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The role of the leader's digital innovativeness on family firm digital innovation activities

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Abstract

PURPOSE: The paper investigates whether the leader's digital innovativeness is directly and indirectly associated with a family firm's digital innovation activities. **METHODOLOGY:** The study was conducted on a sample of Polish family firms. In total, 501 self-declared family businesses that represent the SME sector were completed. Structural Equation Modeling (SEM) was employed to capture underlying relationships between latent constructs and to verify hypotheses. **FINDINGS:** The findings indicate that the leader's digital innovativeness has a significant impact on the digital innovation activities of family firms. However, the achievement of these outcomes depends on the existence of complementary organizational factors, including IT capabilities, employee digital competencies, and a strong digital culture. These results emphasize the interconnected relationship between the leader's innovativeness and organizational resources in facilitating digital transformation within family businesses. **IMPLICATIONS:** This research highlights the necessity for family-owned businesses to invest in leadership development programs that foster digital innovativeness, enabling leaders to effectively navigate digital transformation and enhance the company's overall resilience. Additionally, cultivating a supportive digital culture—through collaboration, advanced digital tools, and an innovation-driven mindset—ensures that the entire organisation aligns with digital transformation goals, ultimately driving long-term competitiveness. **ORIGINALITY AND VALUE:** This paper contributes to the literature on family firms by presenting the association between leader's digital innovativeness and digital innovation activities in family firms. We offer new evidence for the upper echelons theory by demonstrating the impact of the leader's digital innovativeness on digital innovation activities. **Keywords:** digital innovativeness, family firms, digital innovation activities, leadership, digital transformation, upper echelons theory, small and medium-sized enterprises (SMEs), IT capabilities, organizational digital capabilities, employee digital competencies, digital culture, family business, Structural equation modeling (SEM).

INTRODUCTION

Addressing the preparedness of family businesses for digital transformation involves mixed perspectives (Tirdasari et al., 2022). Some scholars have observed a negative association between family businesses and their willingness to adopt digital technologies (Chung & Lee, 2024). On the flip side, a body of research (Tirdasari et al., 2024; Begnini et al., 2023) suggests a favourable link between family businesses and adopting digital technologies. Unlike non-family firms, which base their decisions primarily on economic considerations, family firms tend to prioritise a behavioural approach to decision-making, where non-financial goals are more important than purely financial ones (Chrisman et al., 2015b). Some researchers have proven that a higher level of family shares in the ownership structure is negatively associated with

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the R&D expenses incurred by these firms (Chrisman & Patel, 2012) and technology adoption (Souder et al., 2017). This phenomenon can be explained using the concept of socio-emotional wealth (SEW), emphasising the impact of socio-emotional factors on strategic and financial decisions in family firms (Arzubiaga, 2020). Family businesses often perceive digital changes as threats to their SEW and as a risk to keeping the firm in the hands of the family (Gomez-Mejia et al., 2024; Lasio et al., 2024). Digital transformation could be an even more complex decision from the standpoint of family business leaders, as it is important to harmonise traditional family values with progressive growth. As family businesses increasingly acknowledge the necessity and advantages of technological progress, they equip themselves to tackle modern challenges and seize opportunities, ensuring their cherished brand stays relevant and thrives.

Still, some studies show that family firms are more innovative than non-family firms (Muñoz-Bullón & Sanchez-Bueno, 2011), attach great importance to innovation (Craig & Moores, 2006), and due to their business models that have embraced digital technology, are more resilient during times of crisis (Bürgel et al., 2022). Family firms demonstrate the so-called 'ability and willingness paradox' (Chrisman et al., 2015a; Dieleman, 2019). It refers to their lower propensity to engage in innovative activities than non-family firms despite significantly greater innovation capability. This capability results from the ability of family firms to identify opportunities and gather knowledge beyond their boundaries, driven by their non-economic goals (Zapata-Cantu, San-Guino, Barroso et al., 2023). The reduced willingness to introduce innovations, on the other hand, results from, among other things, an above-average attachment to tradition and increased concern for the reputation of the business and the family that represents it (Hauck & Prüggl, 2015). However, the literature lacks empirical studies that would indicate which characteristics of a leader in a family enterprise should overcome barriers associated with aversion to innovation and skillfully use their specific attributes to implement digital solutions effectively.

According to the Upper Echelons Theory (UET) as formulated by Hambrick and Mason (1984) and Hambrick (2007), the strategic decisions and overall managerial orientation of an organization are significantly influenced by the demographic and psychological attributes of its top executives. Hambrick and Mason (1984) suggested measuring unobservable or difficult-to-measure psychological and social characteristics of senior managers through observable proxies, such as education, professional experience, or social background. This methodological framework has been further operationalized in the conceptual model of UET presented by Hiebl (2014). Building on this foundation, and in light of contemporary empirical findings, we propose an extension of the UET framework to incorporate managerial attributes related to digital innovativeness. In this paper, a business leader's individual digital innovativeness is defined as a leader's inherent predisposition and ability to understand, embrace, and champion digital technologies, reflecting their openness to experimenting with and implementing novel digital solutions to drive business growth and transformation (Waal et al., 2016). It is justified due to growing empirical evidence that digital literacy and technological adaptability are critical determinants of strategic and operational decision-making. As an example, (Asrarudin, 2023; Willis et al., 2021) asserted that the personal characteristics of innovative leaders could enhance an organisation's competitive advantage by fostering innovative attitudes and behaviours among subordinates. Others (Alekhina et al., 2020; Korableva et al., 2024) clarified that an enterprise's innovative activity necessitates a leader who possesses a specific set of innovative and motivational characteristics. These characteristics empower leaders to spearhead digital transformation and cultivate a culture of innovation, thereby significantly improving organisational performance in the digital era (Schulster et al., 2023).

This paper aims to investigate whether leader's digital innovativeness is directly and indirectly associated with a family firm's digital innovation activity – meaning the creation of products, services, processes, or business models driven by digital technology (Bornhausen & Wulf, 2023) or the trials that can lead to such a creation. The research was carried out using a sample of Polish family firms, comprising 501 self-identified family businesses from the SME sector. Polish family firms were chosen due to access to the dataset that was collected within the framework of the broader research project. To test the hypotheses and address the primary objectives of the study, Structural Equation Modeling (SEM) served as the primary analytical method.

This paper makes several contributions. First, it contributes to the literature on family firms by presenting the association between the digital innovativeness of a family firm's leader and digital performance. Second, we provide new evidence to UEP, extracting the impact of the digital innovativeness of the family business leaders on digital innovation activities. Additionally, we verify whether there is a mediation impact of digital culture, digital capabilities of employees, and IT capability on the relationship between the digital innovativeness of family business leaders and digital innovation activities.

To achieve this, we propose a model that incorporates mediators outlined by Proksch et al. (2024) in their research on the impact of digital strategy on digital innovation activities in new ventures. Our model adapts this framework to the context of family businesses. Rather than focusing on digital strategy as a predictor, we introduce the personal

innovativeness of the family business leader as the antecedent variable. This modification reflects the founders' pivotal roles in shaping strategic management practices and influencing organisational behaviour within family businesses (Kelly et al., 2000; Soluk et al., 2021).

The paper is structured as follows. The first section reviews the relevant literature on the leader's digital innovativeness, digital capabilities of employees, IT capabilities, digital culture, and their impact on digital innovation activities. The following section details the study's methodological aspects, and the subsequent sections present the main results and discussion about the suggested model. The last section concludes by outlining research implications, limitations, and future research perspectives.

LITERATURE REVIEW

Leader's digital innovativeness

In recent years, digitalisation and digital transformation have emerged as key performance drivers (Pouri, 2021; Vojvodic et al., 2022). It is stressed that successful digital transformation requires leaders with appropriate digital features (Schwarz Müller et al., 2018), ready to lead digital change (Ohain, 2019). The new leadership paradigm, among others, is referred to as digital leadership (Schuster & Lehmann, 2023; Schuster et al., 2023). Leaders are perceived as critical to „laying the foundation for and facilitating digital transformation” (Hunt, 2015). Leaders' digital literacy requires knowledge and understanding of relevant digital concepts, tools, systems, and social technology features and platforms (Hunt, 2015; Santhanam, 2024). According to Ohain (2019), explicitly, executives must proactively acquire these skills. In this context, upper echelons theory (Hambrick & Mason, 1984; Hambrick, 2007) provides a vital theoretical foundation for understanding how top executives' characteristics, specifically their cognitive base and held values (Cristofaro et al., 2022), are likely to predict their strategic choices (Hambrick, 2007). In more detail, theoretical foundation of the UEP assumes that characteristics of senior managers, such as: age, functional background, career path, work experience in the company, education, professional experience, social background, or financial situation are translated into unobservable or difficult to measure psychological and social features as: motivation, risk aversion, way of perception, etc. (Hambrick, 2007). Finally, top management's impact on enterprise outcomes (Hiebl, 2014) is connected with experimentation, technological dynamism, innovation, and R&D spending (Hoskisson et al., 2017). Therefore, the catalogue of characteristics preliminary included to UEP cannot be closed. It is especially obvious in the digital age with the growing role of Chief Digital Officer (CDO) (Singh & Hess, 2020). Therefore, there is currently a need to upgrade the upper echelons theory and bridge the gap in reference to the newly emerging digital characteristics of top executives. This upgrade should also explore how these characteristics impact new strategic choices brought about by the digital age (Moker, 2020). CDOs channel managerial attention to strategic issues in implementing digital technologies and utilise their capabilities to address them (Wei et al., 2024). The presence of a CDO amplifies the positive influence of the top management team's digital knowledge on digital innovation (Firk et al., 2022). Agarwal and Prasad (1998) argue that individuals characterised by a higher degree of personal innovativeness are more likely to form favourable perceptions of an innovation. In reality, it is not necessary for leaders to be technical experts; they need to understand the implications of the changes while using digital technology (Berman, 2012). Family business research also reveals that the personal traits of the CEO are connected with the innovation outcomes (Rovelli et al., 2023; Kraiczy et al., 2015). Therefore, we formulate the following hypothesis:

H1: The leader's digital innovativeness positively affects the degree of digital innovation activity in the context of Polish family SMEs.

Digital capabilities

In scientific production, digital capabilities are aligned with online activity, delivery, and remote work (Zhou & Wu, 2010), acquiring and developing hardware, software, and organisational capabilities (Davies et al., 2023; Khin & Ho, 2020; Zhen et al., 2021), visualisation (Bärenfänger & Otto, 2015), digital ecosystem (Karimi & Walter, 2015), processes digitalisation (Da Silva Freitas et al., 2017), artificial intelligence, cloud computing, robotics, smart device and big data analytics (Marnoto et al., 2024) or usage technologies to create relationships with customers, known as digital marketing capabilities (Wang, 2020). Therefore, digital capabilities would be perceived as technological and technical processes professionalising the enterprise,

including family firms (Duréndez et al., 2016; Gao et al., 2022). Among digital capabilities, we assumed for our model we utilize those suggested by Proksch et al. (2023): IT capabilities, digital capabilities of employees, and digital culture.

IT Capabilities

Information Technology (IT) capabilities encompass a broad range of common information and communication tools and related services that firms mobilise to achieve their business objectives (Chen et al., 2015; Parida & Örtqvist, 2015). Each company requires a tailored IT infrastructure upon which digital solutions are developed (Khin & Ho, 2019). In addition to soft capabilities such as talent, skills, and organisational climate, the technical infrastructure—comprising hardware, software, communication networks, collaboration platforms, and databases—plays a crucial role in supporting business decision-making processes (Gulzar et al., 2024). IT capabilities are critical tools for organisations, enhancing information dissemination, strengthening business-customer relationships, overcoming geographic constraints, and improving overall communication efficiency (Spiezia, 2011). Chen et al. (2015) conceptualise IT capabilities as a multidimensional construct, including IT infrastructure flexibility, IT integration, IT business alignment, and IT management. IT infrastructure flexibility is particularly crucial for enabling competitive performance and organisational agility (Lim, 2014; Mikalef et al., 2016). IT integration facilitates the seamless merging of data and processes within an organisation, thereby reducing coordination costs and errors while providing a stable platform for business operations (Mao et al., 2024). For organisations to fully leverage IT infrastructure, it must be aligned with business objectives and effectively managed, necessitating coordination between IT and non-IT domains (Luftman et al., 2015).

Building an adequate IT infrastructure requires significant investment in ICT resources, which poses a dilemma for family business owners, as these investments are risky but essential for long-term success (Kathuria et al., 2023). Family firms generally opt for investments in assets that involve lower levels of uncertainty, such as buildings and production types of machinery (Anderson et al., 2012). This reluctance is primarily due to the family's desire for stability and the preservation of socioemotional wealth (SEW), which encompasses non-financial aspects such as family control, legacy, and identity (Basly & Hammouda, 2020). Research also indicates that family businesses often adopt information technologies more slowly than larger corporations, particularly regarding implementing integrated systems that support business processes and inform management decisions with long-term impacts on revenue and profit margins. Furthermore, many small business owners and managers, including those in family businesses, tend to lack strong planning skills and often rely on more user-friendly systems (Zapata-Cantu et al., 2023).

Additionally, financial constraints and a lack of understanding of how to leverage technology to enhance competitive advantage often limit family businesses' technological advancements (Begnini et al., 2023; Rozmi et al., 2020; Soluk & Kammerlander, 2021). Despite family businesses investing less than their non-family counterparts, they should not be labelled as „less innovative” (Duran et al., 2019). They possess a strong capability for technological innovation but often exhibit a lower inclination to pursue it (willingness-ability paradox) (Chrisman et al., 2015). In family businesses, firm leaders play a critical role not only in making resource-allocation decisions but also in overseeing and directing how those resources are utilised (Bennedson, 2010). They foster, select, and nurture innovation activities within the company (Duran et al., 2019), including guiding and supporting IT investments. Family business leaders help shape the firm's strategic direction and ability to adapt to technological advancements and market changes by actively encouraging this kind of investment. Therefore, we stated as follows:

H2: Leader's digital innovativeness positively influences IT capabilities in Polish family SMEs.

The technological infrastructure within an organisation plays a pivotal role in adopting technological innovations (Bhatia & Kumar, 2023; De Souza et al., 2017). IT capabilities, particularly in terms of systems architecture design, significantly influence an organisation's capacity for digital transformation and its ability to integrate new technologies (Brunner et al., 2021). These capabilities facilitate the deployment and utilisation of innovative IT tools and systems, thereby directly improving the efficiency and outcomes of digital projects (Wiesböck et al., 2020). Single studies that discuss the efficiency of ICT investments in family businesses show that family involvement positively moderates the relationship between ICT investments and performance (Gargallo Castel & Górriz, 2017). However, the positive relationship between IT alignment and family firm performance is weakened by prioritising family goals (Issah & Calabro, 2024). In terms of digital performance, enhancing IT capabilities, including technical infrastructure, and developing dynamic capabilities

play a critical role in product and service digitalisation in family-owned businesses (Soluk & Kammerlander, 2021). So, we stated as follows:

H3: The level of IT Capabilities positively affects the degree of digital innovation activity in Polish family SMEs.

Digital capabilities of employees

Digital capabilities of the business go beyond pure IT technologies (Da Silva Freitas et al., 2017) and are defined as the ability of the organisation to use digital technologies to gain a competitive advantage in the digital environment (Sousa-Zomer et al., 2020).

It is stressed that leaders play a crucial role in digital transformation processes (Bouwman et al., 2018; Diéguez-Soto et al., 2016), especially when leaders trust digital advancements (Costa et al., 2023). Family firm leaders can drive relevant capabilities and quickly form a consensus within the company to achieve high pragmatism and formulate appropriate digital strategies (Ano & Bent, 2022), and allocate resources to relevant areas. Consequently, leaders' vision, attitude, and behaviour significantly influence employees' perceptions of the benefits of IT innovation and hence its adoption outcomes (Li et al., 2016). In particular, onboarding the younger generation into the firm's leadership position, utilising their technological expertise (Young & Cater III, 2019), can catalyse changes in this field (Calabrò et al., 2019). Ohain (2019) investigated various attributes of digital leaders, such as empathy, innovativeness, openness, and agility. He presented the point that trust in digital leaders can be a springboard to overcoming follower resistance and transmitting positive emotions. It can be stated that for leaders, inspiring followers seems to become a more crucial skill in the digital age (Schwarz Müller et al., 2018). Moreover, conversely, if employees need to be agile and creative and constantly change and develop themselves, leaders might likewise have to more actively promote and allow for such changes (McCann et al., 2009). Positive feelings towards applying digitalisation can reduce resistance to change because it makes employees eager to deal with novelty (Bastari et al., 2020). In this context, leaders have a pivotal role in fostering a positive outlook towards digitalisation on the employee side (Schuster & Lehmann, 2023).

However, family firms strongly differ from non-family ones (Astrachan, 2010; Hasenzagl et al., 2018; Martin & Gomez-Mejia, 2016; Sharma & Sharma, 2011; Chrisman et al., 2012; Madison et al., 2016). These differences also refer to the attitude of family and non-family employees towards the business. Identifying family members with the business is more substantial than non-family ones (Deephouse & Jaskiewicz, 2013) and is connected with social and emotional involvement in running the business (Cleary et al., 2019; Sharma & Sharma, 2011). Hence, family firms constitute a particular working environment for non-family employees (Beehr, 1997; Habbershon et al., 2003; Lansberg, 1983). Non-family employees are facing nepotism (Padgett & Morris, 2005), authoritarian leadership style (Tagiuri & Davis, 1992), human resource practices biased against non-family members (Barnett & Kellermanns, 2006; Lubatkin et al., 2007; Schulze et al., 2001) ingroup-outgroup perceptions of non-family employees (Barnett & Kellermanns, 2006), founder-centric cultures (Schein, 1983), and lack of delegation (Kelly et al., 2000). It leads to a lower level of psychological ownership represented by non-family employees (Melanie et al., 2014). Owners and top managers of family firms are aware that strong formal and informal interrelationships and family life are deeply intertwined with the firm (Hasenzagl et al., 2018) and result in social and emotional involvement in running the business (Cleary et al., 2019; Sharma & Sharma, 2011). Therefore, family managers struggle to create care-oriented employment relationships with employees (Issah & Calabro, 2024). For example, Atalay and Özler (2013) confirmed a positive relationship in correlation analysis between organisational justice and psychological ownership of non-family employees. (Köhn et al., 2023) provided evidence that family values, family involvement, care towards employees, direct communication, strong personal relationships, and business mechanisms support the motivation of non-family employees. Generally, the professionalisation of family firms (Dekker et al., 2013) supports organisational culture and helps family firms overcome their weaknesses and optimise their strengths (Polat, 2021). Digitalisation could foster family business professionalisation (Batt et al., 2020). To achieve this, a family business owner needs to encourage their employee to be innovative, open-minded, and curious about emerging technology (Schulze & Bövers, 2022) because a workforce capable of developing novel products or services using digital technologies could contribute to business value creation (Mancha & Shankaranarayanan, 2021). Therefore, we stated as follows:

H4: Leader's digital innovativeness positively affects digital capabilities of employees in Polish family SMEs.

Digital transformation requires employees to be skilled, motivated, empowered and autonomous (Basly & Hammouda, 2020). Adequate human capital is a critical determinant toward a digital-oriented transformation of a business since sophisticated technologies require significant organisational changes (Ano & Bent, 2022). We share the point that a motivated workforce is prepared to achieve organisational goals (Idowu, 2022; Rae et al., 2015), encompassing digitalisation (Prokesch, 2017). Information technology requires employees to adapt to the technology, which will have different effects on employees. Some employees will perceive them as opportunities and are more likely to use them as active working tools to improve performance and job satisfaction (Bala & Venkatesh, 2016). Other people need more time to adapt to new technologies (Eduar et al., 2020). Besides leadership capabilities and adequate firm structure, digital capabilities of employees are key for digital entrepreneurship (Gurbaxani & Dunkle, 2019). Digital transformation of the business requires not only leaders to drive the transformation continuously but also employees with the appropriate digital skills (Sousa-Zomer et al., 2020). It is emphasised that to perform with digital transformation, a digital-savvy workforce, including digital natives, is necessary (Warner & Wäger, 2019). Consequently, digital capabilities lead to better digital business performance (Da Silva Freitas et al., 2017; Heredia et al., 2022). So, we stated as follows:

H5: The level of digital capabilities of employees in family businesses positively affects the degree of digital innovation activity in Polish family SMEs.

Digital culture

A majority of the scholars agreed that the shift to digital transformation is imperative for companies nowadays (Kostyrko et al., 2023; Chattaraj, 2021; Ogreaan & Herciu, 2021). This transformation is not just a fleeting moment or a limited-time project anymore. It has become a continuous and prevailing phenomenon (Firican, 2023). The relationship between cultural change towards a digital culture and digital transformation is quite intertwined. According to Mergel et al. (2019), cultural transformation is commonly acknowledged as one of the four primary pillars of digital transformation, in addition to domain, business model, and process transformation. A cultural change towards digital culture is increasingly seen as essential for organisational digital transformation (Firican, 2023). On the other hand, digital transformation initiatives can also drive cultural change (Forsythe & Rafoth, 2022). Abhari et al. (2021) stated that digital transformation efforts can drive cultural change, harmonising organisational goals, values, and culture with employees. There are different approaches to defining the concept of digital culture, drawing attention to its many facets and complexity. Uzelac (2010), emphasising the role of technology in shaping behaviours and practices, defined digital culture as the extent to which digital tools and technologies are embedded in an organisation's daily operations and strategic initiatives. Another prevalent approach to define digital culture from the prospective of organisational behaviour according to Bachtiar and Susanty (2020) is collective behaviours, values, and practices of the company that support the use of digital technologies, focusing on the aspect how staff members engage with digital technologies and one another, encouraging a culture of ongoing learning and adaptation. Another intriguing way to define digital culture, as presented by Vasilopoulou, Theodorakopoulos, and Giannoukou (2023), is through a customer-focused strategy. This definition focuses on utilising digital technologies to gain insights into customer behaviour and preferences, enhancing service delivery, creating value, and boosting customer satisfaction. Finally, another way to define digital culture is through the lens of leadership and strategic vision. Ossiannilsson (2018) specified that leaders who prioritise digital transformation and create a vision for digital strategies are the driving force behind digital culture. Indeed, the role of leaders is vital in promoting digital transformation and fostering a digital culture in organisations (Philip, 2021). Whether digital change is forced or planned, the transformative behaviours of leaders are essential to its success (Cortellazzo et al., 2019). Although extensive research has been conducted on digital transformation, a gap exists in understanding how leader's digital innovativeness and capabilities influence the digital culture in family firms (Soluk & Kammerlander, 2021). Building on these perspectives, we hypothesise that the digital innovativeness of family business leaders serves as a critical driver of the firm's digital culture, shaping the environment necessary for effective digital transformation. Thus, we propose:

H6: The leader's digital innovativeness positively affects digital culture in Polish family SMEs.

According to Sivulca et al. (2024), digital transformation and digital culture synergistically contribute to organisational success, particularly in an increasingly volatile and digitally complex environment. Cultivating a digital organisational culture not only accelerates the digitisation of business processes but also significantly enhances overall firm performance.

By fostering an environment that embraces digital tools and technologies, organisations can streamline operations, improve efficiency, and drive innovation, ultimately leading to a competitive advantage in the digital age (Martinez-Caro et al., 2020). The following studies (Kreslins et al., 2020; Isensee et al., 2020; Petrova & Spatenka, 2022) collectively underscore the pivotal importance of digital culture in enabling successful digital transformation and enhancing organisational performance. By fostering a digital culture, organisations can create an environment that supports innovation, agility, and continuous improvement.

Although there has been some research (Batt et al., 2020; Amato et al., 2024; Daskalopoulos & Machek, 2023) examining the correlation between a company's digital culture and its digital outcomes or activities, the moderating role of family business essence in this relationship remains unclear. Further investigation is needed to understand how the unique characteristics of family businesses influence the impact of digital culture on digital performance. This gap in literature highlights the importance of considering the distinct attributes of family-owned enterprises when analysing the dynamics between digital culture and digitalization activities. Referring to this, we stated as follows:

H7: The level of digital culture positively affects the degree of digital innovation activity in Polish family SMEs.

METHODOLOGY

Data collection and sample

The online questionnaire was distributed to 8,000 Polish enterprises initially identified as family businesses. The list of potential family businesses was compiled through web searches, exploration of enterprise registers and databases (Madison et al., 2018), and contacts provided by the survey company. It is important to note that, in the case of family businesses in Poland, no comprehensive sampling frame exists that captures enterprises fulfilling various definitional criteria of a family business. This precludes the use of probability sampling techniques and introduces the risk of incomplete population coverage. In such contexts, non-probability sampling—while not without limitations—remains a widely accepted approach in family business research, provided that the potential for sampling bias is acknowledged and discussed (Szreder, 2010).

In total, we received 550 responses from self-declared family businesses. This perspective draws on the widely recognized Thomas theorem, which states: „If men define situations as real, they are real in their consequences” (Bornmann and Marx, 2020, p. 554). Accordingly, when an owner or manager identifies their enterprise as a family firm, it can be inferred that this designation shapes tangible outcomes, such as the development and utilization of distinctive resources. This criterion has been employed in prior research (Gallo et al., 2004; Zellweger et al., 2012; Żukowska et al., 2021).

To refine the sample, we excluded all entities that employed more than 250 employees in the previous year or whose owner was self-employed, which was in line with the SME definition. Additionally, we retained only responses provided by business owners, co-owners, CEOs, or members of management boards (they can indicate more than 1 role in the enterprise). This process resulted in a final sample of 501 observations, and therefore, the final response rate totalled 6.26%.

The analysed sample comprised family businesses with an average age of 20.4 years, most of which (86.42%) were led by a family CEO. The mean number of employees across the businesses was 27.52, with 17.16% employing 50 or more people. Regarding ownership, 57.88% of the businesses were owned by the first generation, 38.92% by the second generation, 13.97% by the third generation, and 3.20% by the fourth generation or later. A similar generational pattern was observed in management, with the first generation comprising 57.49%, the second generation 41.12%, the third generation 13.37%, and the fourth generation or later 2.40%. The businesses operated across various sectors, with 31.94% in retail, 52.10% in services, and 34.33% in production (Table 1).

The composition of the study sample, encompassing variables such as age, industry sectors, and generational involvement, exhibits a strong alignment with the profiles observed in prior research on family enterprises in Poland (Pernsteiner & Węclawski, 2016; Żukowska et al., 2021). This consistency might suggest that the sample is not significantly affected by selection bias. However, it does not eliminate the risk of inherent selection bias. Replicating similar sample structures across studies may reproduce unmeasured biases, rather than guarantee actual representativeness, especially regarding latent characteristics such as attitudes, capabilities, motivation, professionalization level, or organizational culture, which remain outside the scope of the measured variables. The obtained results should be interpreted within the context of these sampling-related constraints.

The comparability of findings across studies is also constrained by a persistent methodological challenge: the lack of a universally recognised definition of a family business within Poland and in the broader international context.

Table 1. Sample description

Respondents ^a	Business owner	31.94%
	Co-owner	32.14%
	CEO	22.55%
	Member of the management board	22.75%
Owner generation ^a	First	57.88%
	Second	38.92%
	Third	13.97%
	Fourth or later	3.20%
Generations in management ^a	First	57.49%
	Second	41.12%
	Third	13.37%
	Fourth or later	2.40%
Age		20.4
Employees		27.52
Sector ^a	Retail	31.94%
	Service	52.1%
	Production	34.33%

Note: ^aMore than one answer could be given.

The test for non-response bias compared the means for each item response obtained from the first 5% answers against the same means for the last 5% answers (Armstrong & Overton, 1977), using a t-test for the equality of means. In our study, we found that for most items (33 out of 35), the mean values used in the research do not differ between the examined groups. This finding suggests that response timing was not systematically associated with substantive differences in the measured variables, providing evidence against the presence of meaningful late-response bias.

In order to mitigate the problem of common method bias, we implemented several procedural remedies during the survey. We ensured respondent anonymity, used a mix of positively and negatively worded items, and separated items used as dependent and independent variables (Polas, 2025). Additionally, we performed Harman's single-factor test on the final sample. The total variance extracted by a single factor was 40.94%, which is below the commonly accepted threshold of 50% (Riley et al., 2018).

Variables

Our constructs were developed based on items identified in the existing literature, with modifications made to accommodate the application of certain constructs in the family business context for the first time. The survey statements were translated from English to Polish with the assistance of language experts. Table 2 presents a comprehensive list of these items, their original sources, and the corresponding survey questions. A 5-point Likert scale was utilised for all items.

Table 2. List of items

Item		M	SD	Skew	Kurtosis
Leader's digital innovativeness (LDI) - Agarwal and Prasad (1998), Mancha & Shankaranarayanan (2021).					
L1	If the family business leader heard about a new digital technology, he/she would look for ways to experiment with it	3.57	1.16	-0.56	-0.54
L2	If the family business leader heard about a new digital technology, he/she would be the first among the team members to try it out.	3.48	1.17	-0.48	-0.51
L3	In general, if the family business leader encountered a new digital technology, he/she would be hesitant to try it out. (REV)	3.10	1.35	-0.15	-1.16
L4	Family business leader likes to experiment with digital technologies.	3.48	1.19	-0.44	-0.67
L5	When interacting with digital technologies, the family business leader would be spontaneous.	3.47	1.14	-0.37	-0.60
L6	When interacting with digital technologies, the family business leader would demonstrate a lack of imagination. (REV)	3.06	1.28	-0.07	-1.07

Item		M	SD	Skew	Kurtosis
L7	When interacting with digital technologies, the family business leader would be playful.	3.60	1.16	-0.51	-0.54
L8	When interacting with digital technologies, the family business leader would be flexible.	3.62	1.12	-0.56	-0.38
L9	When interacting with digital technologies, the family business leader would not be inventive. (REV)	3.32	1.21	-0.24	-0.86
L10	When interacting with digital technologies, the family business leader would be creative.	3.53	1.19	-0.56	-0.54
L11	When interacting with digital technologies, the family business leader would not demonstrate originality. (REV)	3.50	1.18	-0.45	-0.62
IT Capabilities (ITDC) - Proksch et al. (2024)					
IT1	We adapt our digital offerings whenever changing business needs arise.	3.77	1.06	-0.65	-0.17
IT2	We implement new digital products and services on a regular basis.	3.70	1.07	-0.51	-0.48
IT3	Our IT integrates the most current digital offerings by third parties like digital payments, customer relationship management systems, and others.	3.66	1.04	-0.47	-0.46
IT4	Our company provides access to a variety of digital devices.	3.85	1.05	-0.66	-0.30
IT5	We use the most current IT infrastructure.	3.71	1.06	-0.52	-0.31
IT6	We store all data digitally.	3.56	1.11	-0.40	-0.71
IT7	We have Internet access with gigabit speed.	3.97	1.03	-0.75	-0.23
IT8	We are planning to enhance our IT capabilities	3.81	0.99	-0.53	-0.34
Digital capabilities of employees (EDC) - Proksch et al. (2024)					
EM1	We offer different trainings (courses, literature, coaching) to improve the digital expertise of our non-family/family team members.	3.49	1.11	-0.37	-0.72
EM2	Digital skills are an important selection criterion in recruiting new non-family/family team members.	3.67	1.09	-0.56	-0.62
EM3	Our non-family/family team members use all digital services and products we offer.	3.92	0.92	-0.79	0.50
EM4	Our non-family/family team has the necessary skills to further digitalize our company.	3.75	0.95	-0.57	-0.13
EM5	We actively discuss our digital projects within our company including failures and best practices.	3.83	1.06	-0.74	-0.01
Digital culture (DC) - Proksch et al. (2024)					
C1	We openly discuss failures with all team members.	3.84	0.98	-0.55	-0.43
C2	Decisions are based on the opinion of the whole team, not on a single person only.	3.88	0.97	-0.78	0.26
C3	We work in cross-functional teams (combining people from IT, marketing, finance, etc.).	3.65	1.05	-0.51	-0.34
C4	In our company, we avoid strong hierarchies in project work.	3.78	0.95	-0.56	0.13
C5	Every team member brings in ideas and suggestions for digital products and services.	3.77	0.98	-0.55	-0.25
Digital innovation activities (DA) - Bornhausen and Wulf (2023)					
DA1	Our firm has introduced many new digital products or services over the past three years.	3.53	1.19	-0.52	-0.55
DOA	Our firm has made many dramatic digital changes in the mix of its products and services over the past three years.	3.52	1.16	-0.37	-0.74
DA3	Our firm has emphasized making major digital innovations in its products and services over the past three years.	3.50	1.15	-0.38	-0.71
DA4	Over the past three years, our firm has shown a strong proclivity for high-risk, digital projects (with chances of very high returns).	3.28	1.22	-0.15	-0.92
DA5	Our firm has emphasized taking bold, wide-ranging action to position itself and its products or services as digital over the past three years.	3.41	1.15	-0.25	-0.78
DA6	Our firm has shown a strong commitment to research and development, technological leadership, and innovation towards digitalization.	3.41	1.19	-0.36	-0.76
DA7	Our firm has followed strategies for digitalization that allow it to exploit opportunities in its external environment.	3.56	1.12	-0.43	-0.62

To measure the individual digital innovativeness of a business leader, we adopted the scale developed by Mancha and Shankaranarayanan (2021), which conceptualizes digital innovativeness as an individual's tendency to experiment with, adapt to, and creatively engage with information technologies. This scale builds upon the conceptual foundation of personal innovativeness introduced by Agarwal and Prasad (1998), but it is specifically adapted to the context of digital technologies. While the original authors excluded several items due to low factor loadings or cross-loadings, we initially included all 11 items in our measurement model. After conducting exploratory and confirmatory factor analyses, we found that all items demonstrated acceptable psychometric properties in our sample and therefore were retained for further analysis.

To operationalise the mediators—digital IT capabilities, digital employee capabilities, and digital culture—we utilised measurement tools previously employed by Proksch et al. (2024). The items addressing digital employee capabilities were modified to distinguish between family and non-family employees. Subsequently, the average scores for each item within this mediator were calculated.

The digital innovation activity i.e. the creation of products and services, processes, or business models on the basis of digital technology or the trials of such creation, was assessed using a scale adapted and modified by Bornhausen and Wulf (2023). This scale, which has been validated for both small and large enterprises, was previously employed to measure the innovativeness of family firms (Chirico et al., 2011; Kellermanns et al., 2012).

Method

The final sample size was sufficient for employing the SEM method to test the proposed hypotheses (Priyanath et al., 2020). To assess potential issues with normality, we conducted Mardia's tests for multivariate normality. The results indicated significant Mardia's coefficients, suggesting a possible deviation from a normal distribution. However, it is crucial to emphasise that this significance test alone is not a comprehensive measure of normality. Mardia's tests are susceptible to sample size, with larger samples more likely to produce significant results indicating non-normality.

To provide a more robust assessment, descriptive statistics should complement significance tests, especially kurtosis values, as kurtosis can significantly affect tests of variances and covariances—key components in SEM (Byrne, 2009; DeCarlo, 1997). According to Westfall and Henning (2013), kurtosis values exceeding 3.00 may indicate that a variable does not follow a normal distribution. Our analysis examined the kurtosis for individual items and found that none exceeded the threshold of 3.

All data preparation and SEM computations were performed in RStudio, with the lavaan package (Rosseel, 2012) serving as the primary tool for model estimation.

Measurement model

The validity of the constructs was assessed by systematically eliminating items with insufficient factor loadings. Following established guidelines, factor loadings exceeding 0.70 are preferred, as they indicate that the construct explains a substantial proportion of the variance in its indicators. However, their removal was considered appropriate for items with loadings in the range of 0.40 to 0.70 to enhance construct validity, minimise measurement error, and improve overall model fit (Hair et al., 2016). Ultimately, only items with loadings above 0.65 were retained for further analysis (Table 3).

The variance inflation factors (VIFs) for the individual observed variables in our model ranged from 1.70 to 2.94, indicating low to moderate multicollinearity (i.e., below the commonly accepted threshold of 5; Sarstedt et al., 2017). In contrast, the VIFs calculated for the latent variables (after additional analytical steps, i.e., exporting factor scores from the measurement model) ranged from 5.5 to 9.8. However, according to the SEM literature, multicollinearity becomes problematic when the VIF for latent variables exceeds 10 (Kock & Lynn, 2012).

Table 3. Measurement model diagnostics

Standardised parameter estimates for the measurement model					
	LDI	ITDC	EDC	DC	DA
L1	0.7998				
L2	0.7513				
L4	0.7709				
L5	0.7302				
L7	0.8015				
L8	0.7762				
L9	0.6866				
L10	0.7939				
L11	0.7457				
IT1		0.7234			
IT2		0.7301			
IT3		0.6717			
IT4		0.6924			
IT5		0.6755			

Standardised parameter estimates for the measurement model					
IT8		0.7264			
EM30			0.7339		
EM31			0.7865		
EM33			0.7895		
C1				0.6456	
C2				0.6876	
C3				0.6570	
C4				0.6397	
C5				0.6787	
D1					0.7534
D2					0.7821
D3					0.7826
D4					0.7666
D5					0.7706
D6					0.7660
D7					0.7738
Reliability criteria for the constructs					
alpha	0.9254	0.8542	0.8111	0.8047	0.9108
CR	0.926	0.854	0.810	0.796	0.911
AVE	0.5812	0.5007	0.5896	0.4381	0.5937

The remaining items were subjected to a five-factor confirmatory factor analysis (CFA) to evaluate the psychometric properties of the scales corresponding to each construct. While the chi-square statistic for the model was significant ($\chi^2 = 835.113$, $df = 395$, $p < 0.01$), additional fit indices demonstrated strong model performance: Tucker–Lewis index (TLI) = 0.942, comparative fit index (CFI) = 0.947, root mean square error of approximation (RMSEA) = 0.049, and standardised root mean square residual (SRMR) = 0.038.

Construct reliability was assessed using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) (Cheung et al., 2024). For each construct, the values of Cronbach's α and CR are more than the floor level of 0.70 and are acceptable for basic research (Ritika & Kishor, 2022). Also, the criterion that CR must be greater than AVE is also satisfied in all 5 constructs. Thus, all the conditions to be satisfied for ensuring convergent validity were met by all the constructs (Ritika & Kishor, 2022). While the AVE for the Digital Culture (DC) construct was slightly below the conventional threshold (0.44), it was retained based on the guidance of Fornell and Larcker (1981), who suggested that convergent validity may still be acceptable if composite reliability exceeds 0.60, even when AVE is below 0.50. However, it is important to note that the prevailing standard remains an AVE of at least 0.50 (Hair et al., 2019). Therefore, the lower AVE for DC should be acknowledged as a limitation, and results involving this construct should be interpreted with appropriate caution.

Discriminant validity was evaluated using the Heterotrait-Monotrait Ratio (HTMT). The HTMT values (Table 4) for all constructs were below the threshold of 0.90 (or 0.85 for a more conservative criterion), indicating satisfactory discriminant validity (Henseler et al., 2015).

Table 4. Heterotrait-Monotrait Ratio

	LDI	DA	DC	EDC	ITDC
LDI	1.0000	0.7963	0.5320	0.8675	0.7761
DA	0.7963	1.0000	0.7298	0.8754	0.8314
DC	0.5320	0.7298	1.0000	0.7049	0.7598
EDC	0.8675	0.8754	0.7049	1.0000	0.8478
ITDC	0.7761	0.8314	0.7598	0.8478	1.0000

RESULTS

Structural model

The proposed model predicts that digital IT capabilities, digital capabilities of employees and digital culture partially mediate the effect of leader’s digital innovativeness on digital innovation activities. The findings indicate a satisfactory fit for the model ($\chi^2 = 835.113$, $p < 0.05$, $df = 395$, $CFI = 0.947$; $TLI = 0.942$; $RMSEA = 0.049$, $SRMR=0.038$). Analysis of the structural path coefficients (Figure 1) reveals that only one of the seven proposed paths examined did not reach statistical significance (specifically, H1: LDI \rightarrow DA). Therefore, all hypotheses except H1 receive empirical support (Table 5).

Table 5. Hypotheses support

H	term	Estimate	statistic	p.value
H1	LDI \rightarrow DA	0.1587	1.8347	ns
H2	LDI \rightarrow ITDC	0.6434	13.6896	$p < 0.001$
H3	ITDC \rightarrow DA	0.2154	2.0689	$p < 0.05$
H4	LDI \rightarrow EDC	0.7661	15.0755	$p < 0.001$
H5	EDC \rightarrow DA	0.4706	3.4188	$p < 0.001$
H6	LDI \rightarrow DC	0.3601	9.0181	$p < 0.001$
H7	DC \rightarrow DA	0.2709	2.7020	$p < 0.01$

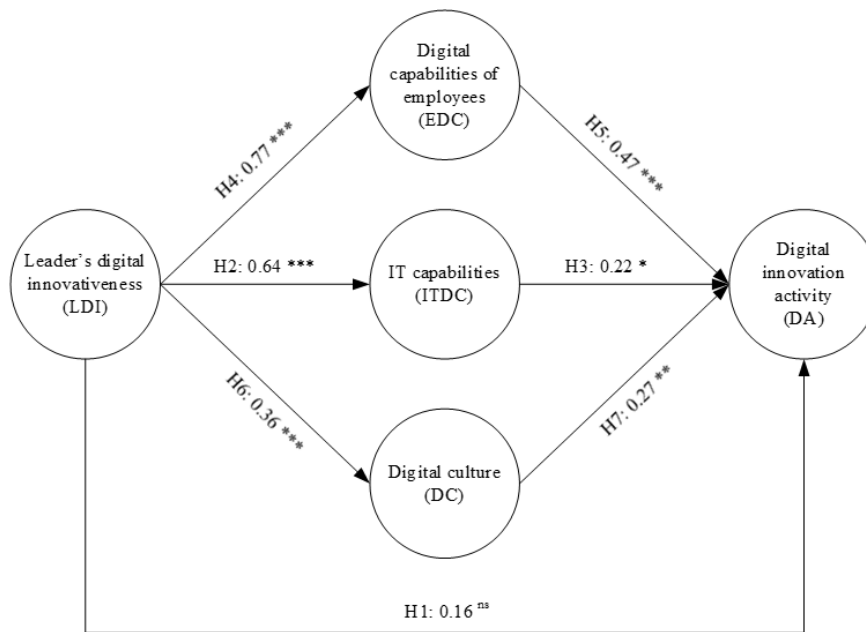


Figure 1. Graphical representation of path coefficients

Analysis of mediation

We propose that digital innovation activities are partially mediated by three key factors: IT capabilities, digital capabilities of employees, and digital culture. To test these mediation effects, following the approach outlined by James et al. (2006) and adopted in the family business research (Afonso et al., 2021), we estimated three additional models (Table 6). Model 1 - that presents a full mediation scenario. Model 2 examines only the direct effect of leader’s digital innovativeness on digital innovation activities. Model 3 incorporates the direct effects of leader’s digital innovativeness on IT capabilities, digital capabilities of employees, and digital culture, as well as on digital innovation activities, but excludes the mediating effects of these factors on digital innovation activities. Lastly, Model 4 represents the proposed model, assuming a partial mediation scenario where a direct effect on digital innovation activities is also included.

Table 6. Mediation analysis results – path coefficients

Path	Model 1 Full mediation	Model 2 IV affects DV	Model 3 No mediation	Model 4 Partial mediation
LDI → DA		0.76***	0.76***	0.16
LDI → ITDC	0.64***		0.64***	0.64***
LDI → EDC	0.77***		0.77***	0.77***
LDI → DC	0.36***		0.36***	0.36***
ITDC → DA	0.24*			0.22*
EDC → DA	0.68***			0.47***
DC → DA	0.17*			0.27**

Note: Two-tailed significance testing; *Significant $p < 0.05$; ** Significant $p < 0.01$; *** Significant $p < 0.001$.

Before evaluating the mediator effect, it is crucial to examine four conditions that validate the presence of mediation. The initial step involves identifying whether the independent variables (leader's digital innovativeness) directly influence the mediators (IT capabilities, digital capabilities of employees, and digital culture) and whether the mediators, in turn, directly affect the dependent variable (digital innovation activities), based on the estimation of Model 1. The analysis then explores whether the leader's digital innovativeness directly impacts the digital innovation activities when the mediators are excluded, as outlined in Model 2. Lastly, the test evaluates whether the influence of the leader's digital innovativeness on digital innovation activities diminishes or becomes statistically insignificant upon including the mediators in the model, thereby indicating either partial or full mediation. The findings point to full mediation, as the effect becomes insignificant. All calculated models obtained a satisfactory fit (Table 7).

Models 3 and 4 demonstrated identical fit indices and the same number of degrees of freedom, indicating that they are statistically equivalent and cannot be distinguished based on model fit criteria alone. Therefore, the selection of Model 4 was guided by theoretical considerations and its closer alignment with the study's conceptual framework and research objectives. This approach is consistent with best practices in structural equation modeling, where theoretical justification is used to guide model selection when statistical criteria are inconclusive (Guo et al., 2009).

Table 7. Mediation analysis results – model fits

Model	AGFI	CFI	chi2	df	RMSEA	SRMR	TLI
Model 1	0.86	0.95	837.95	435	0.05	0.04	0.94
Model 2	0.93	0.98	210.55	103	0.05	0.03	0.98
Model 3	0.86	0.95	835.11	395	0.05	0.04	0.94
Model 4	0.86	0.95	835.11	395	0.05	0.04	0.94

DISCUSSION

Although H1 posited a direct positive effect of the family business leader's digital innovativeness on digital innovation activity, this path was not statistically significant. This finding suggests that digital innovativeness at the leadership level, while important, may not be sufficient on its own to drive digital innovation activity in Polish family SMEs. Recent research increasingly emphasizes that the influence of digital leadership is often indirect and operates through organizational mediators—such as digital culture or specific human resource management practices—rather than as a direct effect (i.e., Cetinkaya & Surucu, 2025; Wang et al., 2024). In the context of family SMEs, qualitative research indicates that even when top managers are open to or fascinated by digitalization, it does not mean that it translates into concrete innovation activity (Bouncken & Schmitt, 2022).

The findings for hypotheses H2, H4, and H6 emphasise the pivotal influence of leader's digital innovativeness on establishing a robust organisational framework for digital transformation. Specifically, the results demonstrate that leader-driven digital innovativeness has a direct, positive impact on three essential facilitators of digital innovation activities: IT capabilities (H2), employee digital competencies (H4), and organisational digital culture (H6). This observation upgrades the preliminary assumptions of the Upper Echelons Theory, which asserts that the unique traits of leaders—including their personalities—significantly shape their interpretations of various situations, thereby affecting their strategic

decisions (Hambrick & Mason, 1984; Hambrick, 2007). Consequently, these characteristics enable leaders to determine the extent and quality of IT and employee digital capabilities while simultaneously influencing the organisational culture and strategic priorities. The results for H3, H5, and H7 emphasise the critical roles of IT capabilities, digital capabilities of employees, and digital culture as direct drivers of digital innovation activity in family businesses. Specifically, the positive and significant relationships between these mediators and digital innovation activity highlight their individual contributions to the digital transformation process. These findings align with the dynamic capabilities framework, underscoring the importance of cultivating organisational competencies that adapt and respond to technological changes in family businesses (Putritamara et al., 2023; Soluk & Kammerlander, 2021).

Our findings resonate with those of Gunawan et al. (2023), who similarly underscored the vital role of organisational digital culture in facilitating digitalisation within family enterprises. In parallel, Porfirio et al. (2024) identified critical factors such as organisational culture, change management, knowledge, human capital, IT systems, and digital transformation strategies as essential components driving the advancement of digital transformation initiatives.

In the literature, it is relatively often stated that successful digital transformation requires leaders with appropriate digital skills (Hunt, 2015; Schwarzmüller et al., 2018) and a certain mindset ready to lead digital change (von Ohain, 2019). In the context of family businesses, the innovativeness of the leader plays a pivotal role in driving digital transformation. Santiago's (2021) research highlights that the adaptability of family firms to digital technologies is significantly influenced by the level of control exerted by the leader in the decision-making process. Leaders with a more controlling nature, particularly those who lack exposure to new knowledge, often resist digital advancements—a phenomenon described as „family inertia.” However, as our research shows, those personal traits of leaders influence digital innovation activities indirectly - through supporting their employees in their digital capabilities growth, deciding on developing IT capabilities, and facilitating digital culture.

Our findings align with the research of Proksch et al. (2024), revealing that digital innovation activities are not solely propelled by leader's digital innovativeness or digital strategy; instead, these outcomes are fully mediated by IT capabilities, employee digital competencies, and organisational digital culture. While Proksch et al. focus on new ventures and highlight the partial mediation effects of IT capabilities and digital culture within their digital strategy framework, our study extends this perspective by emphasising the comprehensive role of these mediators, specifically in the context of family businesses. This contrast may stem from contextual differences between new ventures and family businesses. In our study, the deeply embedded traditions, governance structures, and long-term orientations typical of family firms may amplify the mediating role of internal capabilities and culture, rendering leadership innovativeness insufficient as a direct driver of digital innovation activities. This distinction is crucial, as family firms often face unique challenges and opportunities that differ from those encountered by new ventures.

CONCLUSION

The subject of digital transformation within family firms remains significantly under-researched, primarily due to the intricate nature of the digital transformation phenomenon and the inherent diversity among family businesses (Daskalopoulos & Machek, 2023; Tirdasari et al., 2022). Future research should focus on the role of family influence, antecedents, enablers, barriers, and performance outcomes of digital transformation in family businesses (Daskalopoulos & Machek, 2023).

The practical implications of this research are multifaceted. Firstly, the findings underscore that organisations, particularly family-owned businesses, need to invest in leadership development programs that emphasise digital innovativeness. By fostering these qualities in their leaders, businesses can more effectively navigate the complexities associated with digital transformation. This strategic investment not only equips leaders with the necessary skills to drive technological advancements but also enhances the overall digital resilience of the company. Furthermore, such programs can foster a culture of continuous learning and innovation, ensuring that the organisation remains competitive in an increasingly digitalised market. Therefore, businesses need to recognise the value of nurturing digitally innovative leaders as a critical component of their long-term success and sustainability.

The research highlights the importance of cultivating a supportive digital culture within the organisation. Practical measures to achieve this include promoting collaboration and knowledge sharing among employees, investing in advanced digital tools and technologies, and encouraging a mindset that embraces change and innovation. Businesses can significantly enhance their overall performance and achieve superior digital innovation activities by creating an

environment where digital capabilities are highly valued and nurtured. This approach ensures that the entire organisation, not just its leaders, is aligned with the overarching goals of digital transformation. Consequently, fostering a robust digital culture is pivotal for organisations aiming to thrive in the digital age.

Ultimately, our findings emphasize the imperative to integrate key characteristics of family firm executives—particularly those pertaining to their digital competencies—into the framework of Upper Echelon Theory. This divergence suggests that dominant models of digital transformation—often derived from startup or corporate contexts—may not fully capture the dynamics at play in family firms. By integrating insights from Upper Echelon Theory with the distinctive features of family business governance, our findings call for more nuanced models of digital innovation. The digital orientation, attitudes, and behaviours of these top-level leaders may significantly influence both the development of digital capabilities of employees and the cultivation of a digitally oriented organizational culture. Furthermore, we critically assessed the methodology employed for measuring the leader's digital innovativeness proposed by Mancha and Shankaranarayanan (2021).

Several limitations constrain the generalizability of our study's findings. The sampling approach employed inherently limits external validity, as it does not provide equal selection probability for all family businesses in the population of all family businesses, potentially introducing systematic bias. Geographic limitation to Polish enterprises constrains applicability to family businesses operating in different institutional and cultural contexts. The cross-sectional design captures family business dynamics at a single point in time, limiting insights into developmental processes. While these constraints limit population-level inferences, the findings remain valuable for understanding family business dynamics within the specified contextual boundaries (Polish SME's) when interpreted with appropriate caution. Another limitation of this study is its reliance on a single respondent to assess the leader's digital innovativeness, which may introduce bias and limit perspective diversity. Future research should incorporate multi-source ratings (e.g., from subordinates or peers) to enhance validity and capture the potential impact of differing viewpoints on the observed relationships. The leader's digital innovativeness was assessed from the perspectives of managers and family business owners. These perspectives may differ due to their distinct roles and priorities, which require further investigation.

While this study advances understanding of digital innovation within family firms, several avenues remain open for further exploration. Future research could benefit from expanding the sample to include family businesses from diverse geographical regions, enabling a more comprehensive understanding of the phenomenon in question and enhancing the external validity of the findings. Another intriguing avenue for future research lies in exploring how the personal traits of managers within managerial teams influence digital innovation activities and how their interactions shape these processes (Dasí & Kok, 2023). Future research should explore these differing viewpoints in more depth to better understand the leadership dynamics driving digital innovation within family businesses. Longitudinal research could illuminate how digital leadership and organizational capabilities evolve over time, particularly across generational transitions within family businesses. Comparative studies contrasting family and non-family firms or examining differences between first-generation and multi-generational family businesses may yield insights into how ownership structure and legacy shape digital transformation pathways. Expanding research across diverse institutional and cultural contexts would enrich understanding of how environmental factors influence the success of digital strategies in family firms. Cross-national comparisons, in particular, may reveal context-specific enablers or barriers not evident in single-country studies. Besides, future studies could investigate digital leadership as a team-level phenomenon, exploring how intra-family dynamics and collective managerial decision-making impact the development of digital capabilities, especially in firms where multiple family members are involved in top management teams. Digital governance and risk management practices in family firms present an under-explored area. Understanding how these firms balance innovation with risk aversion could provide practical insights for digital implementation strategies. Lastly, future research may explore intergenerational dynamics, examining how digital fluency and attitudes toward transformation differ across age cohorts within family firms. Investigating the influence of successors versus incumbents may shed light on how generational tensions or synergies shape digital innovation activity. As digital transformation continues to reshape business landscapes, understanding how family firms respond at structural, strategic, and cultural levels remains a rich area for scholarly inquiry.

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Beata Żukowska: Conceptualization; Data Curation; Formal Analysis; Investigation; Methodology; Project Administration; Validation; Writing – Original Draft Preparation; Writing – Review & Editing. **Robert Zajkowski:** Conceptualization; Supervision; Writing – Original Draft Preparation; Writing – Review & Editing. **Valerija Kozlova:** Conceptualization; Writing – Original Draft Preparation; Writing – Review & Editing.

Conflicts of interest

The authors declare no conflict of interest.

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