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The C-Suite's Role in Digital Transformation: A Review and Research Agenda

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Christian Sciuk

LMU Munich School of Management
sciuk@lmu.de

Abstract

Companies across all industries currently strive to master their digital transformation (DT) endeavors. For successful DT, a firm's top management team (TMT) must embrace the challenge holistically, especially given that the inherent complexity of DT points towards shared responsibilities rather than single ownership. However, literature primarily considers individual TMT roles and their involvement in DT. Hence, a comprehensive picture of how DT is steered in the TMT is missing. To integrate the dispersed and position-specific literature, we conducted a systematic literature review. We structure the various contributions by grouping them along three emerging main research clusters, i.e., tasks and functions; relationships; changes and outcomes. This study provides a synopsis of the management of DT in the C-suite and outlines several avenues for further research in this field. For practitioners, we lay the groundwork for designing an effective DT governance system in the TMT, which assists in successfully managing DT.

Keywords

Digital Transformation, Governance, Top Management Team, Chief Officers, Literature Review.

Introduction

The widespread adoption of digital technologies poses a plethora of challenges to firms in all industries, as it entails the need for digital transformation (DT) (Markus and Rowe 2023). Companies face the appendant impacts on their internal and external environment and have to fundamentally rethink their incumbent value proposition logic (Wessel et al. 2021). Thus, to address the risks and opportunities arising from DT, many firms are forced to adapt their business models, products, organizational structures, processes, management concepts, and competencies (Vial 2019). Against this backdrop, companies need to establish a roadmap to drive their DT effectively (Hess et al. 2016). Given DT's highly strategic nature, top managers assume a leading position in firms' DT endeavors (Wrede et al. 2020). To cope with the requirements induced by DT, the establishment of a novel top management team (TMT) position is increasingly observed in practice: the Chief Digital Officer (CDO) (e.g., Tumbas et al. 2017). In other settings, Chief Information Officers (CIOs) take the lead in DT by expanding their role towards more business responsibility (Peppard et al. 2011). Besides, Chief Executive Officers (CEOs) are involved by providing a vision for DT (Weigel et al. 2020). Overall, given DT's cross-functional nature and the intertwining of business and technology in modern enterprises, we see various TMT positions assigned with DT tasks (Tumbas et al., 2018). Thus, DT is perceived as a shared and interrelated TMT responsibility that requires extensive coordination of the corporate elite and coincides with a dilution of traditional roles' boundaries (Firk et al. 2022).

In contrast, research tends to examine individual positions. Moreover, existing literature reviews also either address distinct roles such as the CDO (e.g., Kessel and Graf-Vlachy 2021) or information systems executives (Drechsler 2020) without explicitly targeting the TMT's involvement in DT. In sum, we lack a comprehensive understanding of TMTs' role and dynamics in DT. Yet, this is particularly pertinent as DT will remain a top priority and leadership for the digital change will be needed irrespective of the personnel anchoring in the firm (Tumbas et al. 2017). Thus, we address the following research question: "*How does the literature address TMTs in DT?*" To consolidate the dispersed literature on DT in the TMT, we conducted a systematic literature review (Paré et al. 2016), which aims to critically analyze and synthesize

the current state of research on a topic, identify possible knowledge gaps in the literature, and provide a foundation for future research by unearthing research avenues that might serve as an impetus for further studies in the realm. This paper contributes to academia by providing a structured synopsis of the various studies on DT management in the C-suite, thus contributing to precision in the debate. In particular, by clustering the articles into three emerging main research clusters (i.e., tasks and functions of TMT members in DT, relationship between TMT members in DT, changes and outcomes of TMT members' involvement in DT) we lay a foundation to examine the mechanisms of DT governance in the TMT. Besides, the study is germane for practitioners as it consolidates various views on the anchoring of DT in the upper echelons and can, therefore, serve as a basis for designing an efficacious DT governance system.

Theoretical Foundations

Digital technologies' transformative impact opens up myriad opportunities for firms to reinvent themselves by acquiring digital capabilities and creating novel business segments (Markus and Rowe 2023). Yet, they also present immense challenges due to the impact on both companies' internal and external environments. Customers' habits change, innovation cycles shorten, and market pressures mount, compelling businesses to utilize digital technologies to maintain competitiveness (Vial 2019). In response, companies embark on far-reaching organizational transformations, i.e., DTs. Such DTs differ from previous IT-enabled changes as they involve holistic organizational adjustments triggered and shaped by the diffusion of digital technologies rather than targeting punctual impacts in specific areas (Hess et al. 2016). This paper follows Vial (2019, p. 118), who defines DT as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies". In contrast to other works that refer to DT only when digital technologies redefine value propositions and create a new organizational identity (Wessel et al. 2021), this definition implies a broad understanding of DT. Hence, DT does not only focus on developing novel digital business offerings but refers to changes throughout the organization (Hess et al. 2016). In this respect, DT describes a gradual process that is constantly in flux and has no foreseeable end (Chaniyas et al. 2019). Due to its far-reaching influence, tasks related to DT can arise in different parts of the organization and across all hierarchical levels, requiring central coordination (Singh et al. 2020). Accordingly, DT is a topic that ranks very high on firms' strategic agenda and is decisively steered by the TMT (Firk et al. 2022).

The term TMT refers to the small group of highly influential executives at the highest level of an organization, typically consisting of CEOs and their direct reports (Menz 2012). TMTs play a pivotal role in shaping the success of organizations as they are composed of the most senior executives responsible for making critical decisions, formulating and implementing strategies, and setting the tone for the whole organization (Wrede et al. 2020). Initially, aspects related to information technologies (IT) were assumed to fall under the auspices of the CIO (Peppard et al. 2011). Yet, with increasing digital opportunities, the range of tasks has grown drastically (Seeher et al. 2020). DTs' characteristics lead to a complexity that is often not manageable for single executives on top of their original tasks (Singh and Hess 2017), particularly since DT entails altered decision-making contexts that call for tailored approaches (Wrede et al. 2020). In response, many organizations recruit new digital leaders, namely CDOs (e.g., Tumbas et al. 2017). However, not all enterprises see the need to install a CDO (Kunisch et al. 2022) and other C-suite members, such as finance, marketing, or operation executives, may be urged to participate in DT (Firk et al. 2021). Thus, tasks must be distributed among the C-level suite to encourage digital change (Fernandez-Vidal et al. 2022), most notably since it is the TMT as a cohesive unit that defines the corporate vision, pinpoints opportunities, and takes strategic decisions (Menz 2012). Against this backdrop and acknowledging that digital technologies permeate the whole firm, the entire C-suite should embrace the digital agenda (Wedel et al. 2022). Given DTs' increasing importance and the associated pressure to adapt to changing market conditions, it is vital to understand the role and interdependencies of various C-suite members in DT (Wrede et al. 2020).

Methodology

To ensure systematicity and transparency in conducting our literature review, we adhered to the guidelines by Paré et al. (2016), proposing six steps that reflect the main activities usually involved in a review: (1) devising a review plan; (2) searching the extant literature; (3) selecting relevant studies; (4) appraising the quality of the included studies; (5) extracting data and coding of the findings; and (6) analyzing and synthesizing the data and formulating conclusions. First, **(1)** we created a review plan by formulating a

research question, selecting an appropriate research type, and planning the research process. Subsequently, **(2)** based on the objective and scope of our study, we devised a two-step search strategy to compile a comprehensive literature sample (Webster and Watson 2002). In the first step, we conducted a keyword search in the titles, abstracts, and keywords of peer-reviewed papers, ranking A+, A, or B in the VHBJourqual3 that comprised publications up to and including December 2022. We searched for literature in the databases ACM Digital Library, AIS eLibrary, EBSCOhost, ScienceDirect, and Web of Science. The search terms incorporate a combination of two components, which reflect the positioning of the research topic at the nexus of top management and DT research. To elicit papers addressing TMTs and CxOs, we applied the keywords *Chief Officer*, *top management*, *top manager*, *C-suite*, and *C-level*. Due to the search logic of the databases, the search term *Chief Officer* yields results on all Chief * Officers. We refrained from searching for the abbreviations of CxOs because we assume that the authors spell out the terms; at least once. Second, to find papers addressing DT, we selected the search terms *digital transformation*, *digitali(s)zation*, and *digital innovation*. We included the term digitalization, which is occasionally used as a synonym for DT. Besides, we searched for digital innovation, which is regarded as a core element of DT (e.g., Hess et al. 2016). The keyword search generated 268 results. **(3)** These were screened for adherence with the inclusion criteria: a) empirical research, i.e., no editorials, extended abstracts, or literature reviews; b) explicit emphasis on DT, i.e., papers addressing DT only peripherally or deal with IT-enabled change were not included; and c) focus on CxOs or the collective TMT. Besides, we excluded all studies that centered on the DT of public authorities. After applying the inclusion and exclusion criteria, we obtained a set of 31 papers. Following Webster and Watson (2002), we conducted a forward and backward search, which increased our sample to 37 papers. **(4)** A quality appraisal was not required due to the restriction to A+, A, and B journals. **(5)** During several rounds of reading, we inductively and iteratively coded each article according to key themes that were addressed. Subsequently, the derived themes were aggregated if they were identical or highly similar. **(6)** From the analysis of the emerging themes, we iteratively developed a concept-centric classification that organizes studies and, thus, allows us to derive “white spots” in the research. Specifically, three main research clusters (i.e., tasks and functions of TMT members in DT; relationship between TMT members in DT; changes and outcomes of TMT members’ involvement in DT) inductively surfaced during our analysis, which we leveraged to group the previously derived themes of the studies. To assess the consistency and plausibility of the coding, we conducted a validation process workshop with two researchers who were not involved in the coding process, resulting in minor alterations.

Findings

Tasks and Functions of TMT Members in DT

CDOs’ role in DT. As alluded to earlier, much of the research on DT governance in the TMT addresses individual positions. Particularly, CDOs and their task profile receive much attention. CDOs are expected to orchestrate the DT of a company (Singh and Hess 2017) and to drive business value from digital technologies (Tumbas et al. 2017). They are integral for nurturing the sensing, seizing, and transforming of firms’ digital capabilities (Berbel-Vera et al. 2022). CDOs leverage digital innovations by integrating them into business models and reshaping analog value creations by developing digital products and services through continuous opportunity seizing and experimentation with various digital technologies (Haffke et al. 2016; Singh and Hess 2017; Tumbas et al. 2017; Tumbas et al. 2018). Similarly, many CDOs seek to enhance customer experiences by striving for customer-centricity and creating seamless customer journeys across all channels, devices, and touchpoints. This comprises integrating offline and online points of sale, expanding into new customer segments, and developing new e-commerce platforms (Haffke et al. 2016; Singh and Hess 2017). To reach customer intimacy, CDOs analyze customer data at every touchpoint and embark on co-creation activities (Tumbas et al. 2017). In addition to the market-facing tasks, CDOs typically drive the internal DT. A key aspect is nurturing cross-functional collaboration, given that DT is no isolated process but involves various departments and stakeholders in the company (Haffke et al. 2016; Singh and Hess 2017). Similarly, CDOs aim to counteract the proliferation of disorganized digitalization projects in different business units and functions by developing an aggregated view of the digital initiatives (Haffke et al. 2016; Singh and Hess 2017; Tumbas et al. 2017). As the traditional way of business is often deeply embedded in an organization, a cultural shift is needed to enthruse people to embrace digital issues and prevent potential resistance (Haffke et al. 2016). Thus, CDOs often aspire to establish a digital culture by evangelistically communicating digital strategies across departmental boundaries to ensure everyone is

“signed up to the digital journey” (Singh and Hess 2017, p. 11). Finally, CDOs typically strive to build digital competencies to pave the way for a digital enterprise. This can be realized by providing workshops for the existing workforce, bringing digital-savvy talent on board, or building strategic partnerships with digital players to benefit from their expertise (Haffke et al. 2016; Singh and Hess 2017; Tumbas et al. 2017).

Considering the variety of tasks, CDOs usually establish a priority in their remit depending on the firms' circumstances (Kunisch et al. 2022). To reflect this, the literature describes different CDO role types, each equipped with a specific task focus (Haffke et al. 2016; Singh and Hess 2017; Tumbas et al. 2017). The role types derived in the papers overlap strongly (Seeher et al. 2020) and comprise evangelist (i.e., promoting digital culture), marketer (i.e., increasing customer intimacy), innovator (i.e., driving digital innovation), and orchestrator (i.e., fostering collaboration and alignment). For each role type, Seeher et al. (2020) define a set of ten KPIs that reflect essential criteria for performance evaluation. To successfully operate in their role, CDOs embrace a hybrid nature, exhibiting a mix of digital (business) acumen and IT skills (Culasso et al. 2023; Singh and Hess 2017). Besides, CDOs benefit from resilience, visionary thinking, and the ability to inspire (Singh and Hess 2017). Finally, Singh et al. (2020) investigate the organization design parameters that support CDOs in pursuing DT activities. Both vertical, i.e., organizational structure, and horizontal, i.e., formal and informal interactions, design parameters should be considered when embedding the CDO, with the two dimensions being closely entangled. Similarly, Firk et al. (2022) highlight the importance of flat hierarchical structures in the upper echelons to reinforce CDOs' coordinating role.

CIOs' role in DT. First and foremost, CIOs ensure that high-quality, cost-effective IT services are delivered, the IT infrastructure runs smoothly for uninterrupted operations, and IT malfunctions are fixed instantly (Gerth and Peppard 2016; Kohli and Johnson 2011). Yet, in the course of DT, CIOs engage in the strategic deployment of IT, i.e., the creation of digital innovations (Weill and Woerner 2013). The focus shifts from merely addressing technical issues to engaging in business issues (Haffke et al. 2016). Thus, CIOs need to closely collaborate with other C-suite members (Peppard et al. 2011), develop a deep understanding of business requirements, e.g., in terms of customers or markets (Gerth and Peppard 2016; Weill and Woerner 2013), and orchestrate organizational resources, such as digital technologies, people, and processes (Kohli and Johnson 2011). To constantly seize digital opportunities, CIOs identify emerging technologies and read the technology marketplace to stay on the cutting edge (Peppard et al. 2011). Solutions do not necessarily have to be developed in-house but can also be sourced externally by leveraging the ecosystem of technology suppliers (Weill and Woerner 2013). Here, CIOs must take action to efficiently deliver digital technologies at the desired cost, risk, and service levels, whether in-house, outsourced, or a combination (Kohli and Johnson 2011). In addition, in the digital age, critical enterprise (business) processes, e.g., relating to operations, are moving to the forefront of a CIO's remit (Weill and Woerner 2013). Finally, many CIOs have an empowering role in DT by providing training and workshops aimed at imparting IT skills (Kohli and Johnson 2011), educating about the potential of digital technologies as a business driver (Peppard et al. 2011), and creating digital literacy among executives (Chen et al. 2021).

CEOs' role in DT. Although CEOs are deemed central in DT (Kohli and Johnson 2011), literature remains sparse on their particular role in DT. Holistic research on CEOs' role in DT has only been conducted in small and medium-sized enterprises (SMEs), which often lack the resources to create dedicated TMT roles for DT. Thus, CEOs tend to spearhead the digital journey in SMEs, with DT success depending on CEOs' digital competencies and experience (Weigel et al. 2020). Focusing on partial aspects of CEOs' role in DT, Andrade Rojas et al. (2016) indicate that firms can incentivize CEOs with long-term compensation plans to increase their buy-in to growth-oriented digital strategies. Moreover, researchers have studied certain traits of CEOs that are conducive to DT. For instance, CEOs' cognitive simplicity, enabling them to prioritize opportunities and seize swift action, is positively associated with the focal company's digital strategy orientation (Lohmar et al. 2021). Similarly, Wedel et al. (2022) show that CEOs' entrepreneurial mindset drives TMTs' efficacy in harnessing their digital experience toward a stronger digital orientation. Finally, integrative CEOs support a firm's DT by involving CxOs with digital knowledge in TMT processes and overcoming potential role conflicts that may impede the integration of TMT digital expertise (Firk et al. 2022).

Collective TMTs' role in DT. Some studies also delve into the remit of the collective TMT in DT. Wrede et al. (2020) emphasize top managers' significance in the DT process, as their commitment and support are required to enable change processes and targeted actions throughout the organization. In particular, the authors suggest that top managers must understand DT's impact on their firm, create the formal context for DT, and lead the change by signaling personal commitment. Similarly, Fernandez-Vidal et al. (2022)

suggest that TMTs must jointly drive business change, create organizational structures and coordination mechanisms, prepare employees for DT, and embed continuous learning. Yet, some voices also highlight that strong TMT support can entail adverse effects for DT. More specifically, possible hyperopia of the TMT, i.e., an exaggeration of DTs' long-term implications, might lead to an unbalanced implementation, with operational issues falling by the wayside. Besides, overconfidence among CxOs could discourage middle managers and employees from participating in decision-making (Elbanna and Newman 2022).

Relationship between TMT Members in DT

Interplay of the CDO and the CIO in DT. Tumbas et al. (2018) find that CDOs and CIOs often build on different logics, e.g., regarding focus of management control (new initiatives vs. operational integration), value orientation (revenue enhancing vs. cost saving), or goal achievement (heavy experimentation vs. risk aversion). Yet, DT can only succeed in the interplay between CIOs' expert IT knowledge and CDOs' digital business acumen (Haffke et al. 2016; Singh and Hess 2017). Thus, close coordination is necessary for constellations where CDOs are deployed alongside CIOs, especially since the different backgrounds and competencies can quickly lead to divergent approaches and, thus, inhibit DT initiatives. Research shows that four factors are crucial for a prosperous collaboration between the CDO and CIO (Horlacher 2016): (1) shared understanding of the goals of DT; (2) specialization and clearly delineated roles; (3) trust in each other's expertise and open communication; and (4) coordination concerning the collaboration.

Interplay of the CEO and the CIO in DT. Close collaboration between the CEO and CIO is vital for DT as it facilitates the pooling of IT resources and complementary business capabilities to deliver strategic value from IT (Benlian and Haffke 2016). DT success is fostered when the CEO and CIO jointly select domains and processes in which IT is embedded, mutually prioritize goals, and define success metrics (Kohli and Johnson 2011). The relationship between the CEO and CIO is significantly influenced by their personality traits. Studies show that cognitive and emotional empathy between CIOs and CEOs can create shared understanding and trust, which in turn drives DT (Liu et al. 2023). Given the power imbalance in a CEO-CIO partnership, it is more important that the CIO shows comprehension of the CEO's position than vice versa. Thus, the less powerful partner (i.e., the CIO) needs to understand the more powerful partner (i.e., the CEO) to ensure mutual satisfaction and achieve a fruitful collaboration (Benlian and Haffke 2016).

Changes and Outcomes of TMT Members' Involvement in DT

Antecedents of dedicated TMT roles for DT. Most existing literature regarding antecedents of TMT roles for DT deals with the CDO and the circumstances under which companies create this position. Firk et al. (2021) argue that the decision to centralize DT responsibilities in a CDO role depends strongly on the transformation urgency (i.e., the business model is prone to digitalization and high threat of disruption through new digital entrants) and coordination needs (i.e., many decoupled digital initiatives and lagging digital infrastructure) an organization is facing. These two factors are acknowledged by further studies (Haffke et al. 2016; Kunisch et al. 2022; Singh and Hess 2017; Tumbas et al. 2017). Besides, Haffke et al. (2016) list the CIO's role profile and reputation, as well as the primary focus area of DT as antecedents for CDO presence. Specifically, CDOs are primarily appointed in companies where the CIO cannot expand his role toward business aspects. In addition, firms where DT has an external (i.e., market) focus are more likely to employ a CDO. Finally, Kunisch et al. (2022, p. 12) suggest that "the decision to have a CDO may not always be a purely rational choice". In particular, firms with relatively old boards are less likely to adopt CDOs. Further, the CDO adoption rate in an industry affects CDO presence, implying mimetic behavior.

Apart from the CDO, Bendig et al. (2022) examine antecedents of CIO presence in the TMT, arguing that CIOs are a potential source of TMTs' dynamic managerial capabilities, which are particularly valuable in light of intense adaptive pressures in DT. Adaptation pressure stems from external tensions (e.g., industry IT intensity) and internal tensions (e.g., TMT's digital skills gap). Here, CIOs located in the TMT can drive necessary changes reducing adaption pressure by strengthening the firm's relative exploration orientation.

Changing TMT roles in DT. Regarding role transitions, research focuses on the CIO role, as a "digital economy means the responsibilities of the CIO are changing" (Weill and Woerner 2013, p. 66). In many organizations, CIOs are expected to expand their role from technologist to business strategist. As such, CIOs often no longer merely assume a supply-side leadership role, i.e., leverage IT capabilities to support business needs, but also engage in demand-side leadership, i.e., explore business opportunities based on

digital technologies (Peppard et al. 2011). While fulfilling supply-side tasks is still the day-to-day business for CIOs, they increasingly embrace demand-side responsibilities throughout DT (Haffke et al. 2016). CIOs rely on different approaches to free up capacity for demand-side activities, such as mentoring their team to take on more actions, maturing IT governance processes, and developing the partner ecosystem (Weill and Woerner 2013). However, many CIOs still focus almost entirely on efficient IT delivery, especially when they are incapable of adding further tasks to their agendas and the demand-side duties in DT are handled by another executive, such as the CDO (Gerth and Peppard 2016). Yet, in other instances, CIOs found a way to ambidextrously drive digital innovation while handling IT systems (Weill and Woerner 2013). This trend might accelerate in DT as information capabilities become deeply embedded in firms and the very nature of the CIO role diminishes (Peppard et al. 2011). To leverage the business value of IT in the long run, CIOs need to abandon their original stereotype as problem solvers (e.g., by adopting a business jargon) and, thus, assume a strategic leadership role (Gonzalez et al. 2019).

Impact of CxOs in DT. First, research studies CDOs' impact on DT outcomes. Leonhardt et al. (2018) suggest that CDOs contribute to digital innovation performance by serving as formal horizontal governance mechanisms. More precisely, CDO roles transcend departmental boundaries, thus promoting the integration of TMT digital knowledge into TMT processes and spurring digital innovation, given a flat hierarchical structure in the TMT (Firk et al. 2022). Yet, when IT or business units are entrusted with digital innovation, CDOs may even harm digital innovation success (Leonhardt et al. 2018). In terms of financial performance, CDOs serve as strategic signals, with investors recognizing firms' efforts to establish a role tailored to DT, eventually leading to positive stock returns. The stock market particularly rewards CDOs' appointments in firms with high growth prospects (Zhan et al. 2020), in the absence of a CIO (Drechsler et al. 2019; Zhan et al. 2020), and for CDOs who assume specialist roles and exhibit business backgrounds (Drechsler et al. 2019). Finally, Metzler et al. (2021) show a link between CDO presence and the extent of DT-related signals, which reduces information asymmetries between firms and external stakeholders.

In line with CIOs' evolving role, scholars address CIOs' impact on DT-related outcomes. Studies demonstrate that CIOs engaging in issue selling (i.e., gaining support among CxOs) drive digital innovation success (Chen et al. 2021) and innovative IS strategies (Chen et al. 2017). The effectiveness of CIOs' issue selling hinges on their decision-making authority, IT-related strategic knowledge, political savviness, and the CIO-TMT partnership (Chen et al. 2021; Chen et al. 2017). Likewise, Saldanha & Krishnan (2011) provide evidence that CIOs promote firms' propensity for business innovation when interacting with customers, being involved in new product development, and having a direct reporting line to the CEO. The influence of CIOs on digital innovation outcomes is more pronounced in IT firms than in non-IT firms (Hsu and Liu 2019). Taking a more holistic stance, Wittmann & Kranz (2022) indicate a positive impact of CIOs on general DT success. More precisely, the authors empirically show that CIOs aid organizations in using existing IT resources and capabilities for data management more efficiently, thereby driving DT.

Besides, few studies discuss the impact of the collective TMT on DT outcomes. Firk et al. (2022) posit that TMTs' digital knowledge is positively tied to digital innovation success, as it encourages TMT members to interpret their role in favor of digital innovation and enables them to handle nascent tasks, such as identifying the potential of digital innovations and supporting their implementation. Similarly, Wedel et al. (2022) acknowledge the positive influence of digital-savvy CxOs on firms' digital orientation. However, the authors also point to impeding effects on DT caused by too abundant digital knowledge in the TMT. This may cause rivalries among the corporate elite that hinder collaboration and information exchange. Finally, Nguyen et al. (2022) indicate an inverted U-shaped link between IT executives-TMT power dispersion and digital innovation. While moderate power dispersion creates extrinsic stimuli for IT leaders to contribute to digital innovation, high levels disrupt the collaboration with other CxOs, hampering digital innovation.

Table 1 organizes the inferred aggregated themes along the three main research clusters.

Tasks and functions of TMT members in DT	Relationship between TMT members in DT	Changes/outcomes of TMT members' involvement in DT
<ul style="list-style-type: none"> ▪ CDOs' role in DT ▪ CIOs' role in DT ▪ CEOs' role in DT ▪ Collective TMTs' role in DT 	<ul style="list-style-type: none"> ▪ Interplay of the CDO and the CIO in DT ▪ Interplay of the CEO and the CIO in DT 	<ul style="list-style-type: none"> ▪ Antecedents of dedicated TMT roles for DT ▪ Changing TMT roles in DT ▪ Impact of CxOs in DT

Table 1. Structuring the Literature on TMTs in DT

Agenda for Future Research

Tasks and Functions of TMT Members in DT

The literature ascribes most of the tasks of DT to the CDO (e.g., Tumbas et al. 2017). Yet, a CDO is no panacea for DT, given the extensive requirements (Firk et al. 2022). Thus, it is critical to understand the roles of other CxOs in DT. CEOs are particularly intriguing as they bear overall responsibility for the enterprise's future success (Menz 2012). Hence, even with digital leaders in the TMT, the final decision-making responsibility often resides with the CEO (Hess et al. 2016). Surprisingly, their role in DT – with few exceptions (e.g., Weigel et al. 2020) – has received little attention. Previous studies centered on specific CEO traits and their impact on DT without examining CEOs' function in DT from a holistic stance. Further research could investigate the CEO's role in DT in more detail, both in firms where CEOs set the overall direction for digital change, but also where they are directly involved in the day-to-day business of DT.

Yet, the impact of technology permeates the whole enterprise, requiring the entire C-suite to embrace the digital agenda (Gerth and Peppard 2016). Further research could shed light on how DT responsibilities are distributed among CxOs when a CDO position is not established. Moreover, even CDOs perform only parts of the DT tasks, depending on their role (Seeher et al. 2020). Scholars could probe the involvement of other CxOs in DT. For example, the Chief Technology Officer (CTO) has not yet been explored in DT, which is startling given that the CTO is the organization's top executive responsible for technical matters.

DTs do not follow a uniform path. Instead, each firm has specific needs and is at a different point in its DT endeavor (Vial 2019). Accordingly, companies have deviating expectations of their DT, e.g., in terms of goals, tasks, and objectives (Kunisch et al. 2022). In contrast, there is a lack of research on the influence of organization-specific factors on the allocation of DT management responsibilities. Thus, researchers may examine influencing factors that affect the distribution of DT tasks between the CDO, CIO, and other CxOs. Scholars could even investigate DT governance responsibilities detached from single positions. By focusing on the "digital logic" (cf. Tumbas et al. 2018) of organizations, it is feasible to study how they deal with DT and what tasks arise due to their approach, regardless of which CxO is responsible for the duties.

Relationship between TMT Members in DT

Literature has already examined the relationship between CDOs and CIOs (e.g., Horlacher 2016) and CEOs and CIOs (e.g., Benlian and Haffke 2016) in DT. Alongside this, the relationship between the CEO and CDO is particularly relevant, as the CEO is naturally involved in all vital corporate decisions – including those relating to DT (Hess et al. 2016). In addition, both roles are cross-functional, which leads to an overlap in the area of responsibility and a high need for coordination (Weigel et al. 2020). Whereas in the case of the CDO and CIO, a clear distinction can be made according to demand-side and supply-side tasks (Haffke et al. 2016), both the CEO and CDO have the claim to lead DT, which opens the space for tensions. Against this backdrop, researchers could examine the CEO-CDO interplay, including potential sources of tension.

Besides, the interaction patterns between other CxOs involved in managing DT are also highly relevant. For example, the CSO deals with company-wide strategic issues but has no specific focus on digital topics (Singh and Hess 2017). Yet, since DTs highly influence corporate strategies (Hess et al. 2016), it would be intriguing to investigate the interaction between the CSO and the CxO primarily responsible for DT. In addition, as all CxOs have stakes in a firm's DT, scholars should – besides studying dyadic CxO interactions – explore the overarching coordination mechanisms in TMTs, e.g., digital boards, leading to effective DT governance.

Alongside the TMT, the board of directors is decisively involved in setting a firm's strategic direction. This can equally be applied to DT, where the board of directors must promote the digital endeavor (Weill et al. 2019). Consequently, it is of considerable relevance for the TMT to establish a good rapport with the board of directors. Hence, an interesting research approach is to examine how the interface and collaboration of the TMT (or single CxOs) to the board of directors must be designed to enable successful DT management.

Changes and Outcomes of TMT Members' Involvement in DT

Given DT's cross-functional nature and the intertwining of business and technology in modern enterprises (Hess et al. 2016), CDOs must exert influence throughout the organization to successfully implement their digital agenda (Singh et al. 2020). As an emerging executive role, the CDO raises challenges of TMT's power

allocation and induces fights for legitimacy (Menz 2012). Other senior executives try to impose their agenda, creating an imbalance when a new TMT role is established and preventing progress in DT (Firk et al. 2022). Thus, studies may examine how installing a CDO in the firm proceeds, what measures can be taken to avoid tensions within an organization's upper echelons, and how to provide the CDO role with sufficient clout.

In some firms, creating a new TMT position for DT is not required, as extending the CIO role can cushion the increased demands (e.g., Weill and Woerner 2013). Yet, the CIO is not the only CxO subject to change in the wake of DT. For example, there is evidence that parts of the CDO role gradually disperse into the role of other TMT members once the firm fully embraces its digital capabilities (Haffke et al. 2016). Thus, longitudinal studies might explore how DT responsibilities of different CxOs evolve. Besides, while some DT tasks are temporary, other DT duties are rather permanent (cf. Wessel et al. 2021) and require an adequate allocation even in the long term. Studies could examine firms that have already completed the bulk of their DT and investigate how digitalization tasks are anchored here. Studying firms in such a post-DT state is promising as it could elicit the differences in DT governance among firms that view DT as a one-time project and those that regard it as a continuous evolution to achieve a lasting competitive advantage.

While a burgeoning body of research examines the nexus between TMTs and digital innovation success (Drechsler et al. 2019), no connection has yet been drawn between TMTs and overarching DT metrics. Here, scholars could explore how different TMT configurations (e.g., concerning TMT roles, task distribution, or backgrounds and skills) contribute to DT progress, i.e., increased digital maturity. Utilizing digital maturity would significantly add to IS research, as it takes a holistic stance by considering "softer" (non-financial) factors, such as progress in cultural changes. By gauging TMT compositions' impact on overarching DT metrics, a more detailed assessment of their effectiveness for DT management would be feasible.

Table 2 summarizes the research avenues in the research clusters by listing selected research questions.

Research avenue	Selected research questions
Tasks and Functions	<ul style="list-style-type: none"> ▪ What particular role do CEOs take in DT? ▪ Aside from CEOs, CDOs, and CIOs, what is the remaining TMT's role in DT? ▪ How is the allocation of DT tasks impacted by organizational factors?
Relationships	<ul style="list-style-type: none"> ▪ What characterizes the CEO's and CDO's interaction in the course of DT? ▪ How do other CxOs collaborate in DT? ▪ How do the TMT and the board of directors interact in DT?
Changes/Outcomes	<ul style="list-style-type: none"> ▪ How does the integration process of a CDO proceed in a company? ▪ How do TMT roles and responsibilities evolve in the wake of DT? ▪ What is the impact of different TMT constellations on DT progress?

Table 2. Avenues for Future Research on TMTs in DT

Contributions, Implications, and Limitations

Our contribution to academia is threefold. First, while contemporary studies and literature reviews mainly concern individual CxOs or do not explicitly address DT, our findings enrich IS research with a holistic picture of corporate elites' involvement in DT. This angle is valuable as DT responsibilities prevail with high complexity, posing enormous challenges to a single executive, thus requiring a joint effort of the TMT (Firk et al. 2022). Second, we do not limit our analysis to functional aspects, e.g., related to task assignments, but highlight relationship and change/outcome considerations linked to DT management in TMTs. Thus, the findings of our literature synthesis can be seen as a step toward an in-depth understanding of the breadth of DT governance. Third, we provide a structured synopsis of DT management in TMTs and elicit avenues for further research guided by the three inductively emerged main research clusters. In particular, many studies focus on task allocations in DT and, thus, adopt a functional lens. In contrast, relationship and change/outcome aspects are dealt with to a limited extent. Besides, even with the functional perspective, research often refers to individual TMT positions, thus neglecting the shared responsibilities of CxOs in DT.

In addition, the results hold practical implications for firms in shaping their DT approach in the TMT. First, regarding functional considerations, firms should ensure that DT is on the agenda of the entire C-level suite, as the digital change affects all parts of the firm. In addition, companies must evaluate whether a CDO, another CxO, or the collective TMT takes the lead in DT. If the decision is made for a CDO, the role should

be clearly delineated to prevent conflicts with other CxOs. Second, in terms of the relational perspective, companies should define the interfaces in the TMT efficiently, as a prosperous collaboration of the C-suite is a prerequisite for successful DT. Third, concerning changes and outcomes of TMTs' involvement in DT, configurations for DT governance should be constantly re-evaluated, given the dynamic nature of firms' DT.

This study is subject to a set of limitations. First, the results do not reflect all aspects of DT governance due to the TMT focus. Yet, we acknowledge the importance of middle management, digital units, or employees. Second, there are CxOs, such as Chief Privacy Officers or Chief Information Security Officers, who deal with fairly restricted areas of DT and are, thus, not included in the study. Finally, the titles of CxOs are inconsistent, e.g., the CIO is sometimes called IT Director (Haffke et al. 2016). Although this was mitigated by forward and backward search, studies that did not explicitly refer to a CxO might have been missed.

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