



Digital innovation in family firms: The roles of non-family managers and transgenerational control intentions

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Abstract Digital innovation, i.e. the creation of products and services, processes, or business models on the basis of digital technology, represents a new innovation phenomenon that offers important opportunities, but also entails high risks. Family firm research argues that family firms generally possess a greater ability to innovate, but differ in their willingness to do so. We propose that with regard to digital innovation family firms rather face an “ability and willingness challenge”, i.e. they differ in their willingness *and* their ability to engage in digital innovation. We analyze two factors—non-family managers and transgenerational control intentions—that might help family firms overcome the ability and willingness challenge and that allows to explain heterogeneity among family firms in the adoption of digital innovation. An empirical, survey-based investigation of 104 German family firms supports our hypotheses. We contribute to the literature on digital innovation in family firms as well as on family firm professionalization.

Plain English Summary Based on a survey of CEOs in 104 German family firms we show that non-family managers can drive digital innovation in family firms—if they receive the respective discretion. Interest in digital innovation in family firms is growing, as this type of innovation not only offers important benefits but also holds challenges for family firms. Our study offers insights into how family firms can foster digital innovation by integrating non-family managers who experience low levels of TCI from the owning family. Thus, the main implication of our study is that family firms should be open to new perspectives, networks, and knowledge provided by non-family managers to be prepared for the challenges of digital innovation.

Keywords Family firm · Digital innovation · Transgenerational control intention · Loss aversion · Non-family management

JEL Classification O32

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1 Introduction

Digital innovation describes “the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technology”, such as big data, cloud computing, and artificial intelligence (Nambisan et al.,

2017, p. 224). Due to its idiosyncrasies—rapid pace, generativity, and technological complexity (Nambisan et al., 2019)—digital innovation is generally regarded as “a new kind of innovation phenomenon” (Nambisan et al., 2020, p. 7). It has the potential to transform entire industries and not only offers vast opportunities but also entails high risks (Nambisan et al., 2019). Research shows that digital innovation can positively influence firm performance (Scott et al., 2017), lead to the development of new product and service offerings (Lyytinen et al., 2016), and ultimately serve as a source of competitive advantage (Nambisan et al., 2017; Yoo et al., 2010).

The few empirical studies, that have analyzed digital innovation in family firms thus far, point to the heterogeneity among family firms’ digital innovation efforts (Soluk & Kammerlander, 2021), which might have become even larger during the COVID-19 pandemic (Soluk et al., 2021a). Consequently, research on digital innovation in family firms has produced ambiguous results. For example, Soluk et al. (2021b) find that certain dynamic managerial capabilities mediate the positive impact of family influence on digital business model innovations. Ceipek et al. (2021), in contrast, report a negative effect of the family’s management involvement on explorative (relative to exploitative) digital innovation related to the Internet of Things (IoT).

An explanation for the heterogeneity in family firms’ innovation efforts in general is provided by De Massis et al. (2014b). They introduced the “ability and willingness paradox” and argue that family firms are generally characterized by a greater ability to innovate, but differ in their willingness to do so. We propose that due to the idiosyncrasies of digital innovation, family firms actually face an “ability and willingness challenge” with regard to digital innovation. Specifically, the idiosyncrasies of digital innovation increase its risk and outcome uncertainty as well as the relevance of external knowledge and cooperation for its successful adoption (Ardito et al., 2018; Karhu et al., 2018). Given their higher loss aversion (Sciascia et al., 2015) and their reluctance to engage in technological collaboration with external partners (Nieto et al., 2015) due to their focus on socioemotional wealth (SEW) (Chrisman & Patel, 2012), the heterogeneity among family firms in their digital innovation is likely to result from differences in both

their willingness *and* their ability to pursue this type of innovation.

In this paper, we build on the socioemotional wealth (SEW) perspective as well as on agency theory to analyze drivers that might help family firms overcome the ability and willingness challenge that they face in relation to digital innovation, and that might explain the heterogeneity in the adoption of digital innovation among family firms. Chrisman et al. (2012, 284) have identified the family’s control over the firm and transgenerational control intentions (TCI) as the dominant SEW goals, as “the former indicates the ability of a family to use its influence and the latter indicates reasons it might be willing to do so”. At the same time, agency theory predicts that non-family managers—because they are less burdened by ownership stakes and a focus on SEW preservation—are more inclined to invest in risky innovation projects, as such investments might make them even more costly to replace and increase their job security (Huybrechts et al., 2013). Thus, we hypothesize that the share of non-family managers in the top management team (TMT)—a commonly used indicator of lower family (management) control (e.g., Villalonga & Amit, 2006)—positively influences digital innovation in family firms, but that this positive effect is contingent on low levels of TCI. We argue that while family managers are rather loss averse owing to their focus on their SEW (Naldi et al., 2007), the same is not true for non-family managers (Gomez-Mejia et al., 2019). At the same time, non-family managers can provide the capabilities and networks necessary for digital innovation (Hillebrand et al., 2020). However, non-family managers can only contribute to the adoption of digital innovation if they are granted the necessary discretion by family owners—that is, if the family’s TCI is low. An empirical analysis involving 104 German family firms offers support for our hypotheses.

Our paper makes two theoretical contributions to family firm research. First, we add to the literature on digital innovation in family firms by exploring its enabling conditions. Specifically, we contribute to research that analyzes the relevance of external social capital for coping with growing technological and competitive complexities in numerous areas, such as digital innovation (Minola et al., 2016; Prügl & Spitzley, 2021), and to research on family firm professionalization that analyzes non-family managers’

discretion as a driver of firm performance (Madison et al., 2018). Second, our study contributes to research on family firm heterogeneity by providing evidence for the effect of diversity in TCI on the level of digital innovation. Thus, we add to extant research that analyzes the effects of differences in other family goals, such as family bonds or family identification, on innovation (Hauck & Prügl, 2015; Kammerlander et al., 2020). In addition, our study has managerial implications. More specifically, we help family firm owners and managers understand the conditions under which they can strengthen their engagement in digital innovation.

2 Literature review

2.1 Digital innovation in family firms

Extant research on digital innovation has highlighted the positive effects of this new and important innovation phenomenon on performance, product development, and customer reach. For example, Scott et al. (2017) find that digital innovation has a positive long-term effect on firm performance, which is driven by an increase in sales. Lytinen et al. (2016) argue that the use of new digital technologies can translate into the creation of digital products and services by reshaping firms' innovation networks. Yoo et al. (2010) use the example of e-books to discuss how new firms become relevant to consumers by providing digitally-enhanced products with lower production costs. Brynjolfsson and McAfee (2012) use smart cars to exemplify how the development of digital technologies can open up new opportunities and create competitive advantages for firms. Furthermore, digital innovation allows firms to reach more customers, sometimes in new segments. For instance, Huang et al. (2017) show that businesses can rapidly scale their user base through digital innovation by making improvements instantly available to customers.

Surprisingly, only very few studies in the field of family firm research have addressed this new innovation phenomenon so far. Initial studies that compare the adoption of digital innovation in family and non-family firms offer ambiguous results. Soluk et al. (2021b), for example, find that family influence is positively related to digital business model innovation, and that this relationship is mediated by specific

dynamic managerial capabilities, such as knowledge-exploitation, risk-management, and marketing capabilities. They argue that the family's attachment to the business (De Massis et al., 2016), the family's current and transgenerational control intentions (Chrisman & Patel, 2012; Gomez-Mejia et al., 2007), and the family's social capital and social ties (De Massis et al., 2018a) motivate family firms to invest in dynamic capabilities, which provide them with the abilities needed to deal with uncertainty and to manage the internal and external challenges associated with digital business model innovation (Soluk et al., 2021b). In contrast, Ceipek et al. (2021) find that higher family involvement in the management board negatively affects the level of explorative (relative to exploitative) digital innovation related to the IoT. They regard characteristics of family managers, such as a focus on family-centered noneconomic goals, longer tenure and continuity, stronger emotional ties to the firm, concentrated decision-making authority, and more rigid mental models, as drivers of more exploitative IoT innovations (i.e., innovations that are closer to the firm's current innovation trajectory). Finally, in a recent practitioner survey, Soluk et al. (2020) find few differences between family and non-family firms in their perceived readiness for digital transformation.

These inconsistent findings on the adoption of digital innovation in family and non-family firms might be attributable to the heterogeneity among family firms. For example, Soluk et al. (2021b) as well as Leppäaho and Ritala (2022) reveal that some family firms stand out with regard to digital innovation, while others underperform. This heterogeneity has directed researchers toward identifying factors that foster or restrict digital innovation in family firms.

A few qualitative studies have started to explore the drivers of heterogeneity in digital innovation among family firms. Based on an in-depth analysis of 15 family firms, Soluk and Kammerlander (2021) identify three barriers to digital transformation—paternalistic decision-making, an inconsistent understanding of digital transformation in the firm, and employee resistance—as well as three drivers of digital transformation—cash opportunities, early success stories, and the presence of a digital strategy. Using the example of Finnboat, Leppäaho and Ritala (2022) show that crises, such as the 2008–2009 financial crisis or the COVID-19 pandemic, can serve as important triggers for

digital innovation in family firms. Similarly, Soluk et al. (2021a) describe the behavioral implications of an external shock—the COVID-19 pandemic—in four German family firms. Their in-depth analysis reveals that this external shock drove behavioral changes, such as a temporal shift towards a short-term orientation, a reduction in the rigidity of mental models, and increased digital innovation.

While research has identified single drivers of and barriers to digital innovation in family firms, we lack a broader theoretical framework that explains the heterogeneity of digital innovation in family firms. Although digital innovation is not regarded as a facet of radical innovation but as a new type of innovation (Nambisan et al., 2020), we might be able to draw on the extant research on innovation in family firms to develop a relevant theoretical framework.

Various theoretical frameworks, such as the resource-based view, agency theory, stewardship theory, or the socioemotional wealth (SEW) perspective, have been applied to explain differences in innovation behavior among family firms as well as between family and non-family firms (for a review, see Calabrò et al., 2019). However, these frameworks have been unable to fully resolve the inconsistencies in the research findings. While most research that analyzes innovation inputs finds a negative impact of family involvement (e.g., Block, 2012; Patel & Chrisman, 2014), findings are less consistent with regard to innovation outputs. Some studies report a negative association between family influence and innovation output (Decker & Günther, 2017), while others observe no effect (e.g., Madanoglu et al., 2016) or even a positive influence (e.g., Mazzelli et al., 2018). Research that explores the heterogeneity in innovation behavior among family firms has identified certain characteristics of family firms that reduce innovativeness, such as family conflicts (Block, 2012), the quest for managerial control (e.g., Kotlar et al., 2013), and risk aversion (Munari et al., 2010), as well as drivers of innovation intensity, such as the presence of non-family managers (Chen & Hsu, 2009) or unabsorbed organizational slack (Liu et al., 2017). To resolve these inconsistencies in extant research findings and to more comprehensively understand differences in innovation behavior among family firms, De Massis et al. (2014b) presented the “ability and willingness paradox” as an integrative framework.

2.2 The “ability and willingness paradox” and innovation behavior in family firms

While family firms are generally characterized by a greater ability to innovate, De Massis et al., (2014b) argue that they differ in their willingness to do so. Their greater ability is determined by the family’s “discretion to direct, allocate, add to, or dispose of a firm’s resources” (ability as discretion; Chrisman et al., 2015, p. 311), which mainly arises from the power and authority that come with family ownership and involvement. Family firms’ ability to innovate is also influenced by the “capabilities that members of the involved family need or should use to lead the firm in the preferred direction” (ability as capability; De Massis et al., 2018b, 10). Willingness, in contrast, describes the “disposition of the involved family to engage in distinctive behavior” (De Massis et al., 2014b, 347), which is determined by the family’s goals and motivations.

The extant research suggests that the heterogeneity in family firms’ innovation behavior can mainly be explained by differences in their willingness to innovate. One important family goal is, for example, the generation and preservation of SEW, which constitutes the affective value that the family derives from the firm (Gomez-Mejia et al., 2007). The loss aversion resulting from a focus on SEW has been shown to foster risk aversion and to reduce families’ willingness to make risky innovation decisions (Matzler et al., 2015; Sciascia et al., 2015), as such decisions threaten the family’s SEW by reducing family control (Pérez-González, 2006). However, families pursue SEW goals to varying extents (Dyer & Dyer, 2009; Kotlar & De Massis, 2013), which results in heterogeneity in their willingness to innovate (Miller et al., 2015). For instance, Hauck and Pruegl (2015) show that more adaptable families (i.e., those that enjoy change) as well as families with stronger community ties are more inclined to innovate in succession phases, while family firms in which the incumbent generation exerts strong authority over the succeeding generation and that have a long history of family succession tend to refrain from innovation in succession phases.

To a lesser extent, differences in family firms’ innovation behavior have been attributed to their ability to innovate. For example, family conflicts reduce the family’s discretion and negatively affect

innovation behavior in family firms (Block, 2012). With regard to ability as capability, Nieto et al. (2015) find that lower resource endowments negatively influence innovation efforts in family firms.

3 Hypotheses development

3.1 The “ability and willingness challenge” and digital innovation in family firms

The “ability and willingness paradox” has become increasingly established as a framework for explaining heterogeneity in family firm innovation in general, given the rising number of studies that apply the concept (e.g., De Massis et al., 2015; Rondi et al., 2019; Rondi et al., 2021). However, with regard to digital innovation, family firms might instead face an “ability and willingness challenge”. Specifically, we argue that due to the three specific characteristics of digital innovation—rapid pace, generativity, and technological complexity which fosters a need to collaborate (Nambisan et al., 2019)—family firms might be heterogeneous with regard to both their willingness *and* their ability to engage in digital innovation.

The first two characteristics of digital innovation—rapid pace and generativity—increase the risk and uncertainty associated with digital innovation when compared to innovation in general (Nambisan et al., 2019). A rapid pace is regarded as a key characteristic of digital innovation. As Tiwana et al. (2010) demonstrate, the co-evolution of design and governance speeds up the pace with which digital innovation can occur through modularization and reconfiguration. Generativity refers to the outcome uncertainty that is characteristic of digital innovation and that might lead to the creation of new offerings beyond those initially intended (Yoo et al., 2012). For instance, Yoo et al. (2010) show that consumers and third-party providers use Google Maps in numerous ways that were not envisioned by the designers, thereby creating unexpected outcomes for the company. Because of their loss aversion (Gomez-Mejia et al., 2019; Naldi et al., 2007), family firms tend to forgo innovation opportunities that entail high risk and uncertainty (Chrisman & Patel, 2012; Sciascia et al., 2015). Thus, the rapid pace and generativity that are typical of digital innovation might further reduce family firms’ willingness to pursue such innovation (e.g., Chirico et al., 2020).

Technological complexity constitutes the third characteristic of digital innovation. It cannot be managed by individual firms but requires collaboration with other partners along the value chain (Ardito et al., 2018; Karhu et al., 2018). Thus, it might affect the ability of family firms to pursue digital innovation. Research has shown that family managers prefer to retain decision-making authority and control over the firm (Gomez-Mejia et al., 2007), and their fear of a loss of control translates into a reluctance to engage in technological collaboration with external partners (Nieto et al., 2015) and to acquire technologies (Kotlar et al., 2013). As digital innovations often depend on cooperation with new partners who can, for instance, contribute relevant knowledge, or provide access to resources and consumers (Karhu et al., 2018), family firms might lack the ability to invest in digital innovation.

3.2 Non-family managers and TCI as drivers of ability and willingness

As such, differences in the digital innovation behavior of family firms are driven by the ways in which they overcome the “ability and willingness challenge”—that is, how they reduce their loss aversion (which inhibits their willingness to innovate) *and* their fear of a loss of control (which affects their ability to innovate). The SEW perspective as well as agency theory might offer starting points for identifying respective drivers of heterogeneity in family firms’ digital innovation behavior. Berrone et al. (2012) propose five dimensions that jointly create a family’s SEW endowment: the family’s control over the firm, the identification of family members with the firm, the binding social ties in the firm, the emotional attachment among family members, and the renewal of family bonds through dynastic succession (i.e., TCI). Chrisman and colleagues (Chrisman et al., 2012) regard two of these dimensions as the dominant SEW goals: They argue that the family’s control over the firm serves as an indicator of a family firm’s ability to innovate, while TCI determines its willingness to do so. Thus, family control and TCI might serve as drivers of differences in family firms’ digital innovation behavior.

Agency theory underscores and specifies the reasoning of the SEW perspective regarding the impact of family control. Agency theorists argue that

concentrated ownership in a firm, which is typical of family firms, discourages investments in risky innovation projects, as only a very limited number of stakeholders carries a potential financial burden (Fama & Jensen, 1983; Gedajlovic et al., 2004). Accordingly, family managers are expected to be less willing to take on risky innovation projects (Huybrechts et al., 2013). Non-family managers, in contrast, generally do not hold considerable financial stakes in their firm and are less concerned with the preservation of SEW. As a consequence, they show a higher willingness to pursue risky innovation projects as such projects foster their job security and their value on the job market (Bennedson et al., 2007). Thus, we argue that a higher share of non-family managers in the TMT—which in generally used as an indicator of lower family (management) control (e.g., Villalonga & Amit, 2006)—and a lower level of TCI might positively affect family firms' ability and willingness to pursue digital innovation.

3.3 The role of non-family managers in digital innovation in family firms

A higher share of non-family managers in the TMT might have a positive effect on both the willingness *and* the ability of family firms to pursue digital innovation. First, non-family managers are generally less emotionally attached to the firm and less biased by loss aversion related to their focus on SEW (Gomez-Mejia et al., 2019). Non-family managers tend to be externally focused and aim to prove themselves in the eyes of external stakeholders (Bennedson et al., 2007). They often seek opportunities to improve performance or excel at cutting-edge innovation, as doing so enhances their reputation, which signals their value on the labor market (Narayanan, 1985) and determines their job opportunities, including wage improvements (Block, 2011). In summary, non-family managers are “brought in to provide objectivity and more rationality and to generate superior business performance” in family firms (Stockmans et al., 2010, p. 285). Thus, they might focus on driving digital innovation to foster their reputation and, thereby, enhance the family firm's willingness to pursue digital innovation.

Second, non-family managers are often hired to increase the family firm's knowledge (Chirico, 2008) and enable it to pursue new business opportunities by either bringing in the required capabilities or opening

their professional networks to the firm (Sanchez-Famoso et al., 2017). Hillebrand et al., (2020, p. 804) view non-family managers as “resource contributors” in the context of innovation. More specifically, digital innovation requires new skills and capabilities, which may lead family firms to hire non-family managers. Nieto et al. (2015) find, for example, that non-family managers place more emphasis on engaging in technological collaboration with external partners, which is important for successfully implementing digital innovation. Hillebrand et al. (2020) show that family firms with non-family TMT members outperform companies with only family managers in the TMT with regard to innovation due to the knowledge and experience contributed by non-family managers. Thus, non-family managers might also enhance family firms' ability to pursue digital innovation.

Taken together, a higher share of non-family managers in the TMT might explain differences in digital innovation among family firms, as non-family managers foster the ability and willingness of family firms to invest in digital innovation. Hence, we posit:

Hypothesis (H1). The share of non-family members in the TMT is positively associated with digital innovativeness in a family firm.

3.4 The moderating role of TCI

Research indicates that the extent to which non-family managers affect the family firm depends on the owning family and its goals (Waldkirch, 2020). One of the most important family goals (Swab et al., 2020) is TCI—the desire to pass the business on to later generations (Berrone et al., 2012). Some researchers highlight the “bright side” of TCI (see Hoffmann et al., 2019), which lies in the fact that many family firms remain viable organizations over the course of generations (Jaskiewicz et al., 2015). However, other researchers hint at the “dark side” of TCI. In particular, the pursuit of TCI might foster family firms' loss aversion given their focus on SEW (Hoffmann et al., 2019). For instance, research indicates that family firms are characterized by lower levels of corporate diversification (e.g., Gomez-Mejia et al., 2010) and innovativeness (e.g., Block et al., 2013; Gomez-Mejia et al., 2007). Hence, high levels of TCI might further

reduce family firms' willingness to pursue digital innovation.

The family's TCI has the potential to influence non-family managers' pursuit of digital innovation in two ways. First, family owners can take steps to enforce the pursuit of family goals and limit the discretion of non-family managers (Arregle et al., 2007). In this regard, studies indicate that the discretion of non-family managers is limited when the (non-family) CEO's behavior is perceived as posing a risk to family owners' SEW (Gomez-Mejia et al., 2019; Martínez-Ferrero et al., 2016) or when a strong desire for a family legacy exists (Chang & Shim, 2015). As digital innovation is associated with high risk and uncertainty (Nambisan et al., 2019), family owners with high TCI might be particularly inclined to protect their SEW endowments and, therefore, to reduce non-family managers' discretion.

Second, non-family managers may proactively adapt their behavior to the family's goals in order to ensure their job security. As family owners can easily withdraw support and resources if non-family managers act in ways that threaten the family's goals (Binacci et al., 2016), non-family managers are likely to aim to please the family and act according to its goals (Jaskiewicz et al., 2017). Along these lines, Huybrechts and colleagues (Huybrechts et al., 2013) show that the positive effect of non-family managers on risk-taking decreases as their tenure increases, arguably because they develop psychological ownership toward the family firm, which makes them adapt their risk-taking behavior to match the owners' expectations. Thus, higher levels of family TCI might lead non-family managers to adjust their risk-taking behavior more strongly and reduce their willingness to pursue digital innovation.

Based on these arguments, we conclude that if the level of TCI in a family firm is high, non-family managers will enjoy less managerial discretion and curtail their own risk-taking. Therefore, the positive effect of a higher share of non-family managers on digital innovation is negatively moderated by TCI, such that non-family managers only affect the firm's ability and willingness to engage in digital innovation when the level of TCI is low. We posit:

Hypothesis (H2). The relationship between the share of non-family managers and digital innovativeness is moderated by TCI, such that the share

of non-family managers only affects digital innovativeness when the family's TCI is low.

4 Method

4.1 Research design and sample

Germany serves as a fitting context for our research, as family firms form the country's economic backbone (De Massis et al., 2018a). Moreover, Germany's innovativeness and competitiveness make it suitable for research on innovation in family firms (De Massis et al., 2015). This is even more the case with regard to digital innovation, as German family firms seem to show strong heterogeneity with regard to their preparedness for this form of innovation (Soluk et al., 2021b; Soluk et al., 2020).

Thus, we collected survey and archival data from a sample of German firms, which were selected from the Bureau van Dijk Amadeus database using random sampling. This database is frequently used in research on family firms and contains information on about 21 million large and medium-sized firms in Europe with a focus on private firms (e.g., Kraus et al., 2016; Tao-Schuchardt et al., 2022). This implies that our sample does not include very small family firms, but is rather representative for medium-sized and large family firms in Germany (Block & Spiegel, 2013).

In December 2019, a personalized email was sent to the CEOs of 2,450 German firms containing a link to the online survey. Two reminder emails were sent to non-respondents. We defined family firms as firms in which majority ownership (i.e., more than 50%) was held by one family (e.g., Naldi et al., 2007) and we included only firms that self-identified as family firms (e.g., Zellweger et al., 2012). To mitigate common method bias, we separated the data collection for the independent and dependent variables (Podsakoff et al., 2003). The 2019 survey collected data on the independent and control variables. In the summer of 2020, we sent the CEOs of the firms that participated in the first survey a personalized invitation to participate in a second online survey, which allowed us to collect data on our dependent variables. To further reduce the threat of common method bias (Podsakoff et al., 2003), we obtained additional data from annual reports, which we gathered from the business register of the German Federal Gazette.

To accommodate the respondents' main language, the surveys were written in German, although the questionnaire's constructs were taken from validated studies in English. To ensure accuracy, a strict back-translation process was followed, in line with established procedures in family firm studies (e.g., Deephouse & Jaskiewicz, 2013). More specifically, the questions were translated into German and back-translated into English by an independent person. A comparison of the two versions showed no inconsistencies.

In line with prior family firm studies, we employed a key-informant approach, as the CEO of a family firm is a key decision-maker who serves as a reliable source of information on the focal phenomenon (Hoffmann et al., 2019; Zellweger et al., 2012). The CEO can also share insights on topics related to the business and to the ownership side of the family firm, especially as German family firms tend to be managed by owner-managers (Pahnke & Welter, 2019).

The first survey resulted in 222 responses and the second in 113, which correspond to response rates of 9.1% and 4.6%, respectively. These response rates are similar to those in other studies of family firms using primary data (e.g., Hoffmann et al., 2016; Kraiczy et al., 2015). After removing firms that did not provide all of the information required for our analyses, we had a final sample of 104 German family firms. Of these 104 firms, 98 were managed by family CEOs.

To account for non-response bias in our sample, we followed a three-step approach (Hoffmann et al., 2019; Zellweger et al., 2012). First, we compared the data for early (after the first email) and late (after the second reminder) responders, as we would expect late responders to share similarities with non-respondents (e.g., Chrisman et al., 2004). We found no significant differences. Second, we compared completed and partially completed surveys using a t-test. As we did not find any differences for the main variables, we assume that non-response bias is not a problem. Third, to further ensure the representativeness of our sample, we compared the averages for firm age and sales with two national studies (Zellweger et al., 2012). Similar to Hoffmann et al. (2019) and Zellweger et al. (2012), our average family firm was older and had higher sales than the data in the national studies suggests. Therefore, our results represent rather established family firms and might not be transferable to younger family firms, such as start-ups.

4.2 Measures

Dependent variable To measure *digital innovativeness*, we utilized a seven-item scale developed by Kellermanns and Eddleston (2006) and based on Miller (1983). While many approaches to measuring elements of innovation exist (for an overview, see Calabrò et al., 2019), we chose this scale because it encompasses the innovation process, output, and intent; has been found to be valid for small and large companies; and is widely used in family firm research (Chirico et al., 2011; Hsu & Chang, 2011; Kellermanns et al., 2012). We adapted the items to fit the digital-innovation context by specifying the survey questions to include aspects of digitization. For example, we adapted the first survey item from "Our firm has introduced many new products or services over the past three years" to "Our firm has introduced many new *digital* products or services over the past three years." Jointly, the seven items reflect Miller's (1983, 771) definition of corporate entrepreneurship as "a multidimensional concept encompassing the firm's actions relating to product-market and technological innovation, risk taking and proactiveness". The first three items address product-market and technological innovation. The following two items relate to the risk-taking behavior with regard to digital innovation, while the last two items address proactive behavior. We measured all items on a 7-point Likert-type scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). We used the mean value of the seven items for our assessment of digital innovativeness ($\alpha=0.92$; AVE=0.624; CR=0.952). The exact items used in the survey can be found in [Appendix](#).

Independent variable We calculated the *share of non-family management members* as the ratio of non-family managers in the TMT to the total number of TMT members. In the survey, we asked the CEOs to disclose the number of members on the TMT and to indicate how many of those members were not part of the owning family (e.g., Hoffmann et al., 2019; Sciascia & Mazzola, 2008).

Moderator variable We measured *TCI* based on a four-item scale suggested by Berrone et al.'s (2012) and applied by Hoffmann et al. (2019). Respondents were asked to indicate the degree to which they agreed with the following four statements on a

7-point Likert-type scale: “Continuing the family legacy and tradition is an important goal for my family business,” “Family owners are less likely to evaluate their investment on a short-term basis,” “Family members would be unlikely to consider selling the family business,” and “The successful transfer of the business to the next generation is an important goal for family members”. We condensed the responses to the four items into one factor of TCI by using their mean ($\alpha=0.71$). The items included in the questionnaire can be found in [Appendix](#).

Controls In line with previous research and following Bernerth and Aguinis’ (2016) recommendations, we controlled for firm, industry, individual, and family factors that might influence the relationship between the share of non-family TMT members and digital innovativeness. First, we controlled for *firm size*, as larger firms might have more means to engage in digital innovativeness (De Massis et al., 2014a). We calculated firm size as the natural logarithm of full-time employees (Gomez-Mejia et al., 2014). Second, we controlled for *firm leverage* using the firm’s total debt divided by its total equity based on firm data from the year prior to the survey. Firms with higher leverage might have fewer means to invest in long-term digital innovation and decide to instead increase short-term cashflow (Barker & Mueller, 2002).

We also controlled for the *presence of a supervisory board* using an indicator variable. Boards have been shown to influence family firms’ strategies (Pieper et al., 2008) and, hence, their ability and willingness for pursuing digital innovation. Furthermore, we controlled for variations by *industry*, as firms in certain industry contexts may be better suited to pursue digital innovation due to differences in human capital and market incentives (Nicoletti et al., 2020). To do so, we included four industry dummy variables for manufacturing, construction, retail, and service.¹

We also controlled for attributes of the CEO respondents and their families. *CEO age* can influence a firm’s propensity to engage in innovation, particularly in digital innovation (Belenzon et al.,

2019). In addition, we asked whether members of succeeding generations, such as children, nephews, or nieces, were actively involved in the firm. Such *next-generation involvement* might foster “entrepreneurial bridging”, i.e. a situation where the senior generation focuses on daily operations while they use the capabilities of next-generation managers for entrepreneurial activities such as digital innovation (Jaskiewicz et al., 2015, 42). Finally, we controlled for the *owner family’s generation* by asking if the firm was owned by the founder (i.e., a first-generation form), the second, the third, the fourth or a later generation (Villalonga & Amit, 2006). With increasing owner family generation family firms might be less inclined to pursue innovation, particularly digital innovation, due to higher coordination efforts, increased risk aversion, and lower emotional attachment (Decker & Günther, 2017).

5 Results

5.1 Hypotheses tests

The average firm in our sample was 72 years old, had 616 employees, and had EUR 103.5 million in turnover in 2018. Of the firms, 45% were active in the manufacturing industry, while 16% were involved in construction, 15% in retail, 12% in services, and the remaining 12% in other industries. The TMTs consisted of one to seven people with an average of 2.35 members. On average, 18.6% of the TMT members were non-family managers. The absolute number of non-family managers ranged from zero to six. The average size of the TMT and the average share of non-family managers are comparable to those found in previous research (e.g., Kammerlander et al., 2020; Kraiczy et al., 2015). Tables 1 and 2 show the means, standard deviations, and correlations for our data.

The results of the OLS regression analyses used to test our hypotheses are reported in Table 3. Model 1 includes the control variables. We add the main effect of the share of non-family management members in Model 2 and the moderator variable TCI in Model 3. Finally, we include the interaction effect of the share of non-family management members and TCI in Model 4. The F-statistics are significant in all models as is the change in R^2 when we add share of

¹ Survey participants were asked to indicate their industries based on the NACE classification system—the statistical classification of economic activities in the European Community used by the Statistical Office of the European Commission.

Table 1 Descriptive statistics

| | Mean | S.D | Min | Max |
|--|--------|--------|-------|--------|
| 1 Digital innovativeness | 2.845 | 1.345 | 1.00 | 6.71 |
| 2 Share of non-family management members | 0.186 | 0.313 | 0.00 | 1.00 |
| 3 Transgenerational control intention | 5.247 | 1.356 | 1.00 | 7.00 |
| 4 Firm size | 4.624 | 1.677 | 0.00 | 9.21 |
| 5 Firm leverage | 7.600 | 16.577 | 0.03 | 105.06 |
| 6 Presence of a supervisory board | 0.058 | 0.234 | 0.00 | 1.00 |
| 7 Industry Manufacturing | 0.452 | 0.500 | 0.00 | 1.00 |
| 8 Industry Construction | 0.163 | 0.372 | 0.00 | 1.00 |
| 9 Industry Retail | 0.154 | 0.363 | 0.00 | 1.00 |
| 10 Industry Service | 0.115 | 0.321 | 0.00 | 1.00 |
| 11 CEO age | 52.411 | 11.445 | 23.00 | 80.00 |
| 12 Next-generation involvement | 0.260 | 0.441 | 0.00 | 1.00 |
| 13 Owner family generation | 3.019 | 2.109 | 1.00 | 11.00 |

N = 104

non-family management members in Model 2 and the interaction effect in Model 4.²

In the control model we find the expected significant coefficient of the variable firm size. All other control variables do not have a significant impact on digital innovativeness. However, coefficients for the variables presence of a supervisory board, service industries as well as next-generation involvement show the expected positive sign, as the additional knowledge and capabilities, that they provide, might positively affect digital innovativeness.

² We conducted several tests to control for multicollinearity, heteroscedasticity, independence, the normal distribution of residuals, and common-method bias. To control for potential multicollinearity, i.e. a potential correlation between the independent and control variables, we used variance inflation factors and tolerance levels. All variance inflation factors were below 2.854 and tolerance levels were above 0.350, both of which are in line with the suggested cut-offs (Hair, Black, Babin, & Anderson, 2019). To test for heteroscedasticity, we conducted a Breusch-Pagan test which is commonly used in the context of OLS regression analyses. As the result was not significant, heteroscedasticity is not a concern (Breusch & Pagan, 1979). Furthermore, we ensured the independence of residuals by calculating the Durbin-Watson statistic, a standard test for the absence of autocorrelation in regression analyses, and we confirmed the normal distribution of residuals. To control for common-method bias, we applied Harman's one-factor test and loaded all measures into an exploratory factor analysis (Podsakoff & Organ, 1986). The single factor explained less than 50% of the overall variance (20.00%), indicating that common-method bias is not a concern in our sample.

Hypothesis 1 proposes that the share of non-family management members is positively associated with digital innovativeness. Model 2 supports this hypothesis, as the coefficient of the share of non-family management members is positive and highly significant ($\beta = 1.135$, $p < 0.05$). Hypothesis 2 suggests that TCI interacts with the share of non-family managers, such that the effect of non-family managers on digital innovativeness can only be realized when TCI is low. Model 4 offers support for Hypothesis 2 given the significant, negative coefficient of the interaction term of the share of non-family management members and TCI ($\beta = -0.948$, $p < 0.05$), while the direct effect of TCI is insignificant. Figure 1 depicts this interaction. A test of simple slopes (Dawson, 2014) demonstrates that the relationship between the share of non-family management members and digital innovativeness is not significant in cases with high TCI. In contrast, in cases with low TCI, the slope is highly significant. In other words, a high share of non-family management members only leads to more digital innovativeness when the level of TCI is low. In terms of effect sizes, we find that when one non-family manager is added to a TMT with two family managers and TCI decreases by one standard deviation, digital innovativeness increases by 1.5 standard deviations or by 2.06 points (out of 7).

5.2 Robustness tests

To supplement our analysis and ensure robustness with respect to alternative specifications and interpretations, we ran a series of tests. First, the COVID-19

Table 2 Correlations

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--|----------|----------|--------|----------|--------|--------|-----------|--------|--------|--------|---------|---------|
| 1 Digital innovativeness | | | | | | | | | | | | |
| 2 Share of non-family management members | 0.367*** | | | | | | | | | | | |
| 3 Transgenerational control intention | 0.057 | 0.088 | | | | | | | | | | |
| 4 Firm size | 0.334*** | 0.386*** | 0.163 | | | | | | | | | |
| 5 Firm leverage | -0.127 | -0.104 | -0.141 | -0.137 | | | | | | | | |
| 6 Presence of a supervisory board | 0.165 | 0.36*** | -0.045 | 0.331*** | -0.041 | | | | | | | |
| 7 Industry Manufacturing | -0.023 | 0.015 | -0.098 | 0.283** | -0.109 | 0.107 | | | | | | |
| 8 Industry Construction | -0.038 | 0.051 | 0.082 | -0.103 | 0.131 | -0.109 | -0.401*** | | | | | |
| 9 Industry Retail | -0.084 | -0.17 | -0.083 | -0.107 | 0.045 | -0.106 | -0.387*** | -0.188 | | | | |
| 10 Industry Service | 0.103 | 0.034 | 0.068 | -0.134 | -0.024 | 0.04 | -0.328*** | -0.16 | -0.154 | | | |
| 11 CEO age | -0.014 | -0.067 | 0.069 | 0.145 | -0.183 | 0.071 | 0.135 | 0.034 | -0.125 | 0.091 | | |
| 12 Next generation involvement | 0.017 | -0.021 | 0.237* | -0.051 | -0.008 | 0.042 | -0.141 | 0.213* | 0.173 | -0.077 | 0.289** | |
| 13 Family ownership generation | 0.041 | 0.312*** | -0.066 | 0.203* | 0.029 | 0.155 | 0.176 | 0.021 | -0.131 | -0.089 | -0.082 | -0.214* |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

$N = 104$

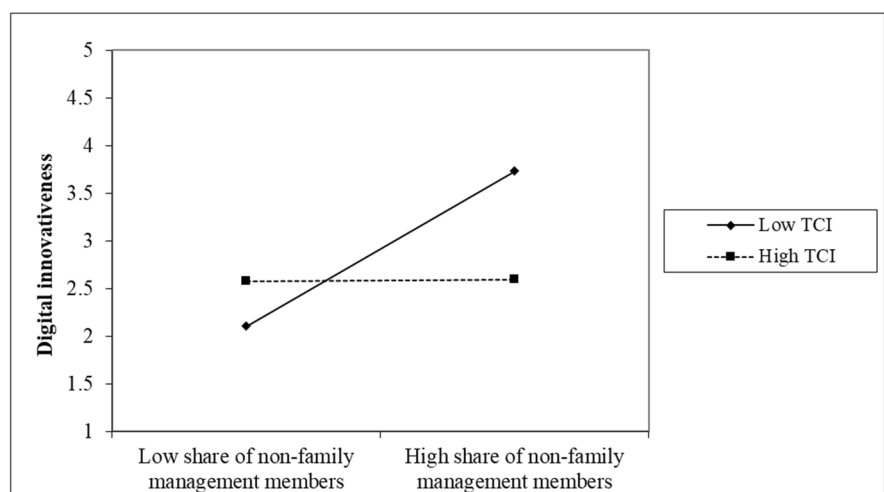
Table 3 Regression results

| Variables | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|--|------------------------|---------|------------------------|---------|------------------------|---------|------------------------|---------|
| | Digital innovativeness | | Digital innovativeness | | Digital innovativeness | | Digital innovativeness | |
| | Coef | SE | Coef | SE | Coef | SE | Coef | SE |
| Control variables | | | | | | | | |
| Constant | 2.460** | (0.780) | 2.367** | (0.788) | 2.705** | (0.895) | 2.224* | (0.875) |
| Firm size | 0.294*** | (0.084) | 0.228** | (0.085) | 0.242** | (0.090) | 0.247** | (0.083) |
| Firm leverage | -0.008 | (0.005) | -0.006 | (0.005) | -0.006 | (0.005) | -0.004 | (0.005) |
| Presence of a supervisory board | 0.213 | (0.725) | -0.125 | (0.729) | -0.183 | (0.692) | -0.259 | (0.569) |
| Industry Manufacturing | -0.475 | (0.456) | -0.348 | (0.491) | -0.393 | (0.496) | -0.342 | (0.496) |
| Industry Construction | -0.303 | (0.545) | -0.304 | (0.541) | -0.328 | (0.535) | -0.610 | (0.522) |
| Industry Retail | -0.517 | (0.500) | -0.343 | (0.528) | -0.404 | (0.531) | -0.511 | (0.541) |
| Industry Service | 0.300 | (0.643) | 0.279 | (0.654) | 0.277 | (0.651) | 0.076 | (0.633) |
| CEO age | -0.013 | (0.013) | -0.008 | (0.012) | -0.009 | (0.012) | -0.010 | (0.012) |
| Next-generation involvement | 0.265 | (0.331) | 0.196 | (0.320) | 0.256 | (0.325) | 0.446 | (0.334) |
| Owner family generation | -0.004 | (0.082) | -0.043 | (0.081) | -0.044 | (0.081) | -0.070 | (0.076) |
| Independent variable | | | | | | | | |
| Share of non-family management members | | | 1.135* | (0.495) | 1.137* | (0.491) | 6.286* | (2.399) |
| Moderator | | | | | | | | |
| Transgenerational control intention | | | | | -0.066 | (0.107) | 0.054 | (0.107) |
| Interaction effect | | | | | | | | |
| Share of non-family management members x TCI | | | | | | | -0.948* | (0.436) |
| N | 104 | | 104 | | 104 | | 104 | |
| R ² | 0.17 | | 0.217 | | 0.221 | | 0.268 | |
| Adjusted R ² | 0.081 | | 0.124 | | 0.118 | | 0.162 | |
| Delta R ² | | | 0.047* | | 0.004t | | 0.047** | |
| F | 2.706** | | 2.562** | | 2.386* | | 3.012** | |

Coef. unstandardized coefficient, SE robust standard errors (in parentheses), Dependent variable digital innovativeness

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; t $p < 0.10$

Fig. 1 Interaction between share of non-family management members and TCI



pandemic, which started between our two surveys, might have biased our results. To test whether the answers regarding digital innovation shifted significantly due to the pandemic, we compared participants' self-assessments of their firms' digital innovativeness, which we assessed in both the t0 and t1 surveys. An insignificant sign test indicated no significant shift in answers due to the pandemic, although the mean of our digital innovativeness variable was slightly lower in the t1 survey. In addition, we re-ran our regression analysis using digital innovativeness in t0 (instead of t1) as the dependent variable. The results remain unchanged, indicating no significant bias due to the pandemic.

Second, our results might be biased by non-family CEOs who may be unable to accurately respond to questions about the family's TCI. To test for this potential effect of non-family CEOs, we excluded the six firms with non-family CEOs from our sample and re-ran our regression analysis with the remaining 98 firms. Our results remain unchanged. In addition, a correlation analysis revealed that, in this subsample, TCI and the share of non-family management members were not significantly related.

Third, we compared the level of digital innovation in the 32 firms that had at least one non-family management member with digital innovation in the 72 firms without non-family management members. A Kruskal–Wallis test indicated a significant difference between the two groups of firms, which further supports our results. Finally, we re-ran the regression analyses with TCI measured using the three items proposed by Zellweger et al. (2012). Again, the results remained unchanged.

Finally, we conducted post-hoc tests for selected items of our dependent variable digital innovativeness. Specifically, we combined the first three items that address product-market and technological innovation, as well as those items that relate to risk-taking and proactive behavior, respectively, to one sub-dimension of digital innovativeness each. The results of our regression analyses remain essentially the same. However, the effect of the share of non-family management members as well as of the interaction term on digital innovativeness is particularly strong and significant for the two items that assess proactive behavior. Proactive behavior, in particular, reflects the ability and willingness of family firms for digital innovation. Overall, our results appear robust to

alternative specifications, variable choices, and alternative explanations.

6 Discussion

6.1 Theoretical contributions

As a new type of innovation phenomenon (Nambisan et al., 2020), digital innovation holds unique challenges for family firms. Due to the idiosyncrasies of digital innovation, family firms might differ not only in their willingness to pursue this new form of innovation, but also in their ability to do so. Nevertheless, even with regard to digital innovation, some family firms stand out. Our study highlights several conditions under which family firms might be able to overcome the “ability and willingness challenge” and to successfully engage in digital innovation. Specifically, our study points to the important role that non-family managers play for digital innovation in family firms. These actors might help family firms deal with the rapid pace and generativity of digital innovation as well as its technological complexity and the accompanying need for collaboration. Moreover, our study shows that families should provide non-family managers with the discretion to drive digital innovation. Thus, our study points to the important role of reduced family control and reduced TCI for digital innovation.

Our paper makes two theoretical contributions to research on digital innovation in family firms and to research on family firm heterogeneity. First, we expand our knowledge on digital innovation in family firms by identifying enabling conditions. We highlight that digital innovation constitutes a new innovation phenomenon (Nambisan et al., 2019) that creates a specific “ability and willingness challenge” for family firms. We then build on and extend research by Ceipek et al. (2021) and Hillebrand et al. (2020), who have highlighted the important role of non-family managers (not only for digital innovation) in family firms. Specifically, we show that non-family managers might bring new perspectives, networks, and knowledge into the firm that are essential for overcoming the two-fold challenge of fostering family firms' willingness and ability to pursue digital innovation. As such, our study contributes to research on the role of external

social capital in family firms that might be necessary to cope with the growing technological and competitive complexities that these firms face—not only with regard to digital innovation (Debellis et al., 2022). For instance, our findings might serve as a basis for extending research by Prügl and Spitzley (2021) as well as Minola et al. (2016), who depict corporate venturing as a source of expertise and capabilities for digital transformation in family firms.

Our study also contributes to research on digital innovation in family firms by uncovering an important boundary condition for the successful adoption of digital innovation—family owners need to provide non-family managers with the discretion to pursue digital innovation. This might require compromising on the family's TCI. As such, our results contribute to family firm professionalization research that analyzes how family firms can build a conducive environment for non-family managers (Blumentritt et al., 2007; Madison et al., 2018; Stewart & Hitt, 2012). Specifically, we highlight that it is not enough to hire non-family managers for their knowledge and networks, and expect them to be able to fulfil their potential. Rather, the owning family must provide non-family managers with the required discretion.

Second, we add to research on family firm heterogeneity. Family goals can help explain heterogeneity not only between family and non-family firms but also among family firms. Our research contributes by demonstrating that the moderating influence of TCI can explain innovation heterogeneity in family firms. Our results add to insights provided by Kammerlander et al. (2020) as well as Hauck and Prügl (2015), who argue that the varying levels of innovation in family firms stem from different family-goal preferences and intensities, which can affect a family's willingness to engage in innovation. We also contribute to research on family goals by directly measuring TCI instead of using proxies, such as family ownership or involvement (Becerra et al., 2020). To extend this knowledge, additional research may investigate whether the effect that we find for TCI is transferable to other non-financial family goals, such as emotional attachment (see Berrone et al., 2012) or family reputation (Bammens & Hünermund, 2020). Such research would be particularly relevant, as Holt et al. (2017) postulate that the plethora of family

goals can provide family firms with different ambitions and, therefore, each goal may need to be investigated separately.

6.2 Practical implications

Family firms will increasingly face the challenge of using digital technologies (Soluk et al., 2021a), especially as a result of the COVID-19 pandemic. To overcome the “ability and willingness challenge”, that they face with regard to digital innovation, family firm owners, managers, and consultants might need to bring new perspectives, networks, and knowledge into their firm. Our research shows that this can, for instance, be achieved by including non-family managers in the management board and by taking actions to reduce the family's loss aversion due to TCI. Thus, the successful adoption of digital innovation might force family firms to take the next step in their professionalization processes, and to follow the moves that (large) family firms such as Germany's Merck Group have already taken. About 30 years ago, the Merck family decided to exclude family managers from the TMT, in order to guarantee a constant inflow of new perspectives, networks, and knowledge, and to sell 30 percent of the firm's shares over the stock market in order to secure a balance between financial and family goals, thus reducing TCI.

6.3 Limitations and future research

As with all research, our paper is not without limitations, which provide opportunities for future research. First, our study focuses on family firms in Germany. While Germany is frequently used as a context for family firm research due to the prevalence and economic importance of family-owned businesses (De Massis et al., 2018a), future research should investigate this phenomenon in other cultural contexts, such as the United States or China, in order to compare institutional contexts, that are more advanced regarding digital innovation, and to identify cultural drivers of differences in digital innovativeness in family firms (e.g., Wulf et al., 2020). In addition, due to our sampling approach using the Amadeus database, our findings are rather representative for medium-sized and large family firms. While these firms are an important subgroup of family firms and frequently in the focus

of research (e.g., Block & Spiegel, 2013), future research should also address smaller and younger family firms.

Second, we adapted the measure of innovativeness suggested by Kellermanns and Eddleston (2006) to capture digital innovativeness in our empirical analysis. Research on innovation in general has shown that the innovation process in family firms requires special attention as, for instance, family firms are able but less willing to innovate (Chrisman et al., 2015), and they invest less in innovation but have a higher innovation-conversion rate than non-family firms (Duran et al., 2016). Additionally, our post-hoc analyses indicate that the effect of non-family managers and low levels of TCI is most strongly related to those items of our measure of digital innovativeness, that address proactive behavior. These first indications highlight that the detailed investigations of digital innovation input, output, and processes might offer additional potential for understanding digital innovations more comprehensively.

Third, our study presents evidence that family firms actually face an “ability and willingness challenge” with regard to digital innovativeness which they can overcome by integrating non-family managers who experience low levels of TCI from the owning family. We also analyzed several control variables that might explain heterogeneity in digital innovativeness. Nevertheless, our results are not highly significant and only explain parts of the variance in family firms’ digital innovativeness. Thus, future research, that further explores the “ability and willingness challenge” of family firms, might benefit from considering further drivers of differences in the digital innovativeness of family firms, such as their partner network, and from pursuing a more fine-grained analysis of the drivers that we considered in our study. For example, non-family managers might have different levels of discretion to pursue digital innovation depending on their positions (see Tabor et al., 2018; Waldkirch, 2020). Likewise, a more fine-grained analysis of industry effects might offer stronger results (Nicoletti et al., 2020).

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Declarations

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Appendix

Measurements

Digital innovativeness (adapted from Kellermanns & Eddleston, 2006).

Please indicate the extent to which you agree with each of the following statements:

Strongly disagree 1 – 2 – 3 – 4 – 5 – 6 – 7 Strongly agree.

Our firm has introduced many new digital products or services over the past three years.

Our firm has made many dramatic digital changes in the mix of its products and services over the past three years.

Our firm has emphasized making major digital innovations in its products and services over the past three years.

Over the past three years, our firm has shown a strong proclivity for high-risk, digital projects (with chances of very high returns).

Our firm has emphasized taking bold, wide-ranging action to position itself and its products or services as digital over the past three years.

Our firm has shown a strong commitment to research and development, technological leadership, and innovation towards digitalization.

Our firm has followed strategies for digitalization that allow it to exploit opportunities in its external environment.

Transgenerational control intention (Berrone et al., 2012).

Please indicate the extent to which you agree with each of the following statements:

Strongly disagree 1 – 2 – 3 – 4 – 5 – 6 – 7 Strongly agree.

Continuing the family legacy and tradition is an important goal for my family business.

Family owners are less likely to evaluate their investment on a short-term basis.

Family members would be unlikely to consider selling the family business.

The successful transfer of the business to the next generation is an important goal for family members.

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