

DYNAMIC MANAGERIAL CAPABILITIES FOR DIGITAL TRANSFORMATION IN INNOVATIVE SMEs: WHAT ARE THE EFFECTS ON NEW PRODUCT DEVELOPMENT PERFORMANCE?

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Funding sources: This work was supported by the Spanish Ministry of Science, Innovation and Universities with two research projects: PID2024-162556NB-I00 financiado por MICIU /AEI /10.13039/501100011033 / FEDER, UE and PID 2021-127882NA-I00 financed by MCIN/AEI/10.13039/501100011033 and by FEDER una manera de hacer Europa, UE.

Declaration of interests: None

This is the accepted version in Journal of Business Research with DOI:
<https://doi.org/10.1016/j.jbusres.2025.115709>

Paper accepted on the 8th of September 2025.

This publication has open access:
<https://www.sciencedirect.com/science/article/pii/S0148296325005326>

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ABSTRACT

In innovative SMEs, the CEO is the main decision-maker for digital transformation (DT). This study focuses on the specific microfoundations of CEOs' dynamic managerial capabilities (DMCs) by examining how their general expertise, digital expertise, external connectivity, and empowering leadership influence DT. Additionally, based on upper echelons theory, we also examine how CEO tenure and age moderate the relationship between the CEO's DMCs and DT. Finally, we investigate the link between DT and new product development (NPD) performance. Using survey and archival data from innovative Spanish SMEs, we present three main findings: (1) DMCs enable DT in a non-uniform manner, (2) CEO tenure and age impact some of the positive effects of DMCs on DT, and (3) DT improves NPD performance. Our results provide several scholarly and managerial implications and directions for future research.

Keywords: *Dynamic Managerial Capabilities, Digital Transformation, NPD Performance, Innovative SMEs, Microfoundations.*

1. Introduction

As a dynamic and evolutionary process, digital transformation involves adopting digital technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and big data, to create differential value in this new digital era (Morakanyane et al., 2017; Vial, 2019). Digital Transformation (DT) is a “fundamental change process enabled by the innovative use of digital technologies, accompanied by the strategic leverage of key resources and capabilities, with the aim of radically improving a firm and redefining its value proposition to its stakeholders” (Gong & Ribiere, 2021; p.12). According to current studies (e.g., Vial, 2019; Warner & Wäger, 2019), DT relates to positive outcomes, including improving firm performance (Eller et al., 2020), innovating firms’ business models (Merín-Rodríguez et al., 2024), building flexible organizational designs (Hanelt et al., 2021), or achieving economies of scale (Furr et al., 2022).

However, the harsh truth is that most DT initiatives ultimately fail, with recent studies reporting that between 70% and 80% of DT initiatives do not meet their expected goals (Tabrizi et al., 2019; Wade & Shan, 2020). This failure rate is an especially pressing concern for small and medium-sized enterprises (SMEs) due to their relative scarcity of financial resources (Del Giudice et al., 2021), inadequate capabilities for experimenting with new digital technologies (Bouwman et al., 2019), gaps in technological knowledge (Klein & Todesco, 2021), and the resistance of employees who might perceive DT as a threat (Horváth & Szabó, 2019). SMEs are the most common type of firm; however, treating them as a homogeneous group does not allow for a detailed understanding, as not all are equally prepared for DT (Eller et al., 2020). For this reason, we focus on innovative SMEs, which are those committed to change and involved in R&D and technological development activities (Flor & Oltra, 2004; Alegre & Pasamar, 2018; OECD, 2018).

Digital technologies cannot generate ‘flexibility’ or ‘innovation’ alone; instead, it is the responsibility of managers to cultivate a digital mindset as they transform existing

organizational practices into digital ones (Tabrizi et al., 2019; Vial, 2019). In the case of SMEs, Matarazzo et al. (2021) emphasized the importance of the CEO in the decision-making process, which is crucial for undertaking transformational processes such as DT. Building on this reasoning, we respond to current calls (Foss & Mazzelli, 2015; Baishya et al., 2025) to place managers at the center of strategic processes and build on the concept of Dynamic Managerial Capabilities (DMCs) (Adner & Helfat, 2003; Helfat & Martin, 2015a) to better understand the relationship between CEOs' capabilities and traits, and innovative SMEs' DT process and outcomes. Addressing this research gap is theoretically and practically relevant for two reasons. First, innovative SMEs have riskier business models and are more sensitive to technological changes because they depend heavily on innovation to survive and grow (Wang et al., 2025). Moreover, despite an organizational culture and routines that foster innovation, innovative SMEs face more severe financial, human, and technological constraints than larger competitors and rely more on external financial resources (Lee et al., 2015). Therefore, CEOs' DMCs might serve as a catalyst for engaging in DT. Second, innovative SMEs are characterized by rapid growth and their contribution to creating a more competitive economy (Eshima, 2003). Therefore, identifying the key managerial capabilities driving their DT should be a priority for practitioners and policymakers, as these factors could offer valuable insights for developing strategies to enhance SME digitalization.

According to Adner and Helfat (2003; p. 1012), DMCs are “the capabilities with which managers build, integrate, and reconfigure organizational resources and competences.” DMCs are rooted in three core managerial underpinnings (Adner & Helfat, 2003): managerial human capital, managerial social capital, and managerial cognition. More recently, Baishya et al. (2025) identified managerial political capital as the fourth underlying factor within the DMCs framework. These managerial capabilities facilitate adaptive changes in firms' resource base through various social mechanisms (Foss & Mazzelli, 2025), enabling managers to navigate

and make sense of ambiguous situations or manage conflict effectively. For instance, Dasí and Kok (2025) investigate the DT of the biggest independent fashion retailer in the Netherlands. The company transformed the physical store into an integrated online and physical business. Such a process took 6 years to complete (between 2010 and 2016) and challenged all of the company's functions, including supply chain, human resources management, operations, IT systems, and marketing. Concerning the role of DMC for the company's DT, purposeful friction, or the ability to discuss conflicting perceptions among individual managers on the board, was key to the success of this DT process (Dasí & Kok, 2025). Similarly, Cannas (2021) studied the DT of Italian agribusiness SMEs and identified CEO capabilities, including empathy, creativity, and intuition, as fundamental to overcoming resistance to DT. In this study, we extend previous conceptual and qualitative research, demonstrating how the CEO's DMC relates to innovative SMEs' DT.

Moreover, we expect the CEO DMC–DT relationship to be contingent and consider the moderating effects of two time-related CEO traits: tenure and age. While an enormous volume of research in the upper echelons literature (e.g., Hambrick & Mason, 1984; Hambrick, 2007) has identified CEO tenure and CEO age as two critical characteristics that influence managerial actions, reactions, and personal perceptions of the environment (Artamoshina et al., 2023; Ezeani et al., 2024), there is less evidence on whether they intervene in the relationship between DMCs and DT. However, we anticipate that both tenure and age can influence the previous relationship, as they can affect the risk attitude of the CEO (McClelland et al., 2010; Liu & Wu, 2025). This influence might, in turn, weaken the active mobilization of their DMCs to handle the challenges associated with a dynamic and disruptive process, such as DT.

Beyond understanding the antecedents of DT for innovative SMEs, we delve into its outcomes for their New Product Development (NPD) performance. Innovative SMEs mainly differ from traditional ones in the effort and resources allocated to developing innovative

products (Hervas-Oliver et al., 2021). However, despite the benefits associated with developing new, smart, and connected products or services (Porter & Heppelman, 2014; Lanzolla et al., 2021), superior firm performance is not guaranteed. Being a digital firm is costly (Ghosh et al., 2022), and consumers might be unwilling to pay more for technologically advanced products and services without a clear value proposition (Björkdahl, 2020). To reconcile these conflicting views, we focus on examining innovative SMEs as a boundary condition since: (a) NPD is argued to be especially critical to creating a competitive advantage among these firms (e.g., Hervas-Oliver et al., 2021); and (b) several theoretical and empirical research gaps still hinder a comprehensive understanding of how DT influences NPD and produces positive performance outcomes (Appio et al., 2021).

With this in mind, three research questions guide this study: (1) *How do CEO's DMCs relate to DT in innovative SMEs?* (2) *How do CEO tenure and CEO age shape the relationship between CEO's DMCs and DT in innovative SMEs?* (3) *How does DT relate to NPD performance in innovative SMEs?* We test our research model using PLS-SEM on a dataset from a recent survey and archival data of 414 innovative Spanish SMEs. We contribute to knowledge in three ways. First, we advance the literature on the antecedents of DT by providing a microfoundational perspective (Felin et al., 2015; Foss & Mazzelli, 2025) that places the individual and the differences in their managerial capabilities at the center of the explanation of an organizational and technological change process (Wang et al., 2019; Hock-Doepgen et al., 2024) such as DT. Consequently, this study responds to recent calls for research (Li et al., 2018; Heubeck, 2023) and brings additional empirical evidence and theoretical understanding about the central role of CEOs' managerial capabilities in explaining firm differences in DT. Second, we reflect on the potential eroding effect of time-related traits of CEOs' age and tenure over their managerial capabilities, offering a more nuanced perspective to the DMC literature. Third, by focusing on the innovative character of SMEs as a boundary condition, this study

clarifies previous mixed results concerning the impact of DT in terms of NPD performance (Dabić et al., 2023; Schneider et al., 2023). On a managerial level, our study helps managers understand the specific circumstances under which the mobilization of DMCs could be channeled toward the achievement of DT. Additionally, CEOs of innovative SMEs should pay close attention to CEO tenure and age, as these time-related characteristics might diminish their ability to convert DMCs into the desired level of DT. Finally, our study emphasizes the importance of implementing a company-wide DT to leverage efforts put into developing new products. The remainder of the paper is as follows: Section 2 presents our theoretical framework and hypotheses. Section 3 describes the methodology. Section 4 discusses our analysis and results. Finally, Section 5 concludes with a discussion of the implications, limitations, and issues for future research.

2. Theory and hypotheses

2.1. Dynamic managerial capabilities and Innovative SMEs digital transformation

Dynamic capabilities are the capabilities that enable a firm to “create, extend, upgrade, protect and keep relevant the enterprise’s unique asset base” (Teece, 2007; p.1319). Adner and Helfat (2003) introduced the concept of DMCs by paying attention to the role of top managers and focusing on how their managerial decisions affected a firm’s strategic change and performance. DT is a continuous complex process that influences, to a greater or lesser extent, each company activity (Matt et al., 2015; Morakanyane et al., 2017). It differs from digitalization, which “focuses mainly on the business process automation, operations automation, as well as on the processing of information” (Tijan et al., 2021; p.2). Consequently, DT “is a company-wide phenomenon” that affects its way of doing business (Verhoef et al., 2021; p.892).

Understanding the antecedents of innovative SMEs' DT process requires introducing lower-level explanations—its microfoundations. Microfoundations in strategic management refers to a research program centered on the identification and understanding of the underlying individual-level processes and actions that underpin higher-level processes and collective actions (Felin & Foss, 2005; Teece, 2007; Felin et al., 2015; Foss & Mazzelli, 2025). Some of these key individual-level processes refer to cognition and perception. These are individual beliefs and mental models that shape sense-making (Gavetti, 2005), individuals' heuristics and risk preferences that impact their strategic choices (Felin & Foss, 2005), or social interactions and learning processes (Nahapiet & Ghoshal, 1998).

In articulating the microfoundations of dynamic capabilities at the individual level, Adner and Helfat (2003) pointed to three core managerial capabilities: managerial human capital, managerial social capital, and managerial cognition. Managerial human capital refers to the learned skills, knowledge, and expertise that managers acquire throughout their lives through various activities such as training, education, and experiences (Becker, 1964). Managerial social capital denotes “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual” (Nahapiet & Ghoshal, 1998; p. 243). Managerial cognition refers to mental structures and beliefs that help managers in their decision-making process (Adner & Helfat, 2003). Extant research within the DMC literature has generally assumed “*the more, the better*” concerning various managerial capabilities, without differentiating between the specific effects of each DMC.

Building on the three core underpinning DMCs (Adner & Helfat, 2003; Helfat & Martin, 2015a), we follow the approach of Wang et al. (2019) to argue that CEO's managerial capabilities in terms of expertise breadth, external connectivity, and empowering leadership provide the basis for decision-making in dealing with DT. Expertise breadth represents

managerial human capital sources such as educational backgrounds, past career experiences, and international exposure through which CEOs acquire and develop expertise that enhances their ability to address and solve various challenges (Wang et al., 2019). External connectivity refers to the managerial social capital through which CEOs have access to external information and resources based on the formal and informal relationships that managers build with key external stakeholders of the firm, such as banks, suppliers, or customers (Adler & Kwon, 2002; Helfat & Martin, 2015a). Regarding managerial cognition, empowering leadership requires additional cognitive effort from CEOs to overcome their resistance to sharing decision-making power with employees and to build emotional commitment that fosters cooperation among subordinates (Thomas & Velthouse, 1990; Zhang & Bartol, 2010). Therefore, the link between managerial cognition and empowering leadership occurs through cognitive processes that build motivation and a sense of self-efficacy, driven by the leader (Wang et al., 2019). This is shown through specific behaviors, such as creating an environment where subordinates feel encouraged to share their opinions and ideas, promoting collaborative decision-making, and supporting information sharing and teamwork (Lorinkova et al., 2013).

2.1.1. Expertise breadth and digital transformation

We distinguish between two dimensions of CEOs' expertise breadth. First, we conceptualize *general expertise* which entails all the expertise acquired and developed through formal education and training (Hambrick & Mason, 1984); their accumulated industry-specific managerial experience since it provides more profound knowledge of the industry and the critical stakeholders involved in the firm's value chain; and their international experience, capturing the skills and experiences of working in different competitive environments (Hsu et al., 2013). Second, *digital expertise* comprises the skills and digital knowledge acquired through running a digital business and fundamental to designing and executing a DT strategy.

General expertise and digital transformation

The CEO's general expertise can help meet the managerial needs necessary to prepare innovative SMEs for DT. First, education is a vital aspect of human capital that can enable CEOs to participate more deeply in the DT decision-making process by enhancing their information-processing skills. CEOs with higher levels of formal education may be better equipped to understand and evaluate the options and implications of adopting digital technologies to replace current business processes (Hsu et al., 2013).

Second, industry-specific managerial experience includes knowledge acquired from prior work experience, which constitutes part of the cognitive framework for making managerial decisions (Adner & Helfat, 2003). The experience of working in a specific industry enables managers to identify and evaluate the value of emerging technologies for the industry (Kor & Mesko, 2013), which may influence the firm's capacity for DT (Li et al., 2018). As Hanelt et al. (2021) noted, the path to DT is shaped by the context of a specific industry.

Third, international experience is important because it provides CEOs with skills and experiences from different competitive environments (Wang et al., 2019). For instance, prior international experience of decision makers may increase the firms' learning speed (Vial, 2019). Thus, CEOs with greater international experience may be better prepared to reconfigure resources and capabilities to seize digital opportunities by having multiple worldviews and a wider range of change-related experience.

In sum, CEOs with broader general expertise are likely to be more effective in processing information to sense and seize digital opportunities (Helfat & Martin, 2015a; Martin & Bachrach, 2018). Thus, we hypothesize:

Hypothesis 1a: *CEO general expertise positively relates to digital transformation in innovative SMEs.*

Digital expertise and digital transformation

Previous experience managing a digital business can help anticipate and navigate the challenges of DT. CEOs are likely to differ in their digital expertise and, therefore, to diverge in the digital opportunities they sense and seize (Helfat & Martin, 2015b). Under this line of reasoning, we argue that the CEO's digital expertise is an antecedent of innovative SMEs' DT, since it should help decision-makers recognize the right digital technologies and engage promptly with their use compared to a digitally inexperienced CEO. Concurrently, CEOs with higher digital expertise can promote a firm-wide digital culture based on continuous learning that accepts the risks associated with DT and fosters innovative behaviors among employees to support DT (Karimi & Walter, 2015; Tabrizi et al., 2019; Verhoef et al., 2021).

DT involves orchestrating different digital initiatives and the connection of organizational capabilities with new digital capabilities (Tumbas et al., 2018). In addition, driving DT also demands congruence to align people, culture, and digital infrastructures with the digital strategy in a constantly changing digital environment (Kane et al., 2015). Therefore, implementing a DT strategy requires a holistic view of the firm's needs because of the disruptiveness caused by adopting new digital technologies (Carcary et al., 2016). We expect that a CEO with high digital expertise would better recognize the opportunities offered by emerging technologies and their properties to improve business processes (Weill et al., 2019), allowing innovative SMEs to adopt a holistic vision for pursuing and implementing DT practices within the firm. Conversely, CEOs with lower digital expertise will be less able to understand the relevance of emerging technologies and more reluctant to make the necessary investments to adopt them early (Dasí & Kok, 2025).

Moreover, DT requires technological, human, and financial resources to address the challenges of adopting digital technologies (Matt et al., 2015). For instance, firms must invest heavily in developing and acquiring digital resources such as IT infrastructure to store data (Frank et al., 2019; Verhoef et al., 2021). Innovative SMEs' technology investments are made

under high levels of uncertainty; thus, effective resource allocation plays a fundamental role during the DT process (Warner & Wäger, 2019). Hence, CEOs with greater digital expertise are better placed to ensure timely resource allocation in these ways and to arbitrate between different DT initiatives according to their potential and profitability (Sousa-Zomer et al., 2020). In addition, the CEO's digital expertise provides guidelines for a firm to build DT practices and routines to execute its firm's DT strategy (Carcary et al., 2016; Warner & Wäger, 2019). In time, these practices and routines may coalesce into capabilities that further enable and support DT. Consequently, we hypothesize:

Hypothesis 1b: *CEO digital expertise positively relates to digital transformation in innovative SMEs.*

2.1.2. External connectivity and digital transformation

For firms that rely on outside organizations for digital technologies, like innovative SMEs, CEOs often build external networks with managers, suppliers, and competitors for strategic advice (Cao et al., 2015; Hock-Doepgen et al., 2024). This is because external information is seen as less biased and distorted than internal sources (Arendt et al., 2005). In terms of professional experience, a lack of expert knowledge in a particular domain will prompt the CEO to seek external advice (Ma et al., 2020). This could be crucial for innovative SMEs due to their small size and constrained capacity to recognize and capitalize on digital opportunities. Because emerging technologies evolve rapidly (Hanelt et al., 2021), a CEO's external connections can offer fresh insights into the paradoxes surrounding the complex processes involved in DT. For instance, external connections can provide CEOs with valuable information to assess alternative digital strategic options, expanding the range of options and encouraging the firm's strategic flexibility (Fernández-Pérez et al., 2016). Ultimately, the CEO's external connectivity could be a key differentiator between those able and unable to sense and seize digital opportunities (Helfat & Martin, 2015a), improving the firm's digital

agility (Verhoef et al., 2021) and mitigating the inertial tendencies originating from path dependencies (Ghosh et al., 2022).

Understanding the role of supportive institutions is key to correctly sensing opportunities and threats (Teece, 2007). CEOs' external relationships can also help managers access and acquire critical information for decision-making (Kor & Mesko, 2013). This is especially important for DT, as investing in unproven emerging technologies can lead to wasteful expenditure (Sirmon & Hitt, 2009). As a result, CEOs with strong relationships with suppliers and external partners who bring in new digital technologies can continually improve their firms' efficiency by tapping into external technological expertise (Acquaah, 2007). Relationships with other stakeholders, such as government institutions, can provide CEOs with early information about new regulations and policies (Acquaah, 2007). The CEO's external connectivity would allow an earlier response to changing regulatory conditions relevant to DT, providing an advantage for small firms compared to those firms whose CEOs lack external connections. Consequently, we posit:

Hypothesis 2: CEO external connectivity positively relates to digital transformation in innovative SMEs.

2.1.3. Empowering leadership and digital transformation

For innovative SMEs, promoting conditions for active employee engagement in the DT process is crucial (Solberg et al., 2020), since employees' ideas and creativity are vital for innovation (Kajtazi et al., 2023). Empowering leadership involves sharing power with employees to increase their motivation and commitment (Zhang & Bartol, 2010), promoting resource reconfiguration and developing new practices (Foss & Mazzelli, 2025). Different mechanisms underpin a positive relationship between the CEO's empowering leadership and DT for innovative SMEs.

First, employees experience tensions during DT as they must often grapple with contradictory demands and goals (Klein et al., 2024) that oftentimes contradict, or are incompatible with, DT (Verhoef et al., 2021). DT is a top-down process, and recent research indicates that CEOs need to provide absolute clarity regarding the objectives, expected outcomes, and changes related to the firm's DT to encourage employees to facilitate solutions to problems encountered in DT (Klein et al., 2024). The leadership style of a CEO can affect the goal framing of employees (Foss & Lindenberg, 2013). Since employees are a key resource for DT (Vial, 2019), the CEO's empowering leadership can encourage team members to solve problems together, enhancing knowledge sharing, team efficacy, and employee creativity (Zhang & Bartol, 2010). CEO's empowering leadership can promote employees' participation and drive them to explore new points of view related to digital opportunities (Berman, 2012; Tabrizi et al., 2019), collaborate in setting goals and sharing an integrated view of the main barriers to undertaking the different DT practices (Wang et al., 2019).

Second, employee resistance and negative attitudes toward technological change can hinder the introduction of new digital technologies, jeopardizing DT (Vial, 2019), particularly if they do not perceive the right autonomy in managing the different DT projects (Karimi & Walter, 2015). By contrast, the CEO's empowering leadership builds on "giving more responsibility and autonomy to employees" (Srivastava et al., 2006; p.1239). A CEO's empowering leadership is inherently linked to delegating authority to employees to enable them to make decisions and implement solutions without direct supervision (Zhang & Bartol, 2010). Promoting an autonomous environment is critical to enable rapid learning by favoring experimentation with digital technologies (Smith & Beretta, 2021). As a result, we believe that the CEO's empowering leadership style may help drive DT by giving employees more authority and responsibility. This, in turn, can lower employees' resistance to learning new digital skills and using digital technologies. Moreover, because managerial attention is a selective and finite

resource (Ghobadian et al., 2022), empowering employees to take greater control of internal activities can allow managers to allocate more attention to critical activities (Xu et al., 2023), such as scouting digital opportunities (Ghosh et al., 2022) or promoting customer engagement through DT (Matarazzo et al., 2021). The CEO's empowering leadership also entails rewarding employees accordingly to influence their intrinsic task motivation (Thomas & Velthouse, 1990; Amundsen & Martinsen, 2014). By rewarding employees for specific DT achievements, CEOs can promote employees' experimentation with digital technologies and foster their knowledge sharing (Smith & Beretta, 2021). Therefore, we posit:

***Hypothesis 3.** CEO empowering leadership positively relates to digital transformation in innovative SMEs.*

2.2. The moderating role of the CEO's characteristics

We explore the role that time-related CEO traits of age and tenure can have on previous direct relationships. We propose that the role of CEOs' DMCs for their firms' DT is not oblivious to these two characteristics.

2.2.1. CEO tenure

CEO tenure has implications for risk-taking behaviors, where both positive and negative effects can be argued (Henderson, Miller, & Hambrick, 2006; Simsek, 2007). On the positive side, seniority relates to previous experience when dealing with risky situations, which helps when assessing new ones (Simsek, 2007). On the negative side, seniority is also related to investments in political networking and well-established human and social capital (Baishya et al., 2025), increasing commitment to and reliance on well-known paradigms when making decisions (Simsek et al., 2007). Because of the radical novelty of digital technologies, DT is a highly uncertain process (Vial, 2019), and previous risk-dealing experience might be less valuable as it does not offer cues for assessing novel upcoming risk. CEOs tend to be more risk-averse (Matta & Beamish, 2008) and avoid changing paradigms (Henderson et al., 2006) as

their tenure increases. Following this reasoning, we hypothesize a negative moderation effect from CEO tenure on the direct relationships between CEOs' DMCs and innovative SMEs' DT.

First, DT "requires managerial interpretation and the evaluation of digital technologies, understanding the long-term benefits and risks of adopting them" (Dasí & Kok, 2025; p. 147). Long-tenured CEOs are more likely to be attached to their personal beliefs, reluctant to deviate from their past successful strategies, because of lower adaptive aspirations, and tend to be more in favor of proven strategies and existing knowledge (Simsek, 2007). Conversely, short-tenured CEOs are less psychologically committed to previous strategies and less affected by strategic rigidity and risk aversion, allowing them to draw on their knowledge and expertise to adopt technological and organizational changes when the firm engages in the process of digitally transforming its business. We thus expect that longer CEO tenure will attenuate the benefits of general expertise on DT.

Second, long-tenured CEOs are likely more prone to biases (Hambrick & Mason, 1984; Hambrick, 2007) and tend to consider fewer strategic changes (Hambrick et al., 1993), which might hinder their ability to effectively turn digital expertise into action for replacing business processes with digital practices, due to the increased uncertainties that DT introduces to firms. On the contrary, CEOs in their early tenure are enthusiastic, with fresh perspectives and clear strategic insights about the market environment (Al-Najjar & Abualqumboz, 2023) and likely more eager to adopt new digital technologies within business practices (Dasí & Kok, 2025). This reasoning further reinforces our expectation that CEO tenure may weaken the positive relationship between CEO digital expertise and DT.

Third, CEOs tend to become more inward-focused as their tenure lengthens, relying more on internal information and knowledge instead of paying attention to key market signals (Hambrick & Mason, 1984; Luo et al., 2014). Long-tenured CEOs may develop a narrower external perspective due to their external networks becoming limited and outdated over time

(Miller, 1991; Hambrick & Fukutomi, 1991), reducing their ability to sense and seize new digital opportunities essential for fostering DT. Moreover, CEOs with longer tenure tend to have more power (Miller, 1991). Under this situation, long-tenured CEOs tend to overestimate the importance and support of external stakeholders, prioritizing their preferences when making decisions (Oh et al., 2018). Consequently, CEO tenure should further mitigate the positive association between CEO external connectivity and DT.

Finally, CEOs tend to gain greater power and control over time (Dutta et al., 2016). The longer CEOs occupy their role, the more they tend to hire individuals who support their established views and dismiss those who disagree (Miller, 1991; Jeong et al., 2021). In firms where employees sense that CEOs unduly exploit long-tenure power, support for achieving the firm's DT objectives and strategy is likely to be much lower (Schneider & Sting, 2020). CEOs with long tenure also tend to develop overconfidence or hubris (Oh et al., 2018), which translates into excessive self-confidence in their capabilities.

Taken together, increased CEO tenure should weaken the relationship between CEOs' DMCs and DT. From the above arguments, we propose the following hypotheses:

Hypothesis 4: *The positive relationship between CEO (a) general expertise, (b) digital expertise, (c) external connectivity, and (d) empowering leadership and DT is weakened by CEO tenure.*

2.2.2. CEO age

Younger CEOs are more used to digital technologies, tend to have a more positive perception about the importance of DT (Dasí & Kok, 2025), and are thus more likely to implement digital practices than their older counterparts (Zou et al., 2024). Therefore, we argue that CEOs' age will negatively moderate the positive relationship between their DMCs and DT.

Younger CEOs are more inclined to undertake strategic endeavors to establish their reputation (Zou et al, 2024) while older CEOs are assumed to prefer less risky and less

pioneering initiatives (von den Driesch et al., 2015; Aktan & Castellucci, 2025). Therefore, for the same level of educational background and industry-specific knowledge, we expect younger CEOs to be more risk-taking and to have greater tolerance for failure when implementing DT than older CEOs (Zou et al., 2024). Also, CEOs' age may then attenuate the role of digital expertise for DT. Despite having the digital expertise to lead the firm through the DT process, CEOs are likely to encounter increasing psychological and motivational barriers as they get older (Belenzon et al., 2019). For instance, older CEOs may experience a misalignment between transforming business practices into digital practices and their personal interests, such as ensuring greater stability and financial security. Indeed, Zou et al. (2024) observe that older CEOs can become more attached to their positions and be less inclined to change paradigms when embarking on DT.

Moreover, CEO age may reduce the positive relationship between CEO external connectivity and DT based on these arguments. First, DT is a strategic process that enhances firm performance (Merin-Rodríguez et al., 2024), attracting external attention. As such, DT presents an opportunity for younger CEOs to improve their prestige and reputation in the labor market (Zou et al., 2024). Thus, younger CEOs are more likely to emphasize building and maintaining external social networks needed to channel resources from external stakeholders to seize digital opportunities to increase their external validity. Second, young CEOs may lack familiarity with embracing organizational change. In contrast, older CEOs might better identify the risks with such change, facilitating a more effective transition (Liu & Wu, 2025). In this situation, younger CEOs are more likely than older ones to rely on their external relationships to actively access the resources needed for undertaking digital investments. Also, younger CEOs will be more sensitive to external new information/knowledge to support flexible responses when reconfiguring the resources, structure, and personnel necessary to facilitate DT

(Guan & Wang, 2025). Consequently, we anticipate that the CEO's age weakens the hypothesized relationship between the CEO's external connectivity and DT.

When initiating and implementing DT, CEOs need to invest significant effort in convincing subordinates of the benefits associated with the implementation of digital technologies (Weber et al., 2022). Younger managers need to build their reputation and are more tolerant of failure as they still have time to overcome it (Zou et al., 2024). For these reasons, we expect that, at the same level of empowering leadership, younger CEOs will be more receptive to innovative ideas and more willing to take on challenges to demonstrate their managerial capabilities. As such, we expect that the CEO's age will weaken the positive relationship between CEO empowering leadership and DT.

These arguments lead us to suggest that the DMCs-DT relationship is likely to be influenced by CEO age. Therefore, we hypothesize:

Hypothesis 5: *The positive relationship between CEO (a) general expertise, (b) digital expertise, (c) external connectivity, and (d) empowering leadership and DT is weakened by CEO age.*

2.3. Digital transformation and NPD performance

As many SMEs face growing pressure to address the challenges of DT (Bouwman et al., 2019; Matarazzo et al., 2021) and coordinate efforts across the firm to launch new products and services (Ferrerias-Méndez et al., 2021), it is often assumed that DT can enhance NPD performance (Björkdahl, 2020; Schneider et al., 2023). Developing new product(s) is a “*must*” for innovative SMEs in their constant pursuit to stimulate superior performance (Hervas-Oliver et al., 2021). In the following, we argue why innovative SMEs that undertake DT are better positioned to benefit from developing new products or services.

First, these firms, through extensive digitalization, can develop new digital products (Nasiri et al., 2020; Hanelt et al., 2021), which enable them to offer smart, connected, and

customized solutions that are more appealing and can perform better (Porter & Heppelman, 2014). DT might provide new value-added services to customers (Correani et al., 2020) through data collection and exchange (Audretsch & Belitski, 2024). Data availability and additional services might enhance NPD performance (Kazantsev et al., 2024). Moreover, firms can improve their NPD performance through DT by expanding the range of potential buyers and decreasing the cost of identifying new customers (Lanzolla et al., 2020).

Second, DT fosters the firm's ability to proactively generate, analyze, and disseminate new information and knowledge within the firm through digital technologies (Björkdahl, 2020). NPD is based on better use of information and knowledge (Savino et al., 2017). In this sense, DT can foster a broader information search and better knowledge recombination, which are fundamental mechanisms within the creativity phase of NPD (Lanzolla et al., 2021). For instance, by improving internal information flows, DT facilitates the transmission of information and collaboration among NPD members (Wetzels, 2021). Thus, DT can facilitate a smoother flow of information and knowledge sharing across different departments, leading to a shorter product time to market, which is crucial for staying ahead of competitors, and improving NPD performance (Endres et al., 2022).

Third, DT enables value creation from data and appears essential for data-driven decision-making (Ghosh et al., 2022). For example, obtaining data from supply chain partners enables firms to learn about new market trends, facilitating NPD (von Delft et al., 2019; Li et al., 2025). DT also facilitates an efficient digital customer interface, enabling customers to participate in the design phase of product development, thereby promoting co-creation of value (Verhoef et al., 2021; Sjödin et al., 2020). Hence, digitalizing business processes and transforming data into a digital strategic resource (Kazantsev et al., 2024) can facilitate innovative SMEs to extract more value from customers.

Lastly, as product launch speed increases, building a minimum viable product and rapid prototyping become essential (Volberda et al., 2021). DT promotes rapid prototyping to meet new customer demands (Warner & Wäger, 2019). Thus, DT can foster quick product development, crucial for offering high-quality, cost-effective products swiftly (Ghosh et al., 2022), boosting NPD performance. Therefore, we hypothesize:

Hypothesis 6. *Digital transformation positively relates to new product development performance in innovative SMEs.*

The research model and hypotheses are represented in Figure 1.

****Insert Figure 1 here****

3. Methodology

3.1. Sample and data collection

The Directory of Innovative Spanish SMEs by the Spanish Ministry of Science and Innovation constitutes our target population. SMEs are included in this directory if any of the following conditions are met in the past three years: (1) received public funding for innovation projects, (2) held a patent or received tax deductions from verified innovation activities, (3) earned official certifications for innovative activities from recognized certifying organizations. These selection criteria align with the Oslo Manual (OECD, 2018) and with previous studies (Flor & Oltra, 2004; Alegre & Pasamar, 2018) concerning innovation.

We focus on innovative SMEs for four reasons. First, SMEs provide a straightforward context to analyze DMCs due to the centrality of the CEO in the decision-making process (Matarazzo et al., 2021). Second, due to their resource limitations, innovative SMEs experience more difficulties than large firms when facing DT (Audretsch & Belitski, 2024). Third, innovative SMEs are more likely to be involved in DT processes than less innovative ones

(Appio et al., 2021). Fourth, as our research model's dependent variable is NPD performance, we need to examine firms that have carried out innovation activities.

Data collection was completed between July and October 2022 through an online questionnaire. We specifically targeted CEOs to reach the single best respondent at each firm. CEOs have comprehensive knowledge and typically assume responsibility for managing DT and NPD initiatives in innovative SMEs. Before administering the final questionnaire, we conducted a pre-test involving three managers from innovative SMEs and two academics to obtain feedback about the questionnaire's relevance and clarity. In total, we identified a target population comprising 2,717 innovative SMEs, from which we received 434 responses. In addition, we complemented the data collection through other databases, including ORBIS and LinkedIn, to obtain data related to moderation and control variables, when possible. Ultimately, the final sample for hypothesis testing comprised 414 innovative SMEs, representing a response rate of 15.2%. Table 1 provides descriptive information about the sample.

****Insert Table 1 here****

3.2. Measures

CEO general expertise. We capture three sources of general expertise: education, career experience, and international experience. Education is measured by the number of years of the CEO's formal education (Magni & Maruping, 2013); career experience is gauged by how many years the CEO has worked in the industry where the firm currently competes (Dimov, 2010); and international experience is assessed by the number of years the CEO has worked abroad (Hsu et al., 2013). To calculate the diversity of expertise, we sum the three types of expertise (Wang et al., 2019). Hence, more years indicate a higher degree of CEO general expertise.

CEO digital expertise. We measure digital expertise as the number of years that a CEO has had an active role and past involvement in leading a digital business. Longer experience and immersion in a digital business should indicate a deeper understanding and familiarity with

digital environments and the challenges of undertaking DT within the firm (Filatotchev et al., 2023).

CEO external connectivity captures the extent to which a CEO possesses and uses extensive connections with external stakeholders to develop a firm's business operations (Peng & Luo, 2000). Following Wang et al. (2019), we measure CEO external connectivity through four items measured on a 7-point Likert scale.

CEO empowering leadership refers to the extent to which the CEO shares power and responsibilities with their subordinates (Pearce & Sims Jr, 2002; Ensley et al., 2006). It is measured through four items on a 7-point Likert scale previously used by Wang et al. (2019).

CEO tenure was measured by the number of years an individual had worked as CEO at the time our questionnaire was administered. We hand-collected data from CEOs' LinkedIn profiles as a secondary source of information to measure CEO tenure.

CEO age was measured in years (Belenzon et al., 2019).

Digital transformation. We operationalized DT at the firm level following the five-item construct developed by Nasiri et al. (2020) and measured on a 7-point Likert scale. It captures the benefits and effectiveness of integrating digital technologies and practices into different firms' operations.

NPD performance. We assess NPD performance at the firm level following the three-item 7-point Likert scale measurement previously used by Ferreras-Méndez et al. (2021). This measure captures the effectiveness of the firm's NPD program in developing new products or modifying existing products. Our Appendix provides all measurement scales used in this study.

Control variables. At the firm level, we control *firm size* as it is expected that larger firms have more resources and exhibit a greater willingness to invest in DT. Firm size is measured as the total number of employees. *Firm age*, measured as the number of years since the firm was established. Some scholars note that older firms may possess a higher learning

curve, enabling them to be more efficient (e.g., Brettel et al., 2012). We included *Industry* as a control variable, coded as a dummy (1 = NACE 62: Computer programming, consultancy, and related activities; 0 = Other NACEs). This control variable is important because IT and software industry firms are generally more digitally mature and responsive to technological change than other industries, which could lead to significant differences in NPD performance. Finally, at the individual level, we include *CEO gender* measured as a dummy variable.

3.3. *Biases control*

To check the quality of the data, we performed several procedural and statistical analyses. We examined for potential late-response bias by comparing the responses obtained from early respondents and late respondents through an independent sample t-test (Armstrong & Overton, 1977). The results showed no significant differences. In addition, we examined potential non-response bias by conducting an independent sample t-test comparing characteristics as the firm age, size, and revenues of responding and non-responding firms. Our analysis revealed no statistically significant differences between these two groups and, consequently, non-response bias did not pose a significant issue in this study. Moreover, to confirm the reliability of the responses obtained from CEOs, where possible, we cross-checked part of the data collected in our questionnaire with data obtained from the Bureau van Dijk's Orbis database. As a supporting measure, we offered CEOs phone and email support during the data collection process to encourage them to complete the questionnaire and to clarify any doubts.

Furthermore, since our research is based on data from a single respondent, we applied several procedural techniques and statistical tests as suggested by Podsakoff et al. (2003) to rule out the possibility that our findings are affected by common method bias (CMB). First, we designed a brief questionnaire to capture the CEO's attention and we pre-tested it to ensure that all items in the measurement scales were easily understood. Second, we assured respondents that their responses would be anonymous and confidential to reduce the risk of collecting data

affected by socially desirable bias. Third, we provided respondents with a benchmarking report to secure their commitment and motivation. Fourth, we performed Harman's one-factor test as a post-hoc statistical procedure. The results showed that no single factor explained more than half of the variance. Both procedural and statistical remedies enable us to conclude that CMB is not threatening our results.

Lastly, to evaluate potential endogeneity issues, we utilized the Gaussian copula method as described by Hult et al. (2018). The results indicated that none of the values from the Gaussian copulas were statistically significant ($p < 0.05$), implying that endogeneity is unlikely to be a significant concern in our study.

4. Analysis and results

4.1. Data analysis

In testing our hypotheses, we employed Partial Least Squares-based Structural Equation Modeling (PLS-SEM), using the software package SmartPLS 4, as recommended by Hair et al. (2017). The choice of PLS-SEM is based on several reasons. First, according to Hair et al. (2019; p.7), PLS-SEM is "useful for exploratory research that examines less developed or still developing theory". Thus, given the originality of our research model and the fact that some relationships were not previously hypothesized, PLS-SEM is a suitable choice. Second, PLS-SEM works well across a range of sample sizes, including large sample sizes, as in our case ($n=414$). Third, PLS-SEM can handle normal and extremely non-normal data (Ringle et al., 2012). Fourth, PLS-SEM is suitable when the research model is complex and includes many constructs, indicators, and/or relationships (Hair et al., 2019). Fifth, PLS-SEM allows for the simultaneous testing of hypotheses that involve both single-item variables (e.g., "CEO tenure") and multi-item constructs (e.g., "NPD performance"). In short, PLS-SEM is a robust second-generation method.

Our assessment and evaluation of the overall model occurred in two distinct steps, following the approach outlined by Chin (2010). We scrutinized the reliability and validity of reflective measurement models. This initial step allowed us to ensure the robustness and accuracy of the measures employed in our study. In the subsequent step, we directed our attention to the evaluation of the structural model, specifically assessing its explanatory capacity and predictive power.

Table 2 displays the mean values, standard deviations, and correlations between the variables used in this study.

****Insert Table 2 here****

4.2. *Measurement model evaluation*

We employed five criteria to evaluate the reflective measures used in our research model: content validity, construct dimensionality, composite reliability, average variance extracted (AVE), and discriminant validity (Hair et al., 2019). Content validity was deemed sufficient as the measurement items were derived from a thorough review of existing literature and were comprehended by participants in the pre-test. All indicators demonstrating construct dimensionality, composite reliability, AVE, and discriminant validity met satisfactory thresholds.

****Insert Tables 3, 4, and 5 here****

4.3. *Structural model evaluation*

We estimated our research model and assessed each different hypothesis by applying four criteria: R^2 values, Q^2 values for predictive relevance, f^2 effect sizes, and the significance of path coefficients (Hair et al., 2017). In Table 6, the coefficient of determination (R^2) for each endogenous latent variable in our research model is presented. R^2 serves as an indicator of the model's explanatory power (Cohen, 1988). Our model accounts for 28.8% of the variance in DT and 16.4% in NPD performance. Both values surpass the minimum threshold of 10%

established by Falk and Miller (1992), indicating coherence between the latent variables of the model and the data.

In evaluating the predictive relevance of our research model, we utilized the Stone-Geisser Q^2 statistic as outlined by Hair et al. (2019). The Q^2 value was determined through the use of the blindfolding procedure. If the Q^2 statistic for a specific endogenous latent variable exceeds zero, it indicates that the explanatory variables associated with it possess predictive relevance. The values presented in Table 6 report Q^2 statistic values greater than zero for both DT and NPD performance. Consequently, the presence of positive Q^2 values confirms the predictive relevance of the proposed model.

****Insert Table 6 here****

By employing bootstrapping with 5,000 bootstrapped samples, we derived the path coefficients along with their corresponding significance levels for our research model (see Table 7). Results do not support Hypothesis 1a (H1a), as CEO general expertise does not show a significant association with DT. Results do support Hypothesis 1b (H1b), as CEO digital expertise shows a positive and significant relationship with DT. Hypothesis 2 (H2) is supported, as CEO external connectivity exhibited a positive and significant influence on DT. CEO empowering leadership is positively and significantly related to DT, providing support for Hypothesis 3 (H3).

On the moderating role of CEO tenure (Hypotheses H4a, H4b, H4c, and H4d), only H4b is supported, thereby confirming that the CEO's tenure weakens the positive influence of CEO digital expertise on DT. An interesting result concerns H4d, which posits that the positive relationship between CEO empowering leadership and DT is negatively moderated by the CEO's tenure. Contrary to our expectations, our results show that the CEO's tenure significantly and positively moderates the relationship between CEO empowering leadership and DT, indicating that longer CEO tenure may strengthen this relationship. Concerning the

moderating role of CEO age (Hypotheses H5a, H5b, H5c, and H5d), we only found support for age mitigating the positive effects of CEO empowering leadership on DT (H5d).

Concerning the influence of DT on NPD performance, as expected, results confirm a positive and significant relationship, supporting Hypothesis 6 (H6). Our findings also reveal that Industry and CEO gender have a significant relationship with NPD performance.

We examined Cohen's f^2 values (Cohen, 1988; Hair et al., 2017). Generally, values exceeding 0.02, 0.15, and 0.35 are indicative of small, medium, and large effect sizes, respectively. The association posited in H1b and H6 reveals a medium f^2 effect size, while our results reveal a small f^2 effect size for H2, H3, H4b, and H5d.

****Insert Table 7 here****

5. Discussion

Our study analyzes the impact of CEOs' DMCs on DT, since these managerial capabilities can be central to the DT of innovative SMEs. DMCs precede how CEOs differ in sensing digital opportunities and are likely to influence the investments and resource configurations required to undertake DT. However, Helfat and Martin (2015a; p.1285) noted that "not all managers have dynamic managerial capabilities, and possession of a particular capability does not imply superiority", which may be particularly true along the DT journey. Consequently, since variability in CEO's DMCs may present considerable differences in DT, we provide new understanding of how CEOs, because of their managerial capabilities, influence DT. By doing so, we build on existing qualitative studies (e.g., Li et al., 2018; Dasí & Kok, 2025) and move toward empirical testing, offering granular insights into which DMCs are, or are not, directly related to DT.

Moreover, by combining two time-related CEO traits—tenure and age—with managerial capabilities in our research, we integrate the research stream on individual-level characteristics

from the upper echelon literature with the DMC perspective. More specifically, we examine how these individual-level characteristics may attenuate the positive influence of DMCs on DT. By doing so, we develop new understanding concerning how CEOs prioritize and deprioritize different initiatives according to their tenure and age, influencing how they deploy their DMCs to undertake DT.

Finally, we add to the NPD literature by offering new insights and evidence on how DT can create value in specific contexts, specifically regarding the underlying mechanisms that drive NPD performance. Only a handful of studies have examined how DT is related to NPD performance, and contradictory results are apparent among these studies (e.g., Schnedier et al., 2023; Dabić et al., 2023). We clarify this research problem by focusing on innovative SMEs as a boundary condition. Innovative SMEs, unlike more traditional ones, possess a set of characteristics that drive them to engage in innovative activities (Wang et al., 2025). Such firms depend on the performance of NPD initiatives to grow and survive (Hervas-Oliver et al., 2021), and face greater pressure to pursue DT and NPD simultaneously (Wang et al., 2025). Our study provides new implications on this concurrent dynamic, shedding light on the managerial and time-based characteristics missing among existing studies.

5.1. Theoretical contributions

Our research makes three new and important contributions to the literature about DT, DMCs, and NPD in innovative SMEs.

First, this study contributes to current studies about SMEs' DT (Eller et al., 2020; Merin-Rodrigáñez et al., 2024) by focusing on individual-level antecedents and clarifying the different underlying microfoundations of DMCs that drive DT. We develop new knowledge about how CEOs' DMCs influence DT (Li et al., 2018; Dasí & Kok, 2025). Based on the DMC literature (Helfat & Martin, 2015a; Foss & Mazzelli, 2025; Baishya et al., 2025), we show that certain

DMCs can stimulate DT because, through them, CEOs develop, integrate, and reconfigure digital resources and practices to adapt the firm to the demands of the new digital era.

Contrary to our expectations, our findings indicate that the CEO's general expertise does not significantly facilitate DT. This is surprising at first glance, but one potential explanation is that it might be difficult for CEOs to move beyond their past experiences due to the experience trap (Sengupta et al., 2008) when undertaking DT. Thus, we suggest that DT requires managers to go beyond their general expertise and adapt to the (fast-)changing nature of the digital environment (Fernandez-Vidal et al., 2022).

Scholars have made progress in developing approaches to understanding the effects of digital expertise (e.g., Filatotchev et al., 2023). Our study shows that the CEO's digital expertise significantly enhances DT in innovative SMEs. The findings are consistent with the argument that the person in charge of DT must have sufficient experience leading digital projects to increase the coordination needed when experimenting with digital technologies (Dasí & Kok, 2023). Also, a CEO's digital expertise is associated with greater capacity for reasoning and problem-solving around digital practices and proactive implementation of the best ones (Hanelt et al., 2021). Thus, we provide new insights and evidence to clarify the importance of CEO digital expertise as a key antecedent of DT, which is vital considering the financial constraints of innovative SMEs (Wang et al., 2025).

Moreover, we extend knowledge on the link between the CEO's external connectivity and DT. We find that CEOs' external connectivity may provide novel knowledge about digital technologies and promote collaboration between the focal firm and external digital partners. Our study draws attention to the vital role of external stakeholders in DT by offering new insights into the independent mechanisms by which CEOs of innovative SMEs expand the diversity of knowledge and resources required to develop digital practices, as articulated within the framework of action for DT. In this regard, the CEO's external connections might reduce

the hazardous effect of path dependencies brought about by organizational politics and legacy systems during the DT transition (Warner & Wäger, 2019).

Further, SMEs often experience higher volatility, complexity, and uncertainty when initiating their DT journeys than other firms (Eller et al., 2020). Hence, their leaders must ensure that employees accept and support DT initiatives (Klein et al., 2024). Our study establishes CEOs' empowering leadership as an important microfoundation of DT, promoting the motivation of employees (Foss & Lindenberg, 2013), facilitating shared cognitions, and contributing to developing an integrated view of DT within the firm.

Second, we add to the DMCs literature by addressing the need for research on moderating factors, as suggested by scholars such as Wang et al. (2019) and Hock-Doepgen et al. (2024), who theorized that the effects of DMCs might be contingent on other factors. Specifically, our study builds on the upper echelon theory (Hambrick & Mason, 1984; Hambrick, 2007), and provides a more holistic understanding of how CEO tenure (Campbell et al., 2022) and CEO age (Belenzon et al., 2019; Rovelli et al., 2024) moderate the influence of CEO's DMCs on DT. By doing so, our study extends research that links DMCs to DT (e.g., Li et al., 2018; Dasí & Kok, 2025) by focusing on boundary conditions at the individual level (Salvato & Vassolo, 2018) and revealing the pivotal role of two CEO time-based traits (tenure and age) in shaping the influence of some managerial capabilities on DT.

For the case of CEO tenure, we find that it negatively moderates the relationship between CEO digital expertise and DT. Thus, our results reinforce that longer CEO tenure could lead CEOs to "myopically commit to obsolete paradigms" (Luo et al., 2014; p.492). This is especially likely to happen when CEOs try to apply their digital expertise to DT but are confined by the limitations of long tenure and preconceived notions about their business. We suspect that this combination creates conflicts in integrating emerging technologies into business practices and fails to grasp the complexity of implementing DT into a business where the CEO is

overfamiliar with the traditions of the business. In other words, as tenure increases, CEOs are likely to have “an inflexible and rigid decision-making scheme” (Oh et al., 2018; p.326) that weakens the positive effect of CEO digital expertise on DT. Interestingly, and unlike our expectations, our results show that CEO tenure exerts a positive moderating influence on the empowering leadership–DT relationship. Although speculative, our results suggest that longer-tenured CEOs may have a better understanding of internal dynamics and cultural norms, and greater credibility among employees, creating a fertile environment for translating empowering leadership into concrete digital practices. Indeed, CEO tenure is associated with CEO power and relates to the CEO’s managerial political capital as a form of positional power (Baishya et al., 2025). Consequently, CEO tenure has competing effects on the relationship between DMC and DT when examining specific types of DMCs.

We did not find support for the moderating role of CEO tenure on the CEO general expertise–DT relationship. We assumed that tenure is conceptually distinct from general expertise because the former “refers to the length of time that an individual has held a particular professional role” (Campbell et al., 2022; p.14). We found no direct effect from CEO general expertise on DT either, suggesting that CEO tenure does nothing to alter that. Also, contrary to our reasoning, CEO tenure did not weaken the significant positive impact of CEO external connectivity on DT. It is likely that the adverse effects of long CEO tenure, as discussed in the literature, may not outweigh the direct benefits of accessing information, resources, and knowledge through social networking with external stakeholders.

Regarding the moderation effects of CEO age, our findings show mixed results. Our basic tenet was that CEO age attenuates the positive association between CEOs’ DMCs and DT as managers generally become more risk-averse and conservative with age (Rovelli et al., 2024). This negative moderation effect was confirmed for the relationship between CEO empowering leadership and DT, suggesting that the beneficial effects of empowering leadership

are contingent on CEOs' age. Younger CEOs appear better able to mobilize their employees' motivation for DT than older CEOs who employ the same leadership style. Consequently, we agree with Vecchio et al. (2010) that empowering leadership does not have uniform effects. One potential explanation relies on the identification of employees with their leader, lending more credibility to the leadership style, which might be further contingent on CEO tenure.

However, we could not confirm the rest of the moderation effects related to CEO age. For the case of digital expertise, it seems that the beneficial effects attributed to CEOs with digital expertise in accomplishing the firm's DT are not offset by CEO age. This is despite the literature noting that CEO age represents an important mechanism that influences CEO's risk preferences and decision-making behaviors (Holmstrom, 1999; Christofi, 2024). Similarly, we find no support for CEO age moderating the relationship between CEO external connectivity and DT. The peculiarities of innovative SMEs might explain this result. For example, it is possible that innovative SMEs "are acutely aware of their own risky status" due to their informational opacity and uncertain outcomes related to innovative activities (Brown et al., 2022; p. 150). As such, although CEO age might affect a CEO's willingness to engage in network exchanges and become less involved with external stakeholders (von den Driesch et al., 2015), a potential explanation is that the need to tackle resource constraints when addressing DT, regardless of their age, likely drives CEOs to mobilize their connections and networks with banks, government agencies, and other external stakeholders, making use of their social capital and turning it into political capital (Baishya et al., 2025).

Third, our study advances understanding of the DT-NPD performance relationship in two noteworthy ways. We respond to recent calls to expand our knowledge of how DT affects the development of new products and the performance of NPD (e.g., Lanzolla et al., 2021; Appio et al., 2021). DT could hamper creativity and innovation when emerging technologies are implemented, thereby negatively influencing NPD performance (Lanzolla et al., 2021), but

empirical accounts are scarce and mixed (Schneider et al., 2023; Dabić et al., 2023). For instance, Schneider et al. (2023) did not find a statistically significant positive relationship between DT and NPD performance. We reveal new circumstances when this effect is positive.

We also contribute to the NPD literature by shifting the focus of discussion from SMEs to innovative SMEs, a specific subgroup of SMEs that is characterized by proactively undertaking innovative activities (Hervas-Oliver et al., 2021; Merín-Rodrigáñez et al., 2024). Bottai et al. (2024; p.3) noted that innovative SMEs are “oriented towards the commercialization of new products and technologies” since doing so will boost their visibility and sales. Our empirical findings provide evidence for this reasoning. Our results suggest that innovative SMEs, when developing an NPD program, leverage the positive effects of DT to offer smart, connected products and gather real-time behavioral data to enhance products. This creates new opportunities for customer segmentation and extends value-added services, thereby increasing overall NPD performance.

5.2. Managerial contributions

Our study generates several implications for managers of innovative SMEs. While DT is often linked to the skills of CEOs, there is a lack of research exploring which managerial capabilities drive DT. Our results demonstrate that CEOs are not only key promoters of adopting digital technologies but also essential in building digital practices and facilitating the transformation process. From a managerial standpoint, our research indicates that CEOs should prioritize enhancing their digital skills and expertise, fostering valuable external connections, and fostering a positive employee mindset through empowering leadership before selecting digital technologies for implementation across various business processes. On a more general level, although our study expected that the CEO’s general expertise may be necessary for DT, it proved insufficient to yield DT. Given our results, CEOs aiming to prompt their firm’s DT need to go beyond their general expertise and receive new training related to improving their

digital literacy (Zahoor et al., 2023). Doing so can help CEOs identify which areas of business would benefit most from adopting new digital tools and digitally transforming. This is commensurate with our findings pinpointing the importance of the CEO's digital expertise for undertaking DT. Thus, implementing digital training programs and considering digital expertise when hiring managers are two further ways of increasing this pool of expertise within the firm.

Our research suggests that CEOs should engage in building and strengthening their relationships with digital suppliers or third parties, as these relationships improve the CEO's access to up-to-date technological information and other digital resources, fundamental to undertaking DT. Furthermore, employee resistance is an inevitable barrier to SMEs' DT efforts. Our findings reveal that a CEO's empowering leadership could counteract these detrimental tensions by empowering and motivating subordinates. CEOs should adopt an empowering leadership style to harvest the advantages of DT. Ultimately, DT provides an opportunity to integrate digital technologies into the firm's various activities related to NPD, including product range and innovation processes. By understanding the different digital mechanisms and practices through which DT can influence NPD, senior managers can increase the rate and quality at which new digital opportunities for superior NPD performance are detected and implemented.

5.3. Limitations and further research

Our research has limitations that can serve as fruitful avenues for future studies. First, the data were gathered in the context of innovative Spanish SMEs, typified according to the OECD (2018), and whose characteristics follow similar criteria to those of the big economies in the Euro area. In this sense, while our results can be generalized to other innovative SMEs in developed countries, caution is needed before generalizing them to non-innovative SMEs or SMEs in other contexts (e.g., emerging markets). This provides future research studies with the opportunity to replicate the results for different samples of firms. Moreover, the hypotheses

were tested in Spain, which offers future research the opportunity to examine the proposed relationships in cross-cultural settings, as the effects of CEOs' DMCs on dynamic processes such as DT may vary between countries or cultures (e.g., Wang et al., 2019).

Second, we based our study on self-reported survey data, a widely used methodology (von Delft et al., 2019; Hock-Doepgen et al., 2024). We incorporate several methods to tackle endogeneity concerns. However, we recognize that this self-reported data may include some subjectivity. Future research could build on our study and operationalize DT by combining primary and archival data. Moreover, the findings only display responses collected at a specific time. Future studies might thus employ a time-lag approach monitoring changes in the firm's DT over time (Verhoef et al., 2021).

Third, DT implies a high level of complexity requiring careful orchestration efforts. Future research could identify additional microfoundations of DMCs at the individual (e.g., CEO) and team levels (e.g., TMT) that might lead to DT and orchestrate its related activities. For instance, future research could examine the impact of middle managers' DMCs (e.g., Greven et al., 2023) on DT, as this remains an underexplored relationship despite the general importance of middle managers to corporate entrepreneurship efforts. Moreover, while we postulate CEO tenure and CEO age as two individual-level moderator variables on the relationship between CEO's DMCs and DT, other CEO characteristics might also moderate our baseline relationship. Future research should focus on studying the role of CEOs' observable individual characteristics and psychological attributes, such as CEO overconfidence (Saesen et al., 2024) or narcissism (Baishya et al., 2025), to provide nuance to the relationships put forth in this study.

Fourth, we theorized and examined the direct relationship between DT and NPD performance. Yet, to have a more complete understanding of NPD performance, more research is needed to understand how different digital practices and technologies influence NPD performance and the trade-offs firms make when deciding to initiate their DT journeys (Dabić

et al., 2023; Schneider et al., 2023). Future research could also examine the connection between DT and NPD in the context of less innovative SMEs. Finally, because DT involves a wide range of different technologies, we suggest that more attention is required in examining the impact of specific digital tools, such as AI or 3D printing, in the various activities of the innovation process. Using these tools could improve experimentation, design, or various learning processes, and innovation methods, such as Lean Startup (Gamón-Sanz et al., 2024), could be adopted more efficiently and flexibly.

6. References

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Figure 1. Research model and hypotheses.

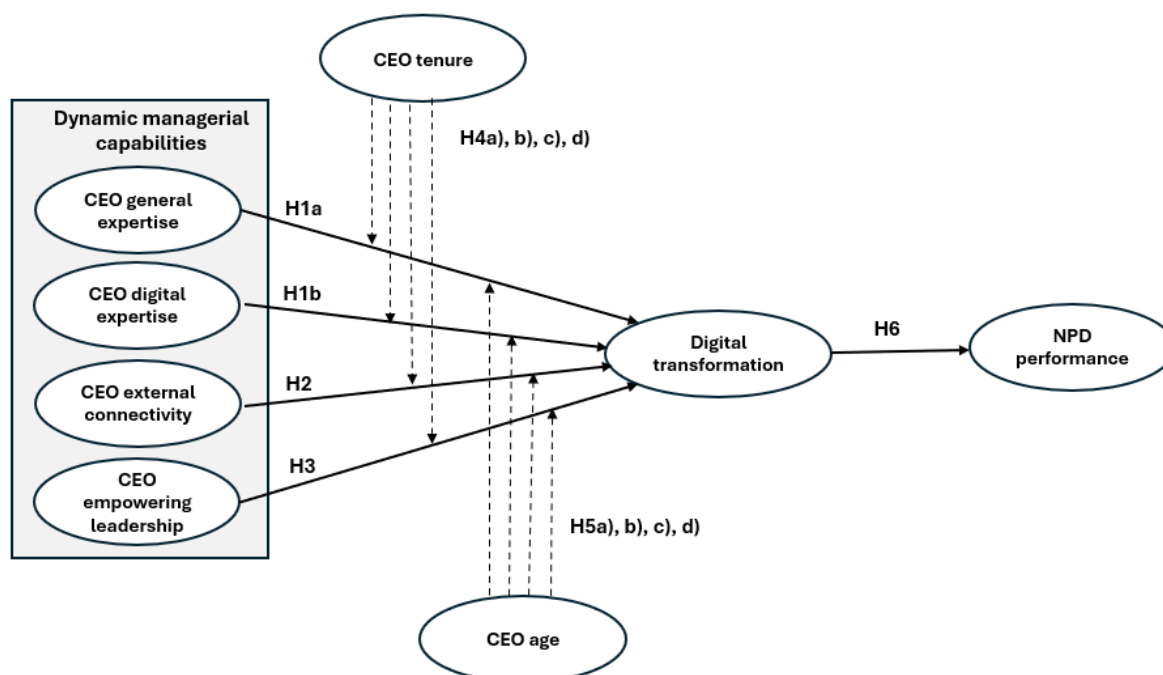


Table 1. Sample descriptive statistics

Items	Categories	Quantity	Percentage
CEO gender	Male	357	86,2%
	Female	57	13,8%
CEO age	20-40	60	14,5%
	41-60	306	73,9%
	61-80	48	11,6%
Firm size	Micro firms (<10)	126	30.4%
	Small firms (10-49)	210	50.7%
	Medium firms (50-250)	78	18.8%
Firm age	<5 years	47	11.4%
	5-10 years	140	33.8%
	11-20 years	105	25.4%
	>20 years	122	29.5%
Industry	NACE 62	115	27.8%
	Other NACEs	299	72.2%

Table 2. Means, standard deviations, and correlations among variables

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. CEO general expertise	30.44	11.93	1.000													
2. CEO digital expertise	5.03	6.56	0,016	1.000												
3. CEO external connectivity	4.54	1.43	-0,020	0,063	1.000											
4. CEO empowering leadership	6.00	0.92	0,031	0,035	0,303**	1.000										
5. CEO tenure	12.36	8.61	0,403**	0,020	-0,135**	-0,076	1.000									
6. CEO age	49.47	9.05	0,496**	0,025	-0,025	-0,038	0,430**	1.000								
7. Digital transformation	4.96	1.33	-0,007	0,342**	0,272**	0,301**	0,002	-0,100*	1.000							
8. NPD performance	5.29	1.15	-0,031	0,115*	0,281**	0,296**	-0,072	-0,014	0,349**	1.000						
9. Firm size	33.50	41.84	0,066	-0,056	0,083	0,048	0,114*	0,090	-0,024	0,047	1.000					
10. Firm age	16.90	15.87	0,261**	-0,058	-0,042	-0,040	,475**	0,314**	-0,076	0,038	0,320**	1.000				
11. Industry (CNA62)	0.28	0.448	-0,038	0,254**	0,020	0,058	-0,082	-0,068	0,221**	-0,054	-0,002	-0,168**	1.000			
12. Industry (Other)	0.72	0.448	0,038	-0,254**	-0,020	-0,058	0,082	0,068	-0,221**	0,054	0,002	0,168**	-1,000**	1.000		
13. CEO gender (Male)	0.86	0.345	0,075	0,150**	0,035	0,076	0,041	0,143**	0,082	0,153**	0,063	0,033	0,107*	-0,107*	1.000	
14. CEO gender (Female)	0.14	0.345	-0,075	-0,150**	-0,035	-0,076	-0,041	-0,143**	-0,082	-0,153**	-0,063	-0,033	-0,107*	0,107*	-1,000**	1.000

Note: * $p \leq 0.05$; ** $p \leq 0.01$; SD: Standard Deviation; NPD performance: New product development performance.

Table 3. First-order reflective constructs results

	Factor loading	SD	T-Statistics	α	CR	AVE
CEO external connectivity				0.817	0.877	0.644
EXC01	0.638***	0.059	10.894			
EXC02	0.836***	0.027	31.383			
EXC03	0.847***	0.025	33.881			
EXC04	0.867***	0.021	42.201			
CEO empowering leadership				0.863	0.906	0.707
EML01	0.874***	0.031	28.484			
EML02	0.829***	0.034	24.183			
EML03	0.868***	0.032	26.965			
EML04	0.789***	0.033	23.696			
Digital transformation				0.876	0.911	0.672
DT01	0.756***	0.028	26.707			
DT02	0.744***	0.030	24.827			
DT03	0.868***	0.014	61.300			
DT04	0.872***	0.015	58.733			
DT05	0.849***	0.019	45.895			
NPD performance				0.861	0.916	0.784
NPD01	0.901***	0.015	60.290			
NPD02	0.932***	0.013	73.708			
NPD03	0.820***	0.028	29.026			

Note: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; T-Statistics for $n = 5.000$ subsamples. SD: Standard Deviation. α : Cronbach's Alpha. CR: Composite Reliability. AVE: Average Variance Extracted. NPD performance: New product development performance.

Table 4. Discriminant validity analysis

First-order constructs	1	2	3	4
1. CEO external connectivity	(0.802)			
2. CEO empowering leadership	0.321	(0.841)		
3. Digital transformation	0.289	0.305	(0.820)	
4. NPD performance	0.287	0.306	0.350	(0.885)

Note: Diagonal elements are the square root of the AVEs (in parenthesis); off-diagonal elements are the square correlations among constructs in the inner mode. NPD performance: New product development performance.

Table 5. Heterotrait-Monotrait analysis

First-order constructs	1	2	3
1. CEO external connectivity			
2. CEO empowering leadership	0.367		
3. Digital transformation	0.326	0.343	
4. NPD performance	0.337	0.344	0.402

Note: NPD performance: New product development performance.

Table 6. Inner model assessment indicators

Factor	R^2	$R^2_{adjusted}$	Q^2
Digital transformation	0.288	0.263	0.23
NPD performance	0.164	0.153	0.02

Note: NPD performance: New product development performance.

Table 7. PLS analysis results

Path	Path coefficient	T-Statistics	p-values	f^2	Hypothesis
CEO general expertise → DT	0.029	0.569	0.570	0.001	H1a: No supported
CEO digital expertise → DT	0.332	8.256	0.000	0.146	H1b: Supported
CEO external connectivity → DT	0.198	3.773	0.000	0.046	H2: Supported
CEO empowering leadership → DT	0.227	4.430	0.000	0.064	H3: Supported
CEO general expertise × CEO tenure → DT	0.006	0.109	0.914	0.000	H4a: No supported
CEO digital expertise × CEO tenure → DT	-0.153	3.208	0.001	0.025	H4b: Supported
CEO external connectivity × CEO tenure → DT	-0.003	0.066	0.948	0.000	H4c: No supported
CEO empowering leadership × CEO tenure → DT	0.125	2.238	0.025	0.012	H4d: No supported
CEO general expertise × CEO age → DT	0.020	0.513	0.608	0.001	H5a: No supported
CEO digital expertise × CEO age → DT	0.086	1.743	0.081	0.007	H5b: No supported
CEO external connectivity × CEO age → DT	0.034	0.655	0.512	0.001	H5c: No supported
CEO empowering leadership × CEO age → DT	-0.136	2.396	0.017	0.021	H5d: Supported
DT → NPD performance	0.374	8.269	0.000	0.159	H6: Supported
Control variables					
Firm size → NPD performance	0.040	0.866	0.387	0.002	
Firm age → NPD performance	0.024	0.501	0.616	0.001	
Industry (NACE 62) → NPD performance	-0.329	3.287	0.001	0.024	
CEO gender (male) → NPD performance	0.402	2.915	0.004	0.022	

Note: T-Statistics for n = 5000 subsamples DT: Digital transformation; NPD performance: New product development performance

Appendix

Questionnaire items for CEO external connectivity (Wang et al., 2019).

Please indicate your level of agreement with the following statements about yourself.

1. I have well-established relationship with important government agencies.
2. I have rich and diverse connections with top managers/founders of suppliers, distributors, banks, and other related organizations.
3. I have always use my personal connections with the community to smooth our operations.
4. I always benefit from the external connections with other companies to develop business.

Questionnaire items for CEO empowering leadership (Wang et al., 2019).

Please indicate your level of agreement with the following statements about yourself.

1. I empower my subordinates (the top management team) to take initiatives and participate in goal setting.
2. I empower my subordinates (the top management team) to search for solutions to problems without supervision.
3. I empower my subordinates (the top management team) to explore opportunities and view problems as opportunities rather than obstacles.
4. I reward my subordinates (the top management team) accordingly when they complete a major task.

Questionnaire items for digital transformation (Nasiri et al., 2020)

Please indicate your level of agreement with the following statements about your firm.

1. In our company, we aim to digitalize everything that can be digitalized.
2. In our company, we collect massive amounts of data from different sources.
3. In our company, we aim to create stronger networking between the different business processes with digital technologies.
4. In our company, we aim to enhance an efficient customer interface with digitality.
5. In our company, we aim at achieving information exchange with digitality.

Questionnaire items for new product development performance (Ferrerias-Méndez et al., 2021).

Please indicate your level of agreement with the following statements about your firm.

1. The overall performance of our new product development programme has met our objectives.
2. From an overall profitability standpoint, our new product development programme has been successful.
3. Compared with our major competitors, our overall new product development programme is far more successful.

Note: All the items were evaluated on a 7-point Likert scale.