allow us to further specify and update the four domains of the SAM—a model which was first published in 1993—to fully account for the idiosyncrasies of digital technologies and their use. Hence, our conceptualization of digital orientation draws on both Henderson and Venkatraman's (1999) SAM and Nambisan et al.'s (2019) key themes. The resulting four dimensions of the digital orientation construct merge the two frameworks: *digital technology scope* (external/technological domain), *digital capabilities* (internal/organizational domain), *digital ecosystem coordination* (external/organizational domain), and *digital architecture configuration* (internal/technological domain). Next, we derive the dimensions' conceptual underpinnings and illustrate how they are reflected in firm processes and structures.

The first digital orientation dimension, *digital technology scope*, refers to firm-specific sets of technologies (i.e., technology as an object) that determine the scope, or extent, to which the firm can create digitally enabled value for its customers. Hence, this dimension embodies the technology aspect of the affordances perspective, as contrasted with the human aspect. The general concept of technology affordances is described as an action potential with regard to “what an individual or organization with a particular purpose can do with a technology or information system” (Majchrzak & Markus, 2013, p. 832). This concept highlights the fact that the uses and consequences of digital technology depend on both the individuals and organizations that use the technology and on the technology itself.

While the dimension of digital technology scope addresses the technological features of digital devices, it also includes the competencies and functionalities that the technologies and, importantly, their combinations offer to the customer. Such combinations offered to customers may arise from a firm’s competence, for instance, to integrate advanced communication, virtualization, and cloud technologies in an app for telemedicine solutions. Thus, digital technology scope relates to the *external-technological* domain of the SAM, particularly to what Henderson and Venkatraman (1999) termed the “position of the organization in the I/T marketplace” (p. 474). We define digital technology scope, accordingly, as the set of digital technologies that allow the firm to realize strategic growth. This set can include technologies such as sensors, blockchain, and internet-of-things solutions as both ingredients and outcomes of digitalization processes (cf. Nambisan et al., 2017). Firms that score highly in this dimension deliberately apply digital technologies to their product or service offerings to create more value, meet customer needs, and generate cash flows (Bharadwaj et al., 2013; Drnevich & Croson, 2013; Ross et al., 2017). For example, while high-speed mobile internet technologies such as 5G are technological inventions that at first may only substantially increase speed in transmission, a firm’s decision to adopt 5G and use it to generate new business initiatives could provide a competitive edge (e.g., autonomous driving, cloud gaming services, telematics) (Henderson & Venkatraman, 1999). Thus, the first dimension of the digital orientation construct reflects how digitally oriented firms leverage technology to offer a greater portfolio of digital or digitally enhanced products and services to their customers.

The second dimension of digital orientation, *digital capabilities*, delineates the human and organizational aspects of the affordances perspective. Previous information systems research has conceptualized these aspects of technology affordances as being reflected in organizational routines that are developed and maintained for a specific set of technologies in use (Leonardi, 2011). While they are located at the organizational level, these routines are rooted in the technological skills and know-how of employees, such as programmers, developers, and user experience designers. Digital capabilities include organizations’ efforts to develop and maintain routines that leverage human capital and knowledge assets to engage with a specific set of digital technologies. The cultivation of such routines is tightly coupled with the design of the firm’s infrastructure. In that, this dimension reflects the *internal-organizational* domain defined in the SAM.

This dimension captures both the system-use competencies and the internal management skills needed to execute a given strategy (Henderson & Venkatraman, 1999). It includes distinct organizational competencies regarding big data analytics, machine- and deep learning engineering expertise, and/or high-performance computing capabilities (Bharadwaj et al., 2013; McAfee & Brynjolfsson, 2017), as well as user experience and artificial intelligence expertise. Well-developed competencies in these areas may explain why some organizations can transform ubiquitously available digital technologies into competitive advantages. For instance, the Development Bank of Singapore changed its leadership culture and its employee training to successfully accelerate digital innovations (Sia et al., 2016). Also, Lego sees the digital know-how of its employees as a key enabler of its digital strategy (El Sawy et al., 2016). Firms that are strong in the digital capabilities dimension strive to acquire individuals and build, add, or renew competencies that enable them to digitize value creation processes and outcomes.

The third dimension of digital orientation is *digital ecosystem coordination*. Strategic decision-making needs to account for the interdependencies defining the structure of the digital ecosystem the firm is embedded in (Adner & Kapoor, 2010). While IT traditionally also featured open elements, the degree, scale, and scope of openness has increased dramatically (Nambisan et al., 2019). Firms can combine various digital devices to build digital platforms “that enable value-creating interactions between external producers and consumers” (Constantinides et al., 2018, p. 381). Around such platforms emerge ecosystems of heterogeneous actors in which innovation is conducted collaboratively (Yoo et al., 2012). Ecosystem partners contribute to a focal value proposition either directly, as component providers or co-creating customers, or indirectly, as complementors (Jacobides et al., 2018).

Independent of their position within the ecosystem (central or periphery), firms might seek to coordinate such interdependencies by shaping the governance structures that regulate membership, value creation, and value capture, and by cultivating distinctive competencies for effective collaboration (e.g., knowledge sharing). Accordingly, this dimension builds on and specifies the *external-organizational* domain defined in the SAM. It captures how effectively firms interact with stakeholders in open technological ecosystems. In order to enable ecosystem partners to fully realize a focal value proposition, firms need to engage in effective coordination processes so that bottlenecks constraining the value creation progress can be solved (Kapoor, 2018). The provision and use of application programming interfaces and open source technology platforms that allow access for multiple devices such as tablets and smartphones can be considered part of such ecosystem coordination. These coordinative efforts are pivotal for successful digitalization, and eventually for competitive advantage (cf. Wareham et al., 2014).

The fourth dimension of digital orientation is *digital architecture configuration*. It captures the idea that generativity—the capacity of digital technology to trigger unguided change mechanisms through many dispersed and uncoordinated units (Zittrain, 2006)—has important implications for firms’ technological architectures and the working processes in the organization. In order to realize the potential benefits related to generativity, firms must establish technological and organizational mechanisms that allow them to effectively utilize and repurpose technological components developed elsewhere. As such openness to external technologies, however, also entails the risk of introducing undesired and uncontrollable features (Zittrain, 2007), which might impair the quality of the overall value proposition, internal technological architectures need to be designed to gear generativity towards controllable innovation, such as by introducing cybersecurity measures. Balancing this tension between generativity and control requires firms to adapt their infrastructures, organizational processes, and operating systems. Here, digital technology can play an important role in supporting creative processes by establishing spaces for constrained serendipity (Austin et al., 2012). Boland et al. (2007) show how the introduction of 3D visualization technology in construction projects led to subsequent “wakes of innovation” (p. 631), referring to innovations “as emerging in and traveling across an innovation space” (ibid.). However, this also requires new forms of control in contract and project management (Yoo et al., 2012).

This dimension affects what Henderson and Venkatraman (1999) referred to as the *internal-technological* domain. It encompasses how digitally oriented organizations enable digitalization by specifying organizational structures and responsibilities that cater to technological change (e.g., having a chief digital officer), as well as by digitizing their internal processes (e.g., through algorithm-driven automation in Industry 4.0 settings). Firms that score highly in this dimension design their systems and technological infrastructures to be responsive to shifts in demand and establish their chief information officer as a constant agent of change (El Sawy et al., 2016). Dynamic administrative structures and work processes enable digitally oriented firms to profit from new digital assets that result from generative actions by external stakeholders (Nambisan et al., 2019). Firms with a pronounced digital architecture configuration implement an organizational design that allows them to digitize formerly analog routines to improve value generation (e.g., by data generation) and value capture (e.g., by automation) (Kohli & Grover, 2008).

MacKenzie et al. (2011) state that it is important to examine how the identified dimensions of a multidimensional construct relate to each other and to the focal construct. While they capture distinct aspects of the digital orientation construct, our four dimensions reflect both the key themes of digitalization described by Nambisan et al. (2019) as well as the SAM of Henderson and Venkatraman (1999). Hence, the dimensions are interrelated and should be correlated with each other. This becomes particularly apparent in light of the technology affordances theme, which emphasizes both the device (i.e., technology as an object) and the use (i.e., human and organizational) contexts of digital technology. Accordingly, only together can our first and second dimension unfold their full potential to support digital innovation initiatives. Similarly, if a firm configures its digital architecture without accounting for the distributed nature of digital value creation and without implementing appropriate ecosystem-coordinative mechanisms, it is likely to decrease the success of innovation or transformation initiatives rather than to increase it.

Similarly, too, one can expect that a decrease in general digital orientation is likely to result in a decrease in all four of its dimensions, and that the organization's overall capacity to create and capture value from digital innovation will be weakened. This point emphasizes the fact that the four dimensions are manifestations of the digital orientation construct and that digital orientation is a second-order reflective construct (MacKenzie et al., 2011). Given the above conceptualization, we define the construct of digital orientation as follows:

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.

## 3. Method and data

### 3.1. Use of computer-aided text analysis

To operationalize digital orientation, we rely on content analysis to analyze communications, which allows for contextual inferences (Krippendorff, 2004). Content analysis of organizational narratives has several benefits, including its applicability to both qualitative and quantitative research and its compatibility with longitudinal research (Duriau et al., 2007). In contrast to interviews or surveys, content analysis is non-intrusive and free from researcher demand bias (Barr et al., 1992). Text can be coded manually or with computer-aided approaches. In comparison to manual coding, CATA does not suffer from subjective interpretation, enhances coding stability, shows similar or higher reliability (King & Lowe, 2003), permits the analysis of larger data volumes (Duriau et al., 2007; Short et al., 2010), eases the replicability and comparability of results across studies (Morris, 1994; Neuendorf, 2002), and captures attributes that are difficult to quantify through other methods (Tetlock, Saar-Tsechansky, & Macskassy, 2008).

CATA software counts the frequency at which certain words appear in a given text. We require a type of CATA software that allows us to also extract phrases consisting of combinations of words separated by spaces, such as "artificial intelligence." Hence, we used CAT Scanner software for content analysis (McKenny, Short, & Newman, 2012). This software can extract single words, phrases consisting of multiple words, and word stems (McKenny et al., 2018). It also allows text files to be cleaned by the removal of special characters, thereby improving the accuracy of results (Short et al., 2018). Finally, CAT Scanner also enables researchers to generate inductive word lists.

### 3.2. Sample of shareholder letters

Following recent research on strategic orientations (e.g., Boling et al., 2016), we used shareholder letters to measure digital orientation. Shareholder letters are published periodically in firms' annual reports and are publicly available. They signal the major topics and themes that are the focus of managers (Barr et al., 1992) and can eventually affect organizational actions (Short et al., 2010). Studies show that word choice in shareholder letters is associated with strategic orientations (Barr et al., 1992; D'Aveni & MacMillan, 1990; Short et al., 2010). The measurement of strategic orientations using shareholder letters relies on two theories. First, the Sapir–Whorf hypothesis states that the choice of words shows the direction of attention, and the frequency at which a word occurs indicates the intensity of this attention (Abrahamson & Hambrick, 1997; Sapir, 1944; Whorf, 1956). Second, the attention-based view affirms that firm behavior is affected by the distribution of executives' attention (Ocasio, 1997). This implies that words in shareholder letters reflecting digital orientation suggest increased attention to this strategic orientation.

We drew our sample of shareholder letters from firms listed in the S&P 500 index for two reasons. On the one hand, studies suggest that large, established firms may benefit from adopting a digital mindset to scale the business and to fulfill new customer requirements (Kane et al., 2015). On the other hand, as the S&P 500 consists of publicly traded firms, using this sample allowed us to collect additional variables (e.g., firm size and R&D expenses) through a secondary data source without introducing common method variance. Our sample consisted of 6498 shareholder letters from 634 firms, covering the years from 2001 to 2016. We chose this period because 2016 was the last full year at the time we started data collection and because we wanted to include at least 15 years to cover a substantial period of time during which the importance of digitalization strategies increased. Because for some firms, not all shareholder letters in this period were available, our sample is an unbalanced panel.

### 3.3. Operationalization of digital orientation

Following MacKenzie et al.'s (2011) scale development procedure and the CATA dictionary development method devised by Short et al. (2010) and McKenny et al. (2018), we operationalized our digital orientation concept in four steps. First, we created a preliminary dictionary based on deductive and inductive word lists. Second, we refined the dictionary according to the contexts of the words and phrases in shareholder letters. Third, we defined a norm for the scale so that we could interpret the dictionary results. Finally, we validated the dictionary by applying five different validity checks. The word selection in steps 1 and 2 was conducted by the authors, including two expert coders who have backgrounds in management consulting with a focus on strategy and digitalization as well as in digitalization strategy research.

#### *3.3.1. Step 1: development of a preliminary dictionary*

First, we generated a deductive word list for each dimension of digital orientation. We compiled these word lists based on the two coding experts' understanding of each dimension's definition. We then expanded the set of words to include other words with the same root using a dictionary of synonyms (e.g., thesaurus.com). Examples of words obtained during this process are "cloud" and "blockchain" for the dimension of *digital technology scope* and "automation" and "database" for the dimension of *digital architecture configuration*. Second, we supplemented these lists with inductively generated words. We followed the recommendations of Short et al. (2010) and McKenny et al. (2018) to derive the words inductively based on the full sample of shareholder letters (N = 6498) in order to cover a wide range of words. This step allowed us to identify words in the narrative text of interest (Short et al., 2010) which had so far not been identified by the deductive process (McKenny et al., 2018). Therefore, we used the inductive word list generation tool of the CAT Scanner software to list every word appearing at least three times in any one shareholder letter. We chose this rather low frequency as the threshold for further evaluation to ensure that our word list was not inflated because we had entered multiple letters from individual firms into the inductive word list generation tool. Consequently, the inductive word generation process resulted in a list of additional words or phrases that appeared either in multiple shareholder letters or in only a single shareholder letter. From these words or phrases, we identified all that were related to one of the digital orientation dimensions but were not yet included in the deductive word lists. For example, we added words such as "telemedicine" and "multichannel" to the dictionary. In summary, the first step resulted in a preliminary dictionary comprising a total of 208 words and phrases for the four dimensions.

#### *3.3.2. Step 2: dictionary purification and refinement*

Words associated with our measured construct in one specific context might also have deviating meanings in different contexts. We thus followed the approach of McKenny et al. (2018) and manually analyzed the contextual usage of the defined words and phrases in our sample of shareholder letters to mitigate potential specific factor error. McKenny et al. (2018) recommend analyzing at least 10% of the sampled text manually to verify that the context is captured accurately. We analyze more than 10%, with over 1700 text passages from our sample of 6498 shareholder letters. To increase the accuracy for rare words with fewer than 100 occurrences in our sample, we also analyzed 10 passages (when available) containing each of these words. The context of every word was analyzed separately by two expert coders. We determined the extent of the coders' agreement with Holsti's (1969) interrater reliability method. Coefficients of 0.70 or higher indicate acceptable levels of interrater reliability (Krippendorff, 2004; Riffe et al., 2005). We achieved an interrater reliability of 0.94, indicating high interrater reliability. The authors resolved the remaining discrepancies by a joint clarification and discussion of the word and its contextual usage. Correlating the digital orientation scores derived from the manual coding process with the scores derived from the CAT Scanner software, we find parallel forms reliability to be high with 0.86.

McKenny et al. (2018) do not specify the percentage of occurrences necessary for a word to reflect a construct's definition and be included in the dictionary. In accordance with the common thresholds regarding interrater reliability, we applied a specific error coefficient of 0.70. Therefore, words that reflect the digital orientation construct in at least 7 out of 10 occurrences were included in the dictionary. For example, we eliminated the word "programming" from our word list because in shareholder letters, it mostly refers to the programming of shows in the entertainment industry. We also removed the abbreviation "CDO" (i.e., chief digital officer) because in shareholder letters it mostly refers to a "collateralized debt obligation." Other words, such as "connect," appear often in a digital context, but fewer than 7 out of 10 times. We thus omitted such words from our dictionary. We kept certain other ambiguous words after evaluating them on a case-by-case basis to see if they fit the construct. Examples of these words are "developer" (i.e., software developers vs real estate developers) and "smart" (i.e., smart devices vs smart decisions). This overall process led to the removal of 60 words, leaving a total of 148 words for the four dimensions. Table 1 shows the final word list for each dimension.

#### *3.3.3. Step 3: norms for the scale*

In the third step of the concept operationalization, we developed norms to help us interpret the digital orientation scores in the population of our sample. To calculate the scores, we followed the procedure of prior research on other strategic orientations operationalized for CATA (e.g., Grühn et al., 2017; Short et al., 2010; Zachary et al., 2011). We accounted for differences in the text lengths of the shareholder letters by dividing the number of words counted for each of the four dimensions in a particular shareholder

**Table 1**
Word lists for digital orientation dimensions.

| Digital Orientation | Content Analysis Words and Phrases |
|---|---|
| Digital technology scope | Advanced communications, advanced technology, advanced technologies, app, apps, bandwidth, blockchain, bot, broadband, cloud, cloudbased, control system, control systems, drone, drones, electronics, high-speed, information management, internet of things, IoT, internet, IT solutions, network services, programmed, sensor, sensors, software, telematics, telemedicine, virtual, virtualize, virtualized, virtualization, wifi, wi-fi |
| Digital capabilities | Analytics, artificial intelligence, AI, autonomous, big data, Bluetooth, compute, computing, connectivity, customizable, deep learning, designer, designers, developer, developers, electronic, engineer, engineers, functionality, functionalities, informatics, integrated solutions, interface, machine learning, mobile, programmable, programmer, programmers, self-driving, smart, streaming, technologist, technologists, technology-enabled, ubiquitous, user experience, user interface, wireless |
| Digital ecosystem coordination | Application programming interface, API, APIs, desktop, desktops, device, devices, ecommerce, e-commerce, enterprise resource planning, ERP, multi-channel, network infrastructure, omnichannel, online, on-line, open source, phone, resource planning system, SaaS, smartphone, social media, software as a service, tablet, tablets, technology platform, technology platforms, web, webs, website, websites |
| Digital architecture configuration | 3-D printed, 3-D printing, 3D printing, additive manufacturing, advanced manufacturing, algorithm, algorithms, analytical tool, analytical tools, automated, automating, automation, chief digital officer, chief information officer, CIO, computer, computers, cyber, cybersecurity, data, database, databases, digital, digitalization, digitally, digitization, fintech, hardware, information security, information systems, information technology, IT infrastructure, IT infrastructures, IT system, IT systems, operating system, operating systems, real time, real-time, remote monitoring, robot, robots, robotics, standardize |

**Table 2**
Digital orientation scores by dimension (N = 6498).

| Dimension | Mean | SD | Min | Max |
|---|---|---|---|---|
| Digital technology scope | 0.9 | 2.4 | 0.0 | 30.2 |
| Digital capabilities | 1.1 | 2.5 | 0.0 | 29.2 |
| Digital ecosystem coordination | 1.0 | 2.0 | 0.0 | 23.0 |
| Digital architecture configuration | 1.2 | 2.3 | 0.0 | 31.3 |
| Digital orientation | 4.3 | 7.0 | 0.0 | 61.1 |

*Note:* scores are normalized to word count per 1000 words for every shareholder letter.

**Table 3**
Digital orientation scores by year (N = 6498).

| Year | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| 2001 | 222 | 3.8 | 5.8 | 0.0 | 34.8 |
| 2002 | 253 | 3.3 | 5.5 | 0.0 | 31.5 |
| 2003 | 286 | 3.4 | 5.7 | 0.0 | 33.8 |
| 2004 | 298 | 3.1 | 4.8 | 0.0 | 28.1 |
| 2005 | 407 | 3.5 | 5.5 | 0.0 | 30.5 |
| 2006 | 468 | 4.0 | 6.9 | 0.0 | 48.6 |
| 2007 | 487 | 3.6 | 6.2 | 0.0 | 41.2 |
| 2008 | 496 | 3.6 | 6.6 | 0.0 | 50.9 |
| 2009 | 499 | 3.9 | 7.1 | 0.0 | 55.2 |
| 2010 | 488 | 4.8 | 8.2 | 0.0 | 61.1 |
| 2011 | 482 | 4.7 | 7.9 | 0.0 | 49.6 |
| 2012 | 489 | 4.7 | 7.4 | 0.0 | 51.3 |
| 2013 | 495 | 5.0 | 7.2 | 0.0 | 44.4 |
| 2014 | 397 | 5.2 | 7.8 | 0.0 | 47.3 |
| 2015 | 392 | 5.3 | 8.0 | 0.0 | 47.9 |
| 2016 | 338 | 5.5 | 7.7 | 0.0 | 57.0 |

*Note:* scores are normalized to word count per 1000 words for every shareholder letter.

letter by the total number of words in that letter. We then normalized the scores per 1000 words to make them easier to interpret. We calculated the scores for each dimension individually before summing them to obtain the overall digital orientation score per firm and year. Table 2 presents the digital orientation scores of our sample and shows that the scores of the four dimensions are in line. The mean digital orientation score across all shareholder letters is 4.3. Moreover, Table 3 shows the distribution of the digital orientation scores over our sampling period (N = 6498). The annual mean score for 2001 is 3.8 and this increases to 5.5 for 2016. On average, we see an annual growth rate of 2.3% for the period under observation, which is in line with the emergence of digitalization as a firm priority (Bharadwaj et al., 2013; Kane et al., 2015).

We also assessed for transient and algorithm errors in our measurement following McKenny et al. (2018). We examined test–retest reliability by averaging the correlation of each digital orientation dimension for each pair of consecutive years. We observe an average correlation of 0.85, indicating that a limited percentage of variance can be attributed to transient measurement error. To assess algorithm error, we re-ran the analysis of our total sample of letters to shareholders with the LIWC 2015 software to test agreement with the digital orientation scores derived from the CAT Scanner software. As the resulting mean Krippendorff's alpha is 0.99, we conclude that algorithm error should not bias our results.

#### 3.3.4. Step 4: dictionary validation

We validated the dictionary according to the procedure of Short et al. (2010), McKenny et al. (2018), and MacKenzie et al. (2011). This required us to assess dimensionality, external validity, concurrent validity, discriminant validity, and predictive validity. Dimensionality was validated by examining the correlation matrix of the CATA scores. There should be significant but not perfect correlations between the dimensions of a multidimensional construct because the dimensions should be distinct from each other (Edwards, 2001). Table 4 displays the correlations for each dimension of digital orientation in our S&P 500 sample (N = 6498). The correlations between all dimensions are significantly positive and range from 0.28 to 0.53, which indicates four distinct but related dimensions of the digital orientation construct. The highest correlation appears between *digital technology scope* and *digital capabilities,* which is $r = 0.53$, and can be explained in light of the affordances perspective the two dimensions draw on. However, the two dimensions are conceptually distinct, since they focus on different aspects of the affordances perspective. The digital technology scope dimension refers to technological features whereas the digital capabilities dimension includes the human and organizational aspects of the affordances perspective. The correlation between the two dimensions is not excessively high (i.e., more than 0.80) (Hair et al., 2010; Short et al., 2010). Finally, the correlation between single dimensions and the latent construct should be $r > 0.50$, so that the latent construct accounts for a majority of the variance in its indicators (MacKenzie et al., 2011). The correlations between the individual dimensions and the overall digital orientation construct are between 0.69 and 0.81, which demonstrates convergent validity of the dimensions (MacKenzie et al., 2011). The results validate our theoretical understanding that digital orientation is a multidimensional construct.

External validity is the confidence with which a causal relationship can be generalized across different types of people, settings, or times (Russ-Eft & Hoover, 2005). To compare the measures resulting from the S&P 500 sample, we collected an additional sample comprised of small firms. We selected firms from the Russell 2000 Index, as this is considered an important benchmark stock index for small valued firms (Cheng et al., 2006). We randomly selected 200 firms from this index, giving us a sample size similar to that of Short et al. (2010). We collected the 200 shareholder letters for the year 2016 and analyzed them with CAT Scanner using our digital orientation dictionary. We also randomly selected 200 shareholder letters from our main S&P 500 sample and calculated their digital orientation scores. To validate that language consistent with digital orientation was present in the shareholder letters, we conducted sample *t*-tests compared with a test statistic of zero for each digital orientation dimension. As shown in Table 5, the results indicate that language consistent with digital orientation is present in the shareholder letters of both samples, since the *t*-value is different from zero with statistical

**Table 4**
Intercorrelations of digital orientation dimensions (N = 6498).

| Dimensions | 1 | | 2 | | 3 | | 4 | | 5 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Digital technology scope | 1.00 | | | | | | | | |
| 2. Digital capabilities | 0.53 | * | 1.00 | | | | | | |
| 3. Digital ecosystem coordination | 0.43 | * | 0.46 | * | 1.00 | | | | |
| 4. Digital architecture configuration | 0.43 | * | 0.42 | * | 0.28 | * | 1.00 | | |
| 5. Digital orientation | 0.80 | * | 0.81 | * | 0.69 | * | 0.71 | * | 1.00 |

*Notes:* *p < 0.001.

**Table 5**
Evidence of language reflecting digital orientation dimensions and ANOVA comparison of S&P 500 and Russell 2000 firms (N = 200).

| | S&P 500 sample (N = 200) | | | Russel 2000 sample (N = 200) | | | |
|---|---|---|---|---|---|---|---|
| | Mean | SD | *t*-test | Mean | SD | *t*-test | *F*-test |
| Digital technology scope | 0.93 | 2.20 | 5.99* | 1.47 | 3.82 | 5.44* | 2.96 |
| Digital capabilities | 1.33 | 2.43 | 7.78* | 1.39 | 3.03 | 6.47* | 0.03 |
| Digital ecosystem coordination | 1.02 | 1.90 | 7.57* | 0.88 | 1.96 | 6.37* | 0.47 |
| Digital architecture configuration | 2.12 | 3.45 | 8.69* | 1.23 | 2.63 | 6.59* | 8.50* |
| Digital orientation | 5.41 | 7.17 | 10.67* | 4.96 | 8.27 | 8.48* | 0.34 |

*Notes:* ANOVA: analysis of variance. Scores are normalized to word count per 1000 words for every shareholder letter. *p < 0.01.

significance. In order to evaluate the mean differences between samples, we conducted a one-way analysis of variance (ANOVA). We took from our S&P 500 sample a random set of 200 shareholder letters from the year 2016 to ensure that any differences were not influenced by sample size or sample year. The results of this analysis reveal no significant differences in the mean values regarding the digital orientation dimensions, with the exception of *digital architecture configuration*, for which higher mean levels were detected in the shareholder letters of the S&P 500 firms.

Concurrent validity determines the extent to which a construct correlates with another theoretically related construct (Kerlinger & Lee, 1999). Discriminant validity assesses how much a construct differs from diverging constructs (Campbell & Fiske, 1959). To assess concurrent and discriminant validity, our construct must be compared with a construct with which it is positively correlated to demonstrate concurrent validity, yet still distinct, with $r < 0.50$, to show discriminant validity (Edwards, 2001; Short et al., 2010). We examined the relationship between the digital orientation measure and the entrepreneurial orientation of a firm. Zhou et al. (2005) show that entrepreneurial orientation facilitates innovations that use advanced technology and offer greater benefits to mainstream customers (i.e., technology-based innovations), as well as innovations targeting emerging market segments (i.e., market-based innovations). Thus, one would expect a positive correlation between digital and entrepreneurial orientation, yet they should be distinct from each other to prove that they are discriminant. We operationalized entrepreneurial orientation with the dictionary developed by McKenny et al. (2018). We calculated the scores for the innovativeness, proactiveness, and risk-taking dimensions using our sample of shareholder letters (N = 6498). The results illustrated in Table 6 show that digital orientation is positively correlated with entrepreneurial orientation ($r = 0.23$, $p < 0.001$). Interestingly, the highest correlation with an entrepreneurial orientation dimension is found with innovativeness ($r = 0.26$, $p < 0.001$), which is in accordance with the characteristic of digitally oriented firms to focus on emerging digital technologies. In summary, these results indicate concurrent validity of the digital orientation construct. Since the correlation between digital and entrepreneurial orientation is below 0.50, discriminant validity is also supported.

Finally, predictive validity assesses the extent to which a construct predicts other theoretically associated constructs (Cronbach & Meehl, 1955). Drawing on the resource-based view (Barney, 1991), a strategic orientation represents intangible capabilities that are difficult to imitate and can create competitive advantage and enhance firm performance (Schweiger et al., 2019). Based on our conceptualization of digital orientation, we argue that higher digital orientation levels predict higher firm performance.

In particular, digitally oriented firms apply digital technologies to their products or services to create enhanced value and to better meet customer needs, which can strengthen their competitive advantage (Bharadwaj et al., 2013; Drnevich & Croson, 2013; Ross et al., 2017). Moreover, the ability of such firms to attract value-adding ecosystem partners and to effectively coordinate and control digital ecosystems is likely to result in higher firm performance (Wareham et al., 2014). Digitally oriented firms also build and adapt digital capabilities by acquiring individuals, skills, and competencies that enable them to digitize value creation processes and outcomes. Leveraging their organizational design, these firms can digitize analog processes to improve both value generation and value capture (Kohli & Grover, 2008). Finally, digitally oriented firms follow a holistic digitalization strategy, leveraging digital resources across the organization instead of limiting them to the IT function (Bharadwaj et al., 2013). Extant research argues that the digitalization of existing business capabilities (e.g., digital customer service or analytics), rather than mere IT investments, creates value (Kohli & Grover, 2008). Digitally oriented firms are more likely to foster the use of digital technologies across the entire organization to enhance existing resources and capabilities or to build new ones. Such improved or newly established resources and capabilities can drive firm performance as they increase value creation and value capture potential (Drnevich & Croson, 2013). As a result, we expect that higher levels of digital orientation predict higher firm performance.

To empirically examine whether digital orientation predicts firm performance, we measured firm performance with profitability and included several control variables. We controlled for firm age, as younger firms might be more agile in their digital adaptation than older ones (Sebastian et al., 2017). We controlled for firm size with the number of employees because firm size influences both the resources to pursue a digital orientation and firm performance in general (Mithas & Rust, 2016). We controlled for industry specifics, in terms of industry sales growth, which could be an indicator of faster scaling (digital) businesses and industry concentration, as

**Table 6**
Correlations between digital orientation and entrepreneurial orientation (EO) (N = 6498).

| | Innovativeness | Pro-activeness | Risk-taking | EO (sum) |
|---|---|---|---|---|
| Digital technology scope | 0.18* | 0.03 | 0.02 | 0.16* |
| Digital capabilities | 0.22* | 0.02 | 0.03 | 0.19* |
| Digital ecosystem coordination | 0.20* | 0.00 | 0.03 | 0.16* |
| Digital architecture configuration | 0.20* | 0.03 | 0.03 | 0.18* |
| Digital orientation | 0.26* | 0.03 | 0.04 | 0.23* |

*Notes:* *p < 0.001.

**Table 7**
Variable definitions and data sources.

| Variable | Definition | Source |
|---|---|---|
| Digital orientation | The digital orientation score of a firm in a given year is calculated by counting the number of times words on a dimension's word list are used in that year's shareholder letter divided by the total number of words in the shareholder letter. The score is normalized to word count per 1000 words. We calculated the scores for each dimension individually before summing the scores to obtain the overall digital orientation score per firm and year. | Shareholder letters |
| Firm performance | Operating income before depreciation divided by sales (Mithas & Rust, 2016). | Compustat |
| Firm size | Natural logarithm of total number of employees of the firm (Mithas et al., 2013). | Compustat |
| Firm age | Natural logarithm of difference between current and first date in Compustat database divided by 365.25. | Compustat |
| Industry concentration | Herfindahl-Hirschman Index of firms' revenue market shares on four-digit SIC level (Mithas et al., 2013). | Compustat |
| Industry sales growth | Average sales growth from previous to current year in the last three years on four-digit SIC level. | Compustat |

competitive pressure might impact the performance outcomes of digitizing firms (Mithas et al., 2013; Mithas & Rust, 2016). Industry sales growth is operationalized by the average sales growth in the last 3 years. We measured industry concentration with the Herfindahl–Hirschman Index, which we calculated based on the four-digit Standard Industrial Classification (SIC) code level and firms' revenue share (Mithas et al., 2013). Finally, we also controlled for year- and industry-specific effects by including year and industry sector dummy variables. Table 7 summarizes the definitions of the variables included in the regression analyses. The analysis of pairwise correlations in Table 8 underscores the empirical and conceptual distinctiveness of the independent and the dependent variables (Mithas et al., 2013). Variance inflation factors are below 4.0.

From the panel data ($t = 16$) available for our sample from Compustat, we arrived at a sample size of 426 firms, with 4101 firm–year observations, for the regression models. Since dependencies in the data for the same firms over time can be expected, ordinary least squares (OLS) regressions are not appropriate (Ballinger, 2004). In line with recent research (Grühn et al., 2017; Miller & Le Breton-Miller, 2011), we relied on generalized estimating equation (GEE) models. We specified a Gaussian distribution with an identity link function, since our dependent variable is normally distributed (Ballinger, 2004). We also specified a first-order autoregressive correlation structure. The results are displayed in Table 9. Our findings support the expectation that digital orientation is positively associated with firm performance (Model 2: $\beta = 0.05$; $p < 0.01$). Hence, predictive validity is supported.

We ran four additional robustness checks. First, we analyzed whether a firm's previous year's digital orientation influences firm performance, as it might take time for the benefits of the strategic orientation to materialize. We found a positive association between digital orientation in the previous year and firm performance, as shown in Model 3 in Table 9 ($\beta = 0.05$; $p < 0.05$). Further tests are

**Table 8**
Descriptive statistics and correlations (N = 4101).

| Variable | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Digital orientation | 1.00 | | | | | |
| 2. Firm performance | 0.06* | 1.00 | | | | |
| 3. Firm size | 0.03 | −0.19* | 1.00 | | | |
| 4. Firm age | −0.13* | −0.09* | 0.29* | 1.00 | | |
| 5. Industry concentration | −0.03 | −0.14* | 0.18* | 0.03 | 1.00 | |
| 6. Industry sales growth | 0.00 | 0.00 | −0.02 | 0.01 | 0.02 | 1.00 |
| Mean | 4.5 | 0.23 | 3.0 | 3.4 | 0.25 | −0.17 |
| Standard deviation | 7.3 | 0.24 | 1.4 | 0.71 | 0.20 | 4.8 |
| Min | 0.00 | −9.5 | −1.4 | 1.0 | 0.01 | −15.9 |
| Max | 61.1 | 5.1 | 7.7 | 4.2 | 1.0 | 13.1 |

*Notes:* *p < 0.001.

**Table 9**
Regression results for the relationship between digital orientation and firm performance.

| | Firm Performance | | | | | |
|---|---|---|---|---|---|---|
| Variables | Model 1 | | Model 2 | | Model 3 | |
| *Controls* | | | | | | |
| Firm age | −0.06 | * | −0.05 | * | −0.05 | * |
| Firm size | −0.14 | *** | −0.14 | *** | −0.14 | *** |
| Industry concentration | −0.05 | * | −0.05 | * | −0.05 | * |
| Industry sales growth | 0.00 | | 0.00 | | 0.00 | |
| *Independent variables* | | | | | | |
| Digital orientation (current year) | | | 0.05 | ** | | |
| Digital orientation (previous year) | | | | | 0.05 | * |
| N | 4101 | | 4101 | | 4101 | |
| Wald chi-squared | 220 | | 229 | | 227 | |

*Notes:* standardized regression coefficients displayed. Industry sector and year included as control variables but not reported. *p < 0.05; **p < 0.01; ***p < 0.001.

not shown to conserve space. Second, we re-estimated our firm performance analysis with Tobin's Q, as a firm's market value also reflects its anticipated future performance (Bharadwaj et al., 1999). Tobin's Q was calculated as (MVE + PS + DEBT)/TA; where MVE = (closing stock price of shares at the end of the financial year) × (number of common shares outstanding), PS = liquidation value of the firm's outstanding preferred stock, DEBT = (current liabilities - current assets) + book value of inventories + long term debts, and TA = book value of total assets (Lee & Chen, 2009). Due to data availability, the sample was reduced to 356 firms with 3345 firm–year observations. When Tobin's Q is the dependent variable, we again found that digital orientation is positively associated with firm performance ($\beta = 0.05$; $p < 0.01$). Third, we controlled for the effects associated with differences between industries in our regression models. We ran the regression models using industry-adjusted digital orientation scores. For a given year, we calculated the mean of the digital orientation scores of all firms in the same industry sector on a one-digit SIC code level. We then deducted this industry mean from the digital orientation scores of the firms to obtain the firms' industry-adjusted digital orientation scores. In addition, we followed the same procedure using the median (instead of mean) industry scores. In both cases, the results remained robust compared to our main models displayed in Table 9. Fourth, we controlled for potential endogeneity with a three-step procedure applied in prior research (Chatterjee & Hambrick, 2007; Nadkarni & Chen, 2014). For the first step, we selected potential antecedents of the independent variable, digital orientation, and considered all the controls in our models. We chose only those not correlated with the dependent variable. In the second step, we examined which of these variables significantly predicts ($p < 0.05$) digital orientation in a regression. Using only the significant regression coefficients, we calculated the predicted digital orientation value and included this value as an endogeneity control in our main analysis. We found no significant association between the predicted value and a firm's performance. The relationship between digital orientation and firm performance remains consistent in terms of significance and direction. Thus, we assume that the effects of endogeneity do not unduly bias our models.

## 4. Discussion

This study conceptualizes and operationalizes an organization's digital orientation. We introduce this novel strategic orientation and define its four interrelated dimensions. We operationalize the concept for text analysis and validate a measurement instrument. Then we demonstrate that a firm's digital orientation positively relates to firm performance. In the following, we discuss the implications of our study for academia and practice.

### 4.1. Theoretical implications

Introducing the new concept of digital orientation allows us to integrate two vital notions: prevalent digitalization themes—affordances, openness, and generativity (Nambisan et al., 2019)—with the SAM that has been established in traditional IT business alignment research (Henderson & Venkatraman, 1999). We define digital orientation as an organizational-level construct manifested by four dimensions: digital technology scope, digital capabilities, digital ecosystem coordination, and digital architecture configuration. With the inauguration of digital orientation based on our conceptualization, we develop theory on a strategic orientation that caters specifically to the contexts of digital transformation, digital innovation, and competitive advantage in a digitized world. It captures those guiding principles of an organization that provide strategic directions to nurture and implement specific digitalization strategies and initiatives. With this, our conceptualization of digital orientation extends our knowledge on strategic orientations by explaining idiosyncrasies and strategic implications related to the pervasiveness of digital technology. Moreover, by empirically focusing on large, publicly listed firms, we complement earlier advances on digital orientation that emphasize small and medium-sized firms (Quinton et al., 2018).

This study offers important implications for digitalization research that adopts the resource-based view. We develop digital orientation based on the SAM (Henderson & Venkatraman, 1999) and three key themes of digitalization (Nambisan et al., 2019). While previous literature has argued for enriching the resource-based view by accounting for digital resources (Bharadwaj et al., 2013) that actively shape physical environments (Baskerville et al., 2020), our conceptualization shifts attention to the importance of aligning such digital resources across internal/external as well as organizational/technological elements in a way that competitors cannot easily imitate (cf. Barney, 1991). Extant research on alignment in digital contexts has focused on aligning *processes* (e.g., Yeow et al., 2018), and we contribute related insights by further specifying the types of resources that need to be aligned. Our results also imply that alignment is not only relevant at the stage of actual strategizing but needs to be considered even earlier, when the broader digital orientation is formed. In particular, this alignment focus suggests that the four identified dimensions of digital orientation should be closely interrelated. As expected, we find that an organization's digital orientation, manifested in all four dimensions, is positively associated with firm performance. While there has been intense debate about the conditions under which IT investments drive firm performance and competitive advantage (Aral & Weill, 2007; Bharadwaj, 2000), implications of the unique features of digitalization (affordances, openness, and generativity) on the general IT–performance relationship are still underemphasized in extant research. Such inquiries, however, are important, as previous literature suggests that these features might alter the logic of value creation and appropriation (Nambisan et al., 2019; Yoo et al., 2010). With this study, we show the positive performance effects of digitalization at the level of strategic orientation (Gatignon & Xuereb, 1997). In that, our results contribute to an advanced understanding of how digitalization affects value creation in general and helps explain performance variance in today's digitized business environments.

However, introducing a novel strategic orientation requires accounting for potential boundary conditions. Examining such boundary conditions will advance theory on the relationships between strategic orientations and competitive advantage resulting from digital resources. In light of the unique, and presumably also challenging, features of digital technologies (Yoo et al., 2010), not all firms might be able to fully realize the benefits related to adopting a digital orientation. First, we would argue that the strength of the relationship between digital orientation and firm performance is likely contingent on various managerial, organizational, product-market, and environmental factors. For instance, the degree of modularization of the value proposition might affect the strength of the relationship between digital orientation and firm performance. Prior research on the three key themes of digitalization emphasizes the role of the layered modular architecture (Nambisan et al., 2019; Yoo et al., 2010). If the degree of modularization of the value proposition is low, building extra mechanisms for ecosystem coordination or module interoperability will generate costs that their benefits potentially cannot compensate for. This point might also be relevant for research on digital product or service architectures: it raises important questions concerning the interplay between technological designs and the development and configuration of digital orientation. Second, given the scope of the organizational domains affected by digital orientation, a firm's transition from analog to digital will entail considerable change effort and financial commitment. Small- and medium-sized firms that lack financial and other resources might not be able to succeed in this transition. In turn, large, publicly listed firms such as those included in our sample might prefer to focus on incremental strategic transformation than on strategic revolution and radical digital innovation.

Finally, this study also has methodological implications. We provide a validated measurement instrument that allows researchers to ascertain a firm's strategic posture towards digital orientation using secondary data sources and the CATA approach. Similar to this article's methodological approach, our measurement instrument can be used to study digital orientation over time and thus renders longitudinal studies of digital orientation possible. This is particularly valuable for the study of strategic orientations, as "for the consideration of an organizational characteristic that is as deeply imbedded and slowly evolving […], a long-term analysis approach is more appropriate" than cross-sectional approaches (Noble et al., 2002). Moreover, the proposed dictionary may be tailored to specific contexts and used to measure strategic postures in other firm documents beyond shareholder letters.

### 4.2. Practical implications

This study offers abundant insights for practitioners aiming to extract value from digital technologies. First, by explicating the digital orientation concept with its four dimensions, we provide managers with a concrete map of the specific organizational domains that must be transformed and aligned to benefit from a digital orientation. The interdependence of these dimensions warns against half-hearted digital transformation efforts in which certain domains within the organization are addressed without consideration of the overall strategic direction. Equipping firms with digital Industry 4.0 technologies to drive automation in production processes, for instance, needs to be paralleled by the development of a clear vision and the implementation of coordination mechanisms for the digital ecosystem. Second, the conceptualization of digital orientation as a strategic orientation puts special emphasis on the necessity of fundamentally rearranging organizing logic when transforming business from analog towards more digital value propositions. This implies that transformational processes require considerable time and effort and so need to be carefully planned. From this perspective, digital transformation efforts will not be initiated merely with the purchase of digital technologies, but rather with a thorough strategy development process.

### *4.3. Limitations and avenues for future research*

Despite the contributions this study makes, it is not without limitations. First, discriminant validity of our concept is ascertained with regard to entrepreneurial orientation. While other strategic orientations differ conceptually from digital orientation, we call for future research to empirically analyze the differences between digital orientation and other orientations and examine the extent to which digital orientation can be considered complementary to other strategic orientations (Schweiger et al., 2019). Second, while we establish empirical linkages between digital orientation and firm performance, further investigation of the broader nomological network was beyond the scope of this study. In addition to the factors constituting boundary conditions, future research should address the specific mechanisms by which digital orientation leads to performance gains. For example, a digitally oriented firm might adapt its business model to capture more value from digitally enabled value propositions through digitalized value delivery and value capture mechanisms. Also, digital orientation's impact on firm outcomes such as innovation, product or service outcomes, and customer satisfaction should be investigated. For instance, scholars researching ambidexterity, as relating to exploration and exploitation behaviors in organizations (Uotila, Maula, Keil, & Zahra, 2009), might examine whether or not a more pronounced digital orientation helps to balance the two activities. Third, our measurement instrument is verbiage-based and hence relies on firms' written communication, which might not necessarily capture actual behavior (Covin & Wales, 2019). For example, firms might intentionally use language reflecting a digital orientation in shareholder letters to present a favorable image towards investors. Since such wording can be misinterpreted as a firm's strategic posture or top management style (Covin & Wales, 2019; Wales, Covin, & Monsen, 2020), future research may develop alternative measures such as scales for surveys. Finally, despite the considerable period of time covered, the word lists derived for the four dimensions can be considered only temporarily stable and might evolve as technology further develops over time. Progress will yield new technologies described by words not yet contained in our dictionary, while other words will fall out of use. Future research should use the CATA methodology to inductively identify additional words for the dictionaries. Moreover, future research could shed light on how digital orientation varies with industry and market settings.

## 5. Conclusion

This study conceptualizes and operationalizes digital orientation as a distinct strategic orientation. Based on the resource-based view of the firm, we advance current research on strategic orientations by proposing a concept that explicitly accounts for the idiosyncrasies of digital technologies and digitalization initiatives. In doing so, we also contribute to bridging information systems research and strategy research and show the unique value that combining ideas from these two disciplines may provide. Our study suggests that developing and maintaining a digital orientation helps firms to better navigate the strategic requirements that the pervasiveness of digital technology brings. We hope that the proposed concept and measure provide a basis for future research advancing theory on competitive advantage in a digitized world.


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