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Paving the way for incumbents' digital transformation. A review and research agenda

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Abstract

Digital transformation is reshaping the competitive landscape by forcing incumbent firms to rethink their strategies, organizational structures, and business models. While a substantial body of literature has explored digital transformation in specific sectors, focusing on various factors and organizational mechanisms, there remains a lack of a comprehensive and cohesive understanding of how incumbent firms actively lead or respond to these transformations. As a result, the concept remains somewhat fragmented and underdeveloped. This review addresses this gap by conducting a systematic review of 68 peer-reviewed articles across five major academic domains: entrepreneurship, general management, innovation, organization studies, and strategy. Our review identifies pathways of leading versus responding to digital transformation as well as the internal and external consequences and antecedents that enable or constrain digital transformation. We also offer a research agenda aimed at deepening our theoretical and managerial understanding of how incumbent firms navigate digital transformation, providing novel directions for future studies.

1. Unveiling the influence of Digital Transformation on incumbent dynamics.
2. Identifying antecedents, enablers, barriers, and consequences of Digital Transformation.
3. New strategies, structures, and business models to respond to or lead to disruptive changes.
4. Illustrating the heterogeneous effect of Digital Transformation within firms.
5. A research agenda to stimulate a holistic understanding of incumbents' Digital Transformation.

KEYWORDS

Business models, digital transformation, incumbent, leading, literature review, organizational structure, responding, strategy

INTRODUCTION

Technologies such as artificial intelligence (AI), blockchain, digital platforms, and robotics are fundamentally altering how firms organize, compete, and strategize (Bailey et al., 2022; Clarysse, Fang He, & Tucci, 2022; Lanzolla, Pesce, & Tucci, 2021; Rauch & Ansari, 2022). These technologies are accelerating the push toward Digital Transformation (DT), defined as a process aiming to improve firms' activities (e.g. business models, organizational structure, and strategy) "through combinations of information, computing, communication, and connectivity technologies" (Denicolai, Magnani, & Vidal, 2022; Elia et al., 2024; Kraus et al., 2022; Vial, 2019).

While digital transformation is not a new concept, it remains persistently difficult to implement, especially for incumbent firms, which often struggle to adapt legacy systems, business models, and organizational structures to a fast-changing digital environment (Li, 2020a, 2020b; Simsek et al., 2024; Tushman & Anderson, 1986). The

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unique affordances of digital technologies (e.g., scalability, real-time data flows, modular architecture, etc.) may render incumbents' competencies obsolete (Eggers & Park, 2018; Tripsas & Gavetti, 2000), requiring not only technological upgrades but also deep organizational and strategic renewal (Ansari & Krop, 2012; Aversa et al., 2021; Kraus et al., 2021a; Kraus et al., 2021b).

This complexity has led to divergent organizational responses: while some incumbents lead digital transformation through proactive innovation and strategic renewal, others respond reactively—or even reject it—due to socio-cognitive, structural, or political barriers (cf. Anthony & Tripsas, 2016; Eggers & Park, 2018; Fernandes & Burcharth, 2024; Kammerlander, König, & Richards, 2018; Kane et al., 2015). For instance, research shows that incumbent firms may fail to allocate attention to digital opportunities, even when they are visible, leading to errors of omission and eventual decline (cf. Ocasio, Laamanen, & Vaara, 2018; Raffaelli, Glynn, & Tushman, 2019). Conversely, other firms demonstrate strong dynamic capabilities by sensing, seizing, and reconfiguring to capture digital opportunities (cf. Teece, 2007; Warner & Wäger, 2019).

A growing body of literature also highlights the role of strategic leadership, particularly top management teams (TMTs), in shaping DT outcomes (Firk et al., 2022; Simsek et al., 2024). Leaders influence whether digital initiatives are interpreted as threats or opportunities, and their characteristics (e.g., digital knowledge, cognitive flexibility, behavioral integration) can determine the success or failure of digital innovation efforts (Chanias, Myers, & Hess, 2019; Volberda et al., 2021).

Despite important advances, much of the review articles on digital transformation have been sector-specific, oriented toward healthcare (Kraus et al., 2021a; Kraus et al., 2021b), B2B marketing (Hofacker et al., 2020), digital business models (Plekhanov, Franke, & Netland, 2022; Schallmo, Williams, & Boardman, 2017), or large established organizations with a focus on dynamic capabilities (Kulichyova et al., 2025). Recent work (Elia et al., 2024; Hanelt et al., 2021; Verhoef et al., 2021) has emphasized the need for a holistic perspective that captures the strategic and organizational dimensions of digital transformation across industries. In particular, more work is needed to distinguish between how incumbents lead digital transformation and how they respond to external digital pressures in order to create, deliver, and capture value (Campagnolo, Gianecchini, & Mosca, 2023; King & Tucci, 2002; Lanzolla, Pesce, & Tucci, 2021; Massa, Tucci, & Afuah, 2017).

This article addresses that gap by answering the following research question: *How do incumbent firms lead or respond to digital transformation?* We conduct a comprehensive literature review of 68 articles published in top-tier journals across five academic domains: (1) entrepreneurship and small business management, (2) general management, ethics, gender & sustainability, (3) innovation, (4) organization studies, and (5) strategy. Our review aims to synthesize current knowledge on the drivers, barriers, and strategic mechanisms underpinning incumbents' engagement with digital transformation.

In the following sections, we present our review methodology and analyze key themes that emerge from the literature, focusing on how incumbent firms change business models, structures, and strategies in response to or in leadership of digital transformation. We conclude with a proposed agenda to guide future research on digital transformation in incumbent firms.

METHOD

This paper adopts a systematic literature review approach (Tranfield, Denyer, & Smart, 2003). To illustrate our approach and process, we report a PRISMA flowchart (Figure 1) to ensure review quality and objectivity (O'Leary, Bayliss, & Haddaway, 2015). Figure 1 describes the steps followed in identifying and examining relevant literature on DT from the incumbent's perspective. Our goal was to capture the organizational structure changes and responses, and strategic processes that shape how incumbent firms engage with digital transformation. The following subsections describe the review procedures, and the thematic analysis carried out.

Identifying and selecting articles

To tackle our research question, we conducted a manual search (see also Hanelt et al., 2021) in academic journals classified in the ABS list with 4*, 4, and 3 stars across five fields including: (1) Entrepreneurship and Small Business Management, (2) General Management, Ethics, Gender and Sustainability, (3) Innovation, (4) Organization Studies and (5) Strategy. Table S1 in the Appendix shows the academic journals related to each field and the related records. We used the following keywords: (1) *"Digital Transformation AND incumbent", (2) "Digital AND incumbent", (3) "Transformation AND incumbent"*. These keywords guided the manual search conducted in selected journals, resulting in a sample of 9,786 articles published from 1980 to 31 December 2024. To ensure that our methodological approach is both comprehensive and reliable, we followed several essential steps: (1) article extraction; (2) verification of consistency with research questions; and (3) development of the results database (Paul & Menzies, 2023; Pietronudo, Croidieu, & Schiavone, 2022). Two main stages followed. The first aimed at identifying, reading, and analyzing articles consistent with the research objectives. Particularly, to identify the most relevant articles, each article was assessed by reading the title and abstract to determine its alignment with our research question. Two authors actively participated in this phase, working systematically and independently to analyze each

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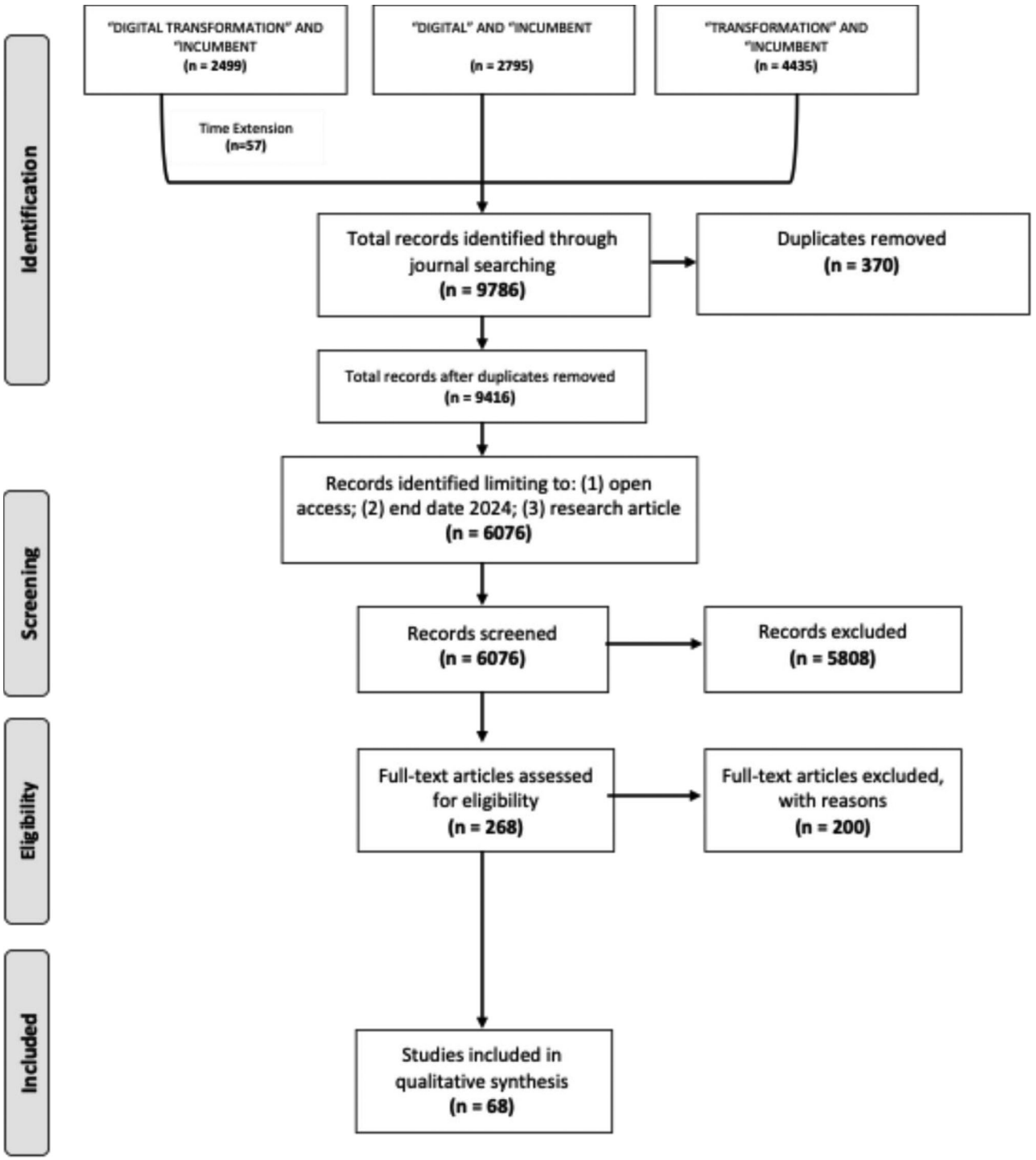


FIGURE 1 PRISMA Protcol. **Source:** adapted from Moher D, Liberati a, Tetzlaff J, Altman DG, the PRISMA group (2009). *P*referred *R*eporting *I*tems for *S*ystematic reviews and *M*eta-*A*nalyses: the PRISMA Statement. PLoS Med 6(6): e1000097. Doi:10.1371/journal.pmed1000097.

article and highlight key points relating to the research objectives.

We applied a set of inclusion criteria to ensure the relevance, quality, and theoretical contribution of the literature selected for this review. First, we included only articles published in peer-reviewed academic journals, as these sources meet rigorous methodological and theoretical standards, enhancing the credibility of the review. Second, we selected studies that explicitly examine incumbent firms, defined as established, legacy, or pre-digital organizations with existing business models and industry positioning in the context of digital transformation. This focus excludes start-ups or digital-native firms, whose transformation processes are inherently

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different due to the absence of legacy structures or path dependencies. Third, articles were included if they addressed the strategic, business model, and organizational structure dimensions of digital transformation. This includes studies on business model innovation, strategic change, and organizational structure changes (e.g., CEOs, top management teams) as they relate to DT. Our aim was to capture not just the technological aspect of transformation, but the broader systemic and strategic shifts that incumbents navigate. Finally, we considered a broad range of contributions, including theoretical, empirical, and review-based studies. This allowed us to integrate diverse perspectives and methodologies (including qualitative case studies, quantitative analyses, and conceptual frameworks), providing a comprehensive view of how incumbent firms lead or respond to digital transformation.

Based on these criteria, we excluded articles in which digitalization was not identified as the main cause of transformations in business models, strategy, and organizational structure. For example, while the work by Ademi, Schuhmacher, & Zacharakis (2023) explores sources of digital affordances, such as the recombinability and the reprogrammability of digital technologies, we excluded their work as they focus on CVC managers' willingness to invest in investment opportunities rather than on company strategy, business model, or organizational structure elements. We also excluded the study by Benner (2010) because it focuses on how securities analysts react to the different strategies undertaken by incumbent firms faced with radical technological change. While this study explores incumbent firms and radical technological change, it looks at the possible influences of public equity markets and securities analysts, overlooking the impact on a firm's strategy, business model, or organizational structure elements. Similarly, we have not included the work by Wu, Wan, & Levinthal (2014) because it focuses on how the incumbent's complementary assets impact choices of technological trajectory and investments along the chosen trajectory.

A total of 200 academic articles were identified. After the final screening, 68 articles were included in the final sample (see Table S2 in the Appendix for the list of the articles included in the sample).

The thematic analysis

The search, screening, and analysis processes were accompanied by a thematic analysis of the final publication sample to identify, organize, and describe systematically models in our sample (Braun & Clarke, 2006). Thematic analysis is a qualitative approach aiming to recognize and analyze "patterns of meaning" in a qualitative dataset, highlighting the most salient constellations of meaning in the description of the phenomenon studied (Braun & Clarke, 2006; Joffe, 2011). We followed three main steps. In the first step, a descriptive classification of the articles was developed using an Excel spreadsheet. To this end, a coding structure was adopted to standardize the information on: (1) theoretical framework, (2) methodology, (3) findings, and (4) future research, thus facilitating the descriptive analysis of the whole sample.

The second step involved the adoption of a configurative approach (Gough, Thomas, & Oliver, 2012), oriented towards heterogeneous research in terms of topics, samples, methods, and theory. Specifically, this is an inductive approach geared towards identifying the main topics without relying on a pre-existing theoretical framework. This allowed us to identify a sufficient number of studies useful for exploring patterns and concepts and assessing the quality of the sample based on the relevance and contribution made by the selected studies (Gough, Thomas, & Oliver, 2012). We, therefore, identified potential themes based on the core concepts reflecting the phenomenon under study (Joffe, 2011), subsequently comparing them with the initial descriptive classifications.

Finally, in the analytical phase (Jones et al., 2011): 1) the academic publications were traced back to one or more first-order themes (i.e., leading or responding to DT, and their focus on strategy, business models, and organizational structure); 2) iteratively, the first-order themes were grouped according to the purpose, meaning, and coding of the themes; and 3) finally, thematic areas or aggregate dimensions were identified. During the analysis, the emphasis was on recognizing keywords and concepts to group articles into distinct categories, thereby attending to the emergence of themes. Particularly, we aimed to investigate how incumbent firms lead or respond to digital transformation by examining changes in their business models, organizational structures, and strategies, associated with digital transformation processes, including changes in combinations of information, computing, communication, and connectivity technologies (Denicolai, Magnani, & Vidal, 2022; Eggers & Park, 2018; Elia et al., 2024; Vial, 2019). The thematic analysis was conducted separately by two authors, who subsequently engaged in a discussion to identify the main themes. To ensure convergence between the authors, the steps outlined by Badura et al. (2010) were followed, according to which disagreements could be resolved through the following process: 1) Negotiate: the authors discussed possible interpretations, accepting the most plausible one as valid; 2) Synthesize: in the absence of a clear interpretation, the authors worked together to create a better interpretation; 3) Arbitrate: in cases of two plausible interpretations, a third external party was consulted; 4) Disallow: if it was not possible to determine a valid interpretation, the code was excluded as too ambiguous. Table S3 in the Appendix shows how each paper was categorized. The following paragraphs illustrate our findings.

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FINDINGS

Responding to digital transformation

Incumbent firms respond to digital transformation by adapting their business models, strategies, and organizational structures. This section examines each of these three dimensions in turn, illustrating how incumbent firms redefine their business models, strategy choices, and organizational structure configurations to navigate digital shifts. In addition, the section summarizes key internal and external factors that further influence the trajectory of digital adaptation.

Business models

Digital transformation fundamentally challenges traditional business models by altering how value is created, delivered, and captured (Lanzolla et al., 2020). Teece (2018) argues that firms must redeploy and reconfigure assets using dynamic capabilities to respond effectively to shifting digital landscapes. For instance, in the case of the book publishing industry, digitization eliminated the competitive advantage of physical features, prompting publishers to shift toward content-centric models (Miller & Wang, 2024). Furthermore, Ma (2023) introduces a typology in which digital innovations are categorized as substitutive, complementary, or parallel, depending on how they relate to incumbents' core offerings. Accordingly, business model changes may range from incremental adjustments to radical reinvention. The success of adaptation thus hinges on the firm's ability to accurately assess the relationship between new technologies and existing value logic (Hsu & Cohen, 2022), and to reconfigure their models accordingly. Additionally, Agyei-Boapeah, Evans, & Nisar (2022) argued that incumbent firms adapt their business models not only to respond to digital market pressures and challenges (Cozzolino, Verona, & Rothaermel, 2018; Markoff-Legrand, Bocquet, & Gandia, 2024) but also to react to rapidly changing consumer behavior due to the digitalization processes.

Strategy

At the strategic level, digital transformation might demand ambidextrous thinking—a balance between exploiting existing capabilities and exploring new opportunities (Taylor & Helfat, 2009; Tushman & O'Reilly, 1996). Strategic responses to DT are shaped not only by environmental scanning but by the cognitive schemas of senior leaders. Vuori & Tushman (2024) highlight how emotional reactions and identity threats among executives led Nokia to pursue suboptimal strategic alliances during a platform shift. In contrast, firms with greater strategic clarity and internal capability alignment—such as certain content-driven publishers—were able to pivot effectively (Khanagha et al., 2018, 2022; Miller & Wang, 2024). Strategic ambidexterity also involves timing and selective commitment. Incumbent firms may delay full transition while experimenting with hybrid strategies, especially when the market for digital products is uncertain or previous experiences influence decision-making processes and outcomes (Tryggvason & Giones, 2025). In this sense, strategy becomes a cognitive and temporal exercise: how firms interpret digital signals, decide when to act, and align resources to navigate the shift. Similarly, Reuter & Floyd (2024) focus on the cognitive perspective on strategic leaders' ecosystem vision formation in digital transformation to theorize the role of strategic leaders' cognitive motivation for making changes in the envisioned value creation models with the firm's ecosystem in the digital transformation In some cases, firms respond to digital disruption through technology counteroffensive strategies, as identified by Furr and Snow (2024). Rather than immediately abandoning legacy systems in favor of new digital regimes, some incumbents extend the performance limits of existing technologies or pursue bridging strategies that hybridize legacy and digital components (Cozzolino, Verona, & Rothaermel, 2018; Furr & Snow, 2024). These strategies allow firms to delay full substitution, maintain relevance, and incrementally prepare for digital transition. While extension strategies often lead to niche market retreats, bridging strategies—such as hybrid products or platform alliances—facilitate smoother transitions and can improve survival rates during substitution periods. This insight broadens the conceptualization of strategic response to DT, revealing that firms may choose deliberate deferral over hasty transformation, especially in markets where digital standards are still evolving or where legacy systems continue to yield value.

Organizational structure

Digital transformation also demands structural flexibility. Organizational design determines how effectively firms integrate new technologies, coordinate across units, and support ongoing innovation. Taylor & Helfat (2009) argue that the presence of strong organizational linkages between technological and complementary asset units is critical for navigating technological transitions. Middle managers often serve as linchpins in this process, translating strategic intent into operational execution and bridging siloed units. However, structural and identity-based tensions frequently emerge, particularly during platform shifts, where established hierarchies and expertise may be disrupted (Vuori & Tushman, 2024). Organizations that adopt ambidextrous structures—with distinct but connected units for exploration and exploitation—are better positioned to manage these tensions. Moreover, successful structural adaptation requires emotional resilience and cultural alignment, not just formal reorganization.

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As digital transformation blurs boundaries between firms and ecosystems, coordination must extend beyond the firm to include external partners, platforms, and user communities.

Firm size and age also moderate digital response. According to BarNir, Gallaugher, & Auger (2003), newer and smaller firms are generally more agile and more likely to adopt digital strategies than larger incumbents, who may be more rigidly tied to legacy systems. Benner (2009) adds that institutionalized management practices, such as ISO 9000, can reduce incumbents' responsiveness by reinforcing exploitative routines, further hindering adaptation to digital disruption. Together, these findings underscore the multifaceted nature of digital response, shaped by values, identities, cognition, and institutional context as much as by competitive pressure or technical feasibility.

The approach firms take to respond to digital transformation is often shaped not only by market and technology factors but also by internal cognitive and cultural dynamics. Strategic choices are frequently influenced by how decision-makers interpret technological change, shaped by firm-specific values, identities, and managerial motivations. For example, Kammerlander & Ganter (2015) show that in family firms, the response to digital threats is mediated by non-economic goals such as preserving control or reputation. These values can constrain strategic openness and limit the scope of digital adaptation. Similarly, Reuter & Floyd (2024) emphasize the role of strategic leaders' cognitive motivations in shaping ecosystem visions during digital transformation, suggesting that leaders' mental models—not just external conditions—determine how firms reimagine their roles within changing digital value networks.

Beyond cognition, organizational identity plays a key role. Kammerlander, König, & Richards (2018) argue that incumbent firms often react based on perceived threats to their organizational identity, rather than engaging in proactive, future-oriented adjustments. This identity-based framing can either facilitate or hinder transformation depending on whether digitalization is seen as aligned or misaligned with the firm's traditional self-concept. Eggers & Kaul (2018) further highlight that firms tend to mobilize digital transformation when they recognize a performance deficit—that is, when actual performance lags behind aspirations (Romanelli & Tushman, 1994). This perspective implies that recognition of underperformance, rather than foresight, often triggers strategic change.

A growing body of research illustrates that responses to digital transformation are neither uniform nor passive; rather, they are shaped by multilevel dynamics—cognitive, organizational, and ecosystemic. For example, Cozzolino & Verona (2022) provide a multilevel adaptation framework that explains how incumbents respond to complementary-asset discontinuities, a scenario where digital technologies render legacy assets obsolete while leaving core knowledge relatively intact. Their longitudinal case study of Italian newspapers reveals that successful adaptation requires transformation across three levels: (1) resources, by recombining existing knowledge with new digital assets; (2) demand, through experimentation with customer preferences and value perceptions; and (3) ecosystems, by collaborating with new digital entrants and redefining value capture mechanisms. These findings challenge earlier notions that incumbents must transform from within alone and instead highlight the critical role of external alignment and interdependence in adapting to DT.

Further deepening our understanding of these responses, Eggers & Kaplan (2009) and Eklund & Kapoor (2019) explored forms of organizational response to technical change. In dynamic and uncertain digital environments, where transformation efforts involve significant risk and ambiguity, CEO attention—particularly to emerging technologies and shifting industry conditions—has a strong effect on strategic reorientation. Their studies demonstrate that top management teams are not just interpreters of environmental change but active shapers of firm trajectories, capable of accelerating or delaying market entry based on where their cognitive resources are directed. The interaction between managerial attention and organizational capabilities is especially significant. Incumbent firms with high absorptive capacity and prior industry experience are better positioned to interpret, internalize, and respond to digital threats. This dynamic interplay underscores that organizational inertia is not simply structural but also cognitive—rooted in leadership's ability or failure to reframe threats as opportunities.

Together, these studies shift the focus from a binary model of success or failure to a contingent, staged view of adaptation, showing that incumbent responses to digital transformation are mediated by several factors. Rather than simply resisting change, incumbents engage in active experimentation, selective recombination, and boundary-spanning collaboration to navigate the tensions between continuity and transformation. These findings underscore that successful digital responses require a synthesis of cognitive agility, organizational flexibility, and strategic ecosystem engagement—elements that collectively shape how incumbents survive and evolve in the face of disruptive digital change.

Leading to digital transformation

Successfully leading digital transformation requires a holistic reshaping of incumbent firms' business models, strategic decisions, and organizational structure choices (Brock et al., 2019; Eklund & Kapoor, 2019). The following sections explore these interconnected elements, drawing on recent research to illustrate how firms across different contexts manage the challenges and opportunities of digital transformation.

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Business models

Leading digital transformation often requires reimagining the business model, not simply in terms of product or service offerings but in how value is created and co-created across the broader ecosystem. Ansari, Garud, & Kumaraswamy (2016) demonstrate through the case of TiVo that disruptors must evolve from an egocentric approach—focused solely on the novelty and disruption of their technology—toward an allocentric model that emphasizes ecosystem integration and collaborative value creation. Initially, TiVo positioned itself as a hardware-based disruptor, threatening existing industry arrangements. However, its transformation into a software platform supporting legacy systems exemplifies a shift in business model logic from fragmentation to orchestration. This involved modifying the technological architecture to accommodate stakeholders and converting coopetitive tensions into shared gains, thereby fostering mutual adaptation. Such evolution aligns with the idea that leading digital transformation involves iterative business model redesign, where incumbent firms do not merely introduce new value propositions but strategically reposition themselves as central nodes in digital ecosystems (Brock et al., 2019).

Extending this perspective, Xie, Zhang, & Blanco (2023) highlight the particular challenges and dynamics family businesses face in digitally transforming their business models. Their work underscores that organizational readiness for digital innovation—defined as the preparedness to adopt, assimilate, and exploit digital technologies—is critical in shaping the successful implementation of digital business model innovation in family firms. While family businesses often benefit from strategic agility and long-term orientation that facilitate digital transformation, constraints such as risk aversion, resource limitations, and the protection of socioemotional wealth can hinder the adoption of radical digital innovation. The authors emphasize that overcoming these barriers requires a proactive assessment and cultivation of readiness at the organizational level.

Further complementing these views, Upadhyay et al. (2023) explore how family businesses' entrepreneurial orientation and digital entrepreneurship capabilities influence their intention to adopt artificial intelligence, which is critical in driving innovative business models (Pinkse, Demirel, & Marino, 2024 Upadhyay et al. (2023). reveal that business innovativeness, culture, and flexible organizational design are key antecedents for technology adoption in family firms.

Strategy

Digital transformation leadership is as much a cognitive and relational act as it is a technical or market-driven one. Butt et al. (2024) emphasize that in industrial firms, the strategic enactment of transformation is heavily influenced by the design and integration of organizational culture as a form of sociocultural governance. In both cases, the leaders did not follow static, pre-defined roadmaps. Instead, strategy was an adaptive process where feedback loops between culture, technology, and stakeholder relationships continuously reshaped the transformation pathway (Butt et al., 2024; Troilo, De Luca, & Guenzi, 2017). This implies that firms effectively lead digital transformation by fostering a mindset of strategic responsiveness—balancing long-term vision with near-term negotiation and alignment with internal and external stakeholders.

Building on these insights, Simsek et al. (2024) provide a nuanced framing of the roles strategic leaders play in driving digital transformation within incumbent firms, framing these through a strategic entrepreneurship lens. They argue that leaders influence digital transformation by shaping cognitive interpretations of digital technologies, balancing strategic tensions such as exploration versus exploitation, and orchestrating the leveraging and linking of digital and non-digital capabilities. Their work identifies three core leadership capabilities: sensing and shaping digital opportunities, navigating strategic tensions, and leveraging organizational capabilities through orchestration. This triad reflects the necessity for leaders to combine entrepreneurial agility with strategic rigor, particularly as digital transformation often challenges incumbents to experiment with emerging business models while maintaining alignment with core operations and ecosystems. Similarly, Ansari, Garud, & Kumaraswamy (2016) describe how TiVo's success in navigating ecosystem hostility hinged on dynamic strategic recalibration, including both soft power (e.g., social skills and relational framing) and hard power (IP enforcement and contractual leverage). Their ability to switch between cooperation and competition underscores the importance of strategic ambidexterity in leading transformation. Similarly, other studies show that the diffusion of new technologies enables incumbent firms to develop novel strategies rather than passively react to the ones adopted by their competitors (Agyei-Boapeah, Evans, & Nisar, 2022; Khanagha et al., 2018; Shibata, 2012; Troilo, De Luca, & Guenzi, 2017).

Complementing these views, Schiuma et al. (2022) introduce the concept of the "transformative leadership compass," outlining six key competencies necessary for leaders to effectively drive digital transformation entrepreneurship. Their framework underscores the importance of combining digital knowledge generation, continuous learning, and sustainable value creation to foster organizational cultures conducive to transformation. This leadership profile bridges the gap between strategic vision and operational execution by promoting attitudes and mindsets aligned with agility, innovation, and ecosystem collaboration.

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Organizational structure

Digital transformation not only reshapes business models and strategy but also requires reconfigurations in organizational structure to support agility, innovation, and ecosystem engagement (Brock et al., 2019; Smith & Beretta, 2021). For instance, Simsek et al. (2024) emphasize that strategic leaders must build what they term "entrepreneurial judgment governance" to effectively distribute and orchestrate decision rights across the organization. This governance adaptation enables firms to manage new forms of uncertainty brought by digital transformation, which often exceeds firms' prior experience with uncertainty management. Their research suggests that leadership is key to establishing learning processes and experimentation structures that permeate all organizational levels, thus fostering collective sensing, shaping, and seizing of digital opportunities. This implies that organizational structures for digital transformation must be designed not only for efficient control but also for distributed entrepreneurship and adaptive learning. Furthermore, Pinkse, Demirel, & Marino (2024) show that the reconfiguration of incumbent firms' capabilities plays a key role in digital innovation transition in complex industrial sectors. Their study suggests four main capabilities, i.e. recombinative, collaborative, integrative, and socio-cognitive capabilities, as key enablers for organizational changes. Xie, Zhang, & Blanco (2023) add that family businesses, due to their unique ownership and resource constraints, may face additional challenges in reorganizing structures for digital innovation. Their study notes that limited digital skills and risk-averse attitudes among owner-managers can slow the adoption of digital business model innovation, which requires not only technological investments but also changes in organizational routines and governance. Organizational readiness in this context includes building digital capabilities and fostering a mindset open to change, both of which often demand structural supports such as dedicated innovation units or cross-functional teams to bridge the gap between traditional and digital business logic.

From a sectoral perspective, Cannas (2023) explores how agrifood SMEs confront digital transformation by developing dynamic capabilities—such as sensing, seizing, and transforming—that enable them to adapt processes, resources, and organizational routines in response to turbulent environments. The study highlights that organizational structure must facilitate these dynamic capabilities through cultural openness and the development of personal and collective skills like creativity and empathy. This approach helps SMEs overcome cultural resistance and resource constraints common in traditional sectors.

Leading and responding

We found that it is not always straightforward to distinguish whether an incumbent leads or reacts to digital transformation processes and challenges. In some studies, the two approaches can be mixed (Burström et al., 2021; Sund et al., 2021; Van Dyck et al., 2024). For instance, Smith & Beretta (2021) highlight that, in parallel, incumbent firms can reactively respond to the challenges related to digital transformation processes (e.g., selection of platforms, technical difficulties, and conflicts between autonomy and control) by proactively adopting a hybrid model of separation and integration to organize and manage their digital transformation efforts, thereby balancing autonomy and integration. Similarly, Paiola et al. (2022) and Leiting, De Cuyper, & Kauffmann (2022) show that, while incumbents are forced to innovate their business models due to the diffusion of competitors' innovations, at the same time, this diffusion stimulates incumbents to adopt proactive approaches that exploit the opportunities offered by technologically advanced solutions. Bosch, for example, has changed its way of working in response to the spread of Internet of Things (IoT) technologies. On the one hand, the firm has passively suffered from the emergence of these technologies; on the other hand, it has exploited them as levers to improve the company's (1) value proposition, (2) creation of value, and (3) capture of value, thereby remaining competitive in the market (Leiting, De Cuyper, & Kauffmann, 2022).

DISCUSSION

This review synthesizes a growing but fragmented body of literature on how incumbent firms engage with digital transformation, either by proactively leading it or reactively responding to external digital challenges and pressures. Recognizing that the challenges of digital transformation are not solely technological but also fundamentally strategic and organizational in nature (Elia et al., 2024; Plantec et al., 2023; Vial, 2019), we focus on how incumbent firms reshape their business models, strategic decisions, and organizational structures.

We found that the changes or adaptation of business models are central to how incumbents respond to and lead digital transformation. Incumbent firms are often forced to rethink how value is created, delivered, and captured. Some firms radically reconfigure their models, while others pursue incremental changes depending on how digital innovations relate to their core offerings (Ma, 2023). Leading firms increasingly position themselves as orchestrators within broader ecosystems, shifting from egocentric to allocentric logics (Ansari, Garud, & Kumaraswamy, 2016). Recent work highlights both the unique strengths (e.g., agility and long-term orientation) and constraints (e.g., risk aversion, socioemotional wealth preservation) that influence business model innovation (Upadhyay et al., 2023; Xie, Zhang, & Blanco, 2023). Hence, the extent of business model transformation depends on an incumbent firm's readiness for digital change.

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At the strategic level, we found that digital transformation might require ambidextrous thinking—a balance between exploiting existing capabilities and exploring new opportunities. Cognitive framing by top management teams (TMTs) plays a crucial role in determining how digital challenges are perceived and acted upon (Vuori & Tushman, 2024). Some incumbent firms might pursue strategies aiming to extend the relevance of legacy systems while experimenting with digital alternatives (Furr & Snow, 2024). Strategic leadership also involves shaping organizational culture and stakeholder relationships as part of an adaptive, relational process rather than following linear, top-down plans (Butt et al., 2024). Leaders who successfully drive transformation tend to possess capabilities such as opportunity sensing, strategic tension navigation, and ecosystem orchestration (Simsek et al., 2024). These leaders engage in dynamic recalibration, switching between cooperation and competition depending on context (Ansari, Garud, & Kumaraswamy, 2016), and develop mindsets of continuous learning and sustainable value creation (Schiuma et al., 2022).

We also found that organizational structure plays a foundational role in determining whether digital transformation processes take root and scale. Incumbent firms that adopt ambidextrous or flexible structures—balancing centralized control with distributed autonomy—are better able to support innovation, cross-functional integration, and ecosystem engagement (Simsek et al., 2024; Taylor & Helfat, 2009). Middle managers often act as key translators between strategy and execution, particularly during digital transformation changes. However, legacy hierarchies and siloed routines can inhibit structural reconfiguration. Incumbent firms (e.g., family firms and SMEs) often face greater structural and cultural resistance to change (Cannas, 2023; Xie, Zhang, & Blanco, 2023). Effective organizational structures for digital transformation processes not only enable technological integration but might also foster psychological safety, emotional resilience, and distributed decision-making under uncertainty.

Furthermore, our systematic review shows that responses to digital transformation are shaped by multilevel dynamics, including managerial cognition, organizational identity, and industry ecosystems. Strategic responses are not simply rational calculations but are filtered through identity frames, values, and perceptions of performance gaps (Eggers & Kaul, 2018; Kammerlander, König, & Richards, 2018). For example, digital threats may be rejected or downplayed if they conflict with a firm's traditional self-concept, while recognition of performance shortfalls can act as a trigger for change. Cozzolino & Verona (2022), for example, demonstrate that successful adaptation often requires firms to recombine knowledge assets, re-engage with evolving customer preferences, and realign with emerging ecosystems—not simply transform from within. This highlights that digital transformation success hinges on both internal change and external coordination. Similarly, we find that top management attention and absorptive capacity are pivotal in determining how incumbent firms interpret digital transformation processes and act upon them (Eggers & Kaplan, 2009; Eklund & Kapoor, 2019).

We also show that, in some studies, it is not always obvious to determine whether an incumbent responds to digital transformation reactively or proactively. In certain circumstances, the two responses may be combined (Leiting, De Cuyper, & Kauffmann, 2022; Paiola et al., 2022; Smith & Beretta, 2021).

Our review contributes to the digital transformation literature by unpacking how incumbent firms change business models, restructure organizational structures, and reshape strategic choices. In the next section, we provide a foundation for future research on how incumbent firms can lead or respond to digital transformation by highlighting both the antecedents and the consequences of their strategic and organizational responses.

FUTURE RESEARCH AGENDA

Incumbent firms responds to digital transformation: antecedents

Incumbent responses to digital transformation are shaped by a range of managerial, organizational, and contextual factors, yet important questions remain about how these antecedents interact under different conditions. Organizational design choices, including the use of structural linkages between existing and emerging business units, also matter. Incumbent firms face trade-offs between integrating old and new operations or maintaining structural separation. These linking mechanisms may be temporary or permanent, depending on the length of the transition and the degree of interdependence between core technologies and complementary assets (Taylor & Helfat, 2009).

Incumbent firms' resource endowments further influence their transformation paths. Incumbents with in-house capabilities in component technologies and access to internal users appear more likely to adapt effectively to disruptive changes. However, firms may also need to acquire external technologies and develop absorptive capacity to integrate them into their innovation processes (Roy, Lampert, & Stoyneva, 2018). Managerial cognition, particularly CEO attention, plays a central role in determining how and when organizations engage in strategic renewal. Misalignment between managerial focus and organizational orientation may hinder transformation efforts and could stem from dysfunctional governance, path-dependent routines, or adaptive tensions between legacy and emerging logics (Eggers & Kaplan, 2009). Factors such as managerial discretion, organizational culture, and institutional context can enhance or constrain the firm's ability to pursue proactive innovation (Bornhausen & Wulf, 2024). The broader ecosystem and institutional

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environment also condition transformation outcomes. In sectors such as agriculture, digital strategies may be shaped by geographic and policy factors, cooperative structures, and localized customer behaviors, raising questions about the generalizability of transformation patterns across different contexts (Appleton & Holt, 2024).

Technology type and its position within the value chain further determine how incumbents respond. Responses to classical substitution—where the new technology enters as a higher-cost, component-level innovation—may involve more gradual adaptation strategies such as bridging or extension tactics. By contrast, disruptive technologies often trigger more immediate strategic reorientation. Incumbent firms also vary in whether they adopt technologies proactively or reactively, and how they sequence investments in hybrids or intermediating technologies before full adoption (Furr & Snow, 2024). Across all these antecedents, there is a need for more longitudinal, cross-industry, and multilevel research designs that explore how capabilities, cognition, structure, context, competition, and other external factors (see also Benner & Ranganathan, 2012) combine to shape the pathways of digital transformation.

Incumbent firms responds to digital transformation: consequences

The outcomes of digital transformation are complex and often unfold over different time horizons, affecting firms at strategic, organizational, and market levels. While early studies often focus on short-term market responses, such as changes in firm value or stock price, these may not fully reflect long-term performance or strategic repositioning. Adjustment costs may lead to temporary valuation dips, but firms can still emerge stronger if they realign effectively with new business models or technologies (Bachmann & Jodlbauer, 2023; Eklund & Kapoor, 2019). Future work can complement financial measures with more nuanced indicators such as innovation conversion rates, customer engagement, and ecosystem influence, to capture the real impact of transformation strategies (Bornhausen & Wulf, 2024; Klos et al., 2021). Additionally, the effectiveness of resource reallocation and capability development efforts (see also Subramanian, Chai, & Mu, 2011) can differ based on whether the firm is targeting technological renewal or business model reinvention.

Organizational responses to transformation can also generate identity tensions and internal conflict, especially when legacy and new units must coexist. Scholars can explore how emotional resistance, political maneuvering, and cultural misalignment can undermine transformation success, particularly when internal linkages are not effectively managed. Competition or collaboration between managers of old and new assets may affect how knowledge is shared, incentives are structured, and innovation is prioritized (Taylor & Helfat, 2009). These dynamics are especially salient in family firms, where relational norms and legacy commitments may create barriers to change, unless offset by the presence of empowered non-family executives or flexible governance structures (Bornhausen & Wulf, 2024).

Transformation may also produce changes at the industry level. In some cases, incumbent firms that adapt successfully can redefine competition and reshape industry architecture, establishing themselves as standard-setters or ecosystem orchestrators. Responses such as bridging and extension strategies can prolong the life of legacy technologies, delay substitution, or reposition firms advantageously within new ecosystems (Furr & Snow, 2024). Yet many transformations fail to achieve their intended outcomes due to incomplete alignment between strategic intent and operational execution. Measuring these consequences requires capturing not only what firms do but how they do it over time—whether they are building, reconfiguring, or discarding capabilities and relationships. Ultimately, more longitudinal, process-based research is needed to understand how incumbents balance continuity and change, and how they convert digital initiatives into sustained competitive advantage.

Leading the digital transformation

Although increasing attention has been given to the processes and outcomes of digital transformation, a comprehensive understanding of how it is led—across various organizational contexts, industries, and ecosystem structures—remains incomplete. To deepen theoretical development and empirical insight, we summarize future research opportunities to understand both the antecedents that enable digital transformation and the consequences it generates within and beyond firm boundaries.

Incumbent firms leads digital transformation: antecedents

The capacity of incumbent firms to lead digital transformation is conditioned by a complex array of organizational, strategic, technological, and environmental factors. One critical antecedent lies in the flexibility of the underlying technological architecture. While current research explores the role of platforms or novel business models to create and develop novel ecosystems, future studies may explore how leadership within incumbent firms unfolds in contexts characterized by rigid platform-enabled technologies, particularly in contexts with high regulatory complexity (cf. Ansari, Garud, & Kumaraswamy, 2016).

At the leadership level, both motivation and ability influence the effectiveness of digital transformation initiatives. There is a need for greater attention to how

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leadership characteristics—such as digital fluency, strategic cognition, and learning orientation—shape firms' engagement with emerging technologies such as AI or IoT. Existing work suggests that factors such as board composition, prior experience, and internal knowledge networks may impact leaders' capacity to drive digital change, but more research is needed into how microfoundations operate in different governance contexts (Ceipek et al., 2021; Foss & Lindenberg, 2013; Kammerlander, König & Richards, 2018).

Organizational culture plays a foundational role in shaping whether digital initiatives take root or stall. Research has highlighted the importance of aligning cultural assumptions, values, and artifacts with the goals of digital transformation, especially in industrial settings. Yet cultural configurations vary widely across firms, sectors, and national contexts. This opens avenues for exploring how cultural enablers of incumbent firms emerge in small, young, or geographically limited firms, and how competing strategic priorities—such as digitalization, sustainability, and diversity—are negotiated through different configurations of cultural design (Butt et al., 2024; Janićijević, 2011).

Furthermore, considering that digital transformation has a significant impact on incumbent firms' capabilities (Brewis, Dibb, & Meadows, 2023; Browder, Dwyer, & Koch, 2024; Gomes et al., 2024; Langley & Rieple, 2021; Paiola et al., 2022; Vuori & Tushman, 2024; Warner & Wäger, 2019) a deeper understanding of how established skills and routines might drive the digital transformation could be an interesting opportunity for future research.

The organizational setting also matters. In family businesses, for example, transformation is often moderated by concerns over socioemotional wealth, risk aversion, and leadership continuity. Research in this context can benefit from examining how intergenerational leadership transitions, informal authority structures, or trust-based governance influence strategic readiness for digital innovation (Upadhyay et al., 2023; Xie, Zhang, & Blanco, 2023).

Additionally, the broader ecosystem in which an incumbent firm operates imposes boundary conditions on decision-making processes. In open, dynamic ecosystems characterized by high interdependencies, the ability to lead often requires orchestrating multilateral relationships and managing tensions between competition and cooperation. This raises new questions about the capabilities required to lead transformation in industries undergoing convergence, such as mobility or energy, where disruption in one domain may trigger ripple effects across others (Moore, 2006; Wareham, Fox, & Cano Giner, 2014).

Incumbent firms leads digital transformation: consequences

While the enabling conditions for digital transformation are critical, so too are the consequences that follow from it. A key area for future research concerns how incumbent firms reshape internal governance structures. Distributed decision-making, learning, and experimentation enabling digital transformation could generate coordination challenges or institutional frictions that affect digital transformation outcomes (Simsek et al., 2024).

Digital transformation also redefines incumbent firms' positioning within broader ecosystems. The emergence of hybrid business models and platform logics (e.g., Bohnsack et al., 2021; Campagnolo, Gianecchini, & Mosca, 2023; Cozzolino, Corbo, & Aversa, 2021) suggests that incumbent firms need to manage external legitimacy, multiparty coordination, and evolving regulatory expectations. Future research could explore how these factors change before and after digital transformation processes (König et al., 2012; Ansari, Garud, & Kumaraswamy, 2016).

Strategically, incumbent firms can explore the changes in performance related to how they balance exploration and exploitation over time, or how post-transformation trajectories are managed. Longitudinal designs could help trace the strategic outcomes of digital transformation processes.

Beyond firm boundaries, digital transformation has broader ethical and societal consequences. For instance, as incumbent firms increasingly adopt AI and data-driven models, questions of governance, fairness, and accountability come to the fore. Future research should investigate how incumbent firms leading digital transformation align their own social and profit interests with public interest, ethical innovation, and responsible governance—especially in cross-sectoral settings involving regulators, citizens, and civil society actors (Duan et al., 2019; Weerakkody et al., 2007; Weerakkody, Dwivedi, & Irani, 2009).

Moving beyond the classification of incumbent firms as either leading or responding to digital transformation, scholars could explore degrees and dimensions of internal or external engagement. For instance, incumbents may lead collaborations aiming to develop customer-facing technologies while remaining slow to digitize internal processes. Longitudinal studies could examine these hybrid trajectories and identify whether partial transformation leads to a sustainable competitive advantage or long-term vulnerability.

Future research could investigate how digital expertise and diversity affect digital transformation outcomes. Board governance, succession planning, and executive education for digital readiness also warrant closer examination, especially in traditional industries where digital experience at the top is often lacking. More attention should be given to political dynamics that shape digital transformation. Future research could integrate perspectives from organizational politics, institutional theory, and change management. Other studies can explore the role of digital transformation for incumbent firms aiming to achieve sustainable outcomes (e.g., net-zero

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emissions, reducing waste, circular economy initiatives, etc.) and the required novel business model configurations and organizational structure changes over time (Comi, Mosca, & Whyte, 2025; Falcke et al., 2024; George & Schillebeeckx, 2022; Mosca, Gianecchini, & Campagnolo, 2021). Furthermore, scholars can explore digital transformation at the ecosystem level across industries, countries, and cities (Kolagar, Parida, & Sjödin, 2022; Lobo & Whyte, 2017; Whyte, 2019).

The digitalization phenomenon is a double-edged sword. It could undermine the company's internal balances, prompting it to reorient processes, strategies, and actions (Abebe, Tangpong, & Ndofor, 2021; Agyei-Boapeah, Evans, & Nisar, 2022; Autio, Mudambi, & Yoo, 2021; Hsu & Cohen, 2022; Kammerlander, König, & Richards, 2018; Moschko, Blazevic, & Piller, 2023; Roy, Lampert, & Stoyneva, 2018). Future studies could explore how firms can allay the disruptive effects of the digitalization phenomenon.

Finally, there is a need to clarify how success in digital transformation is defined and measured. Many studies use proxies such as innovation output or financial performance, but these may not fully capture the scope of incumbents' changes.

CONCLUSION

To address our research question on how incumbent firms lead or respond to digital transformation, we conduct a comprehensive literature review of 68 articles published in top-tier journals. Our review article explores how incumbent firms strategically engage with digital transformation, whether by leading initiatives that drive innovation or responding to external pressures that demand adaptation. Through a comprehensive literature review, we contribute to the broader management and strategy literature by bridging fragmented insights and offering a more holistic understanding of digital transformation within incumbent firms.

We also contribute to the existing literature on digital transformation by highlighting how incumbent firms change and adapt strategies, organizational structures, and business models. Digital transformation is a double-edged weapon with heterogeneous effects within and across incumbent firms. Therefore, shedding light on its multifaceted effects provides management scholars with novel insights and opens new avenues of research.

AUTHOR CONTRIBUTIONS

Anna Bastone: data collection, data analysis, writing, and conceptualization. **Luigi Mosca:** data collection, data analysis, writing, and conceptualization. **Christopher L. Tucci:** supervision, study validation, project administration, writing. **Sai Lan:** study validation, writing. **All authors**: reviewed and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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