



# Unpacking willingness in family firms facing the digital transformation

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**Abstract** Digital transformation introduces a new set of parameters for firm innovation. Existing literature has found that family firms vary on their willingness to innovate. However, explanations of the factors that lead to a family firm's (un)willingness to act remain scarce. Even more scarce are studies exploring the family firm's (un)willingness in the digital transformation. The digital transformation is a promising environmental stimulus to unpack family firm (un)willingness due to its disruptive nature. This research uses a comparative multiple case study of 14 manufacturing family firms. The novel findings identify a variety of dispositions that can be divided into *willingness-enabling* and *willingness-suppressing*. Willingness affects how family firms potentially (do not) take advantage of the opportunities provided by the digital transformation. The contributions are

twofold. First, the importance of considering the heterogeneity of family firms' willingness toward digital transformation is highlighted. Second, by identifying the role of dispositions and related mechanisms we unpack the heterogeneity of the willingness. In sum, we provide a much-needed explanation of family firms in the digital transformation.

**Plain English Summary** Family business members who create a willingness-enabling disposition within the firm will more positively embrace the digital transformation. Our research concerns a popular topic, the digital transformation, within a popular form of organization, the family firm. Family firms hold a distinctive willingness that influences a wide span of behaviors, which has been underexplored in the digital transformation. Based on evidence from 14 family firms, we shed light on two dispositions: willingness-enabling

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and willingness-suppressing. These dispositions lead to (un)willingness towards the digital transformation. Educators should aim to shift family firms' dispositions from willingness-suppressing to willingness-enabling. Practitioners should focus on the willingness as well as the ability of family firms. Policy makers should aim to assist those willing family firms to better develop their ability in the digital transformation. We underpin the importance of dispositions in family firms towards the digital transformation.

**Keywords** Willingness · Digitalization · Innovation · Industry 4.0 · Family firms

**JEL Classification** D22 · L26 · M15 · O33

## 1 Introduction

The digital transformation, as a key topic in business today (de Groote et al., 2023a, 2023b; Siaba & Rivera, 2024) has received a large amount of recent scholarly attention (Hassan et al., 2024; Kesidou et al., 2025; Nafizah et al., 2024). The digital transformation is time-consuming, resource-intensive, and often requires significant organizational change (Kesidou et al., 2025). Scholars concerned with the behaviors of family firms—as the most prominent form of organization in the world (La Porta et al., 1999)—have begun to identify factors that may influence their (in)ability to digitalize, such as non-family managers (Ceipak et al., 2021; Bornhausen & Wolf, 2024), long employee tenures (Soluk & Kammerlander, 2021), and the presence of the next generation family members in the firm (Ano & Bent, 2022; de Groote et al., 2023a). However, few studies have focused on the family firm willingness to digitalize (Ano & Bent, 2022; de Groote et al., 2023a; Soluk & Kammerlander, 2021). Despite the family firm willingness being a wide-ranging construct, there is currently scant comprehensive work on family firms' willingness towards the digital transformation.

Family firm willingness—“the favorable disposition of the involved family to engage in distinctive behavior” (De Massis et al., 2014: p. 348)—is often associated with the ability-willingness paradox, a well-recognized concept in the family firm literature. This concept is clear on the ability of the family firm—“the family's discretion to exercise their power to make decisions that influence the firm” (Chrisman et al., 2015: p. 6), where

discretion is “the latitude of action, or potential options, afforded to [family] executives” (Wangrow et al., 2014: p. 101). Yet the construct of willingness is more loosely defined, reflecting the goal intentions, values and motivations which distinguish family from non-family firms (De Massis et al., 2014). Family firm willingness is known to influence a wide range of behaviors in family firms including internationalization (Dong et al., 2025), bribery (Jiang & Min, 2023), succession (Marques et al., 2022; Richards et al., 2019), innovation (Guenther et al., 2023; Rondi et al., 2021), and openness (Lambrechts et al., 2023). However, the family firm willingness literature has yet to understand the family firm's willingness towards the digital transformation. Therefore, a study bridging family firm digital transformation literature and family firm willingness literature is a promising endeavor for several reasons.

First, it helps understand whether willingness is an important factor for the digital transformation, as it is for other behaviors in family firms. Second, it can help further understand whether such willingness varies in family firms. Generally, family firm willingness is considered to be heterogeneous (Chrisman et al., 2015; Holt & Daspit, 2015). Third, since the external factors that shape willingness remain unclear (Dong et al., 2025), digital transformation, as an environmental stimulus can help unpack the (un)willingness construct. The digital transformation, as a relatively new context, provides an opportunity to step back and look at a defining factor of the family firm's willingness i.e., disposition—the tendency to respond to classes of environmental stimuli in a predetermined manner (House et al., 1996). Dispositions are known to be relatively stable yet malleable, especially when faced with an environmental stimulus (Burt et al., 2017). Based on this rationale, this study addresses the gap at the intersection of family firm digital transformation literature and family firm willingness literature by answering the following research question: “How do various dispositions impact family firm willingness to engage in digital transformation?”

To address our research question, we used abductive reasoning and a comparative case study method (Yin, 2018) from a sample of 14 Italian multigenerational family firms engaging in digital transformation. We collected extensive evidence from various sources, including a total of 54 interviews with family business owners and family and non-family managers. We also conducted informal interviews with employees; performed observations; and read

company books, archives, and websites. We followed a structured data analysis program (Kammerlander et al., 2018; Tracy, 2019; Yin, 2018).

Our findings yield several insights. First, although the cases were initially selected because of their engagement in digital transformation, the level of this engagement varied. Our sample ranged from sub-optimal innovations to more ambitious innovations involving specialist Industry 4.0 (I4.0) applications. Interestingly, contrasting factors across the cases resulted in different forms of willingness to innovate. We identified two dispositions to explain these factors. The first form was a *willingness-enabling* disposition, which involves sharing power in the firm, effectively communicating digital opportunities, and learning about digital technology. This disposition enables willing family and non-family members to engage in digital transformation. In contrast, a *willingness-suppressing* disposition involves controlling the firm, resisting changes to the status quo, and distorting potential opportunities. This disposition often derives from the senior generation and suppresses the willingness of family and non-family members.

Our findings make a twofold contribution to family firm innovation literature and a marginal contribution to the ability-willingness paradox literature. First, we highlight the importance of family firm willingness when considering family firms for the digital transformation. Our study introduces various factors that lead to the two polarizing dispositions, highlighting the importance of considering a family firm's willingness and enriching existing literature (Ceipek et al., 2021; Nieto et al., 2023; Soluk et al., 2021). Our work thus consolidates various types of evidence focused implicitly on family willingness toward digital transformation (Ano & Bent, 2022; de Groote et al., 2023a; Soluk & Kammerlander, 2021). It demonstrates how we should relax the assumption that the family brings a negative attitude towards the digital transformation (Bornhausen & Wulf, 2024; Ceipak et al., 2021). Instead, our contribution extends the theory by clearly explicating how different dispositions lead to different forms of family firms' willingness in the context of the digital transformation. More broadly speaking, this strengthens the need to recognize family firms as distinct from non-family firms due to the family's influence. Whether a firm is a family firm was a missing variable (even as a control variable) from recent digital transformation studies

(Hassan et al., 2024; Kesidou et al., 2025; Nafizah et al., 2024).

Second, we unpack the willingness construct, identifying specific mechanisms and two contrasting dispositions to more precisely define the construct's heterogeneity. This enriches the wide-ranging construct of family firm willingness, complementing studies that have identified it as relevant to other areas in the family firm. Our refined version of the model proposed by Chrisman et al. (2016) explains how disposition is a key mechanism for understanding family firm willingness (De Massis et al., 2014).

In addition, we reflect on the ability-willingness debate, providing a nuanced explanation of the heterogeneity of family firm willingness and the complexity of the family firm's (in)ability due to other factors (human resources, financial resources, and available opportunities). This adds further support to the idea that the ability-willingness paradox is not a universal phenomenon (Guenther et al., 2023). Our insights inform practitioners of the importance of disposition and how to aim for a *willingness-enabling disposition*; this is of critical importance for family firms to proactively prepare for the changes posed by the digital transformation.

## 2 Theoretical background

### 2.1 Characteristics of digital transformation

Digital transformation, defined as “the transformation of the socioeconomic environment through processes of digital artifact adoption, application, and utilization” (Gradillas & Thomas, 2025, p. 2), triggers the need for organizations to adapt through robust change (Lengnick-Hall & Beck, 2016).

The digital transformation is unique in terms of its velocity, complexity, and systemic impact (Schwab, 2017). Velocity relates to the increasing rate of change driven by continuously new and improved technologies (Schwab, 2017), such as increasing mechanization and automation, digital marketing, and miniaturization (Lasi et al., 2014). In addition, new technologies undergo continuous improvements (Sanders et al., 2016), thereby quickening a firm's need to change due to shortened timeframes for the assessment of business model viability and intensified competition (Barreto et al., 2017).

The complexity of digital transformation derives from the numerous combinations of various technologies that impact each organizational function (Baden-Fuller & Haefliger, 2013). Heightened technological complexity aims to fundamentally revolutionize each function of the organization (HR, marketing, operations, finance). For example, organizational decision-making transformation shifts a large proportion of decision-making from humans to algorithms, which quickens real-time decision-making but utilizes an overwhelming amount of data (Fosso Wamba et al., 2015).

Additionally, digital transformation requires systemic change involving the restructuring of designs and creates complex dynamic dependencies (Gradillas & Thomas, 2025). Firms must adopt a network-centric view, focusing on the activities of other firms as well as themselves (Verhoef et al., 2021). Widespread adoption of a network-centric view enables horizontal and vertical integration of the supply chain (Stock & Seliger, 2016), leading to benefits such as traceability. However, such integration also requires the sharing of information between firms in the supply chain (Behnke & Janssen, 2020); this is costly due to data ownership, storage, and cybersecurity expenses (Kraus et al., 2022) and poses inherent risks of misuse and illicit use of data (Zekhnini et al., 2021). Shifting to a network-centric view is anticipated to cause unprecedented paradigm shifts in business (Schwab, 2017). Thus, overall, the digital transformation is an environment stimulus that creates both opportunities and threats for organizations.

## 2.2 Digital transformation and family firms

Given its significance, the digital transformation is receiving more attention from family firm scholars. The family firm digitalization literature is growing and has considered digitalization as an antecedent to different types of innovation, such as business model (Soluk et al., 2021), open, (Nieto et al., 2023), radical, and incremental innovation (Appleton & Holt, 2024). However, existing literature has produced mixed results regarding family ownership (Xie et al., 2023; Liu et al., 2023; Capolupo et al., 2024; Dileo & Pini, 2018; Nieto et al., 2023) and family management (Dileo & Pini, 2018; Basly & Hammouda, 2020; Bornhausen & Wulf, 2024; Cucculelli et al., 2022; Ceipak et al., 2021). Studies that have found a

negative effect due to family management in the firm, attributed the use of non-family managers to mitigate this effect (Bornhausen & Wulf, 2024; Ceipak et al., 2021). In contrast, De Groote et al. (2023a) advocated family managers in their role in utilizing the family firm's specific resources for digital transformation (i.e., the family's collaborative, historical, and venture capital). Such conflicting results may be better understood by considering the willingness of the family.

## 2.3 Family firm willingness in family business research

Unlike family firm ability,<sup>1</sup> family firm willingness is more loosely defined. It is a wide-ranging concept and has been explored in many different firm behaviors such as succession (Bozec & Di Vito, 2019), internationalization (Dong et al., 2025), innovation (Dielemann, 2019; Rondi et al., 2021), and more recently, it has touched upon digitalization (Heider et al., 2022).

The family firm (un)willingness towards innovation is nuanced. The widely held assumption is that family firms have a superior ability but lower willingness to engage in technological innovation (Kastanakis et al., 2024). This is due to the unwillingness to take risks (Mismetti et al., 2024; Rondi et al., 2019; Veider & Matzler, 2016) and an unwillingness to share control with non-family managers (Chrisman et al., 2015). Such (un)willingness varies due to internal and external factors across the different forms of innovation.

Family firm research has begun to identify the external factors that influence (un)willingness (Kim et al., 2023). One external factor, the proximity of

<sup>1</sup> Generally, the willingness of the family is closely tied to the family's ability—involvement in the firm via ownership, governance, and management. This often leads to the supposition of the ability-willingness paradox (Chrisman et al., 2015; De Massis et al., 2014). A paradox is a contradiction between interdependent elements (Schad et al. 2017; Lewis, 2000; Lewis et al., 2022; Chaudhary et al., 2024). Indeed, De Massis et al. (2014) recommends considering both ability and willingness to avoid theoretical indeterminacy and conflicting empirical results. However, there is an imbalance in this literature given the well-defined construct of family firm ability—involvement in the firm via ownership, governance, and management.

collaborators, influences the willingness towards collaborating. Indeed, collaborators being closer to the family firm increases the family firm's ability to monitor them and in turn the family firm's willingness (Guenther et al., 2023). Another external factor is the type of organization (such as universities etc.) with whom the family firm collaborates with, being a non-profit organization increases family firms' willingness towards collaborating (Kim et al., 2023). Two further external factors, the openness of the surrounding ecosystem (Cobben et al., 2023) and institutional property rights (Dong et al., 2025), increases the willingness towards open innovation.

In addition, internal factors influence family firm willingness such as goal intentions, values, and motivations (De Massis et al., 2014). A large influential factor is the values of the involved family members (De Groote et al., 2023b). The values influencing willingness reflect the family's commitment (Holt & Daspit, 2015), loyalty (Radu-lefevre & Randerson, 2020), and collective trust (Holt & Daspit, 2015). The culture is another internal factor which influences the family firm's willingness, specifically the family's openness (De Groote et al., 2023a), cohesion (Guffler et al., 2023) and altruism (De Massis et al., 2014). The connected goals of the family firm are economic and non-economic goals (Alrubaishi et al., 2021; Veider & Matzler, 2016), such as the preservation of socio-emotional wealth (Chrisman et al., 2015; Debellis et al., 2021; Gómez-Mejía et al., 2007). The perceived benefits of these goals influence willingness, such as whether they will strengthen the family's identity and power in the organization (non-economic goal; Lambrechts et al., 2023). Another internal influence is the attachments in the family firm specifically: attachment to family traditions (Alrubaishi et al., 2021; Ingram et al., 2016), attachment to the status quo because of long-term manager tenures (Brinkerink & Bammens, 2018; Veider & Matzler, 2016), and an inability to search for new ideas beyond long-term close ties (Bettinelli et al., 2022; Veider & Matzler, 2016).

An underexplored element of family firm willingness to innovate is the role of disposition. Given that dispositions are shaped by the specific environmental stimulus of concern (House et al., 1996), we focus on unpacking the willingness of the family firm in the context of the digital transformation.

## 2.4 Family firm willingness to engage in digital transformation

Family firm willingness towards digital transformation remains largely unexplored; existing literature has focused instead on family firm ability (Xie et al., 2023; Liu et al., 2023; Capolupo et al., 2024; Soluk et al., 2021). Research has touched upon willingness in a few regards. For example, Ano and Bent (2022) claimed that a family can sometimes possess commitment, respect, trust, and a visionary attitude towards digitalization. De Groote et al. (2023a) revealed that family-specific resources were heavily influenced by willingness to digitalize. Willingness specifically described as the willingness of the next generation, willingness to incentivize employees and create a future-oriented culture, and willingness to collaborate with others, as well as the family's willingness to uphold a reputation of being knowledge creators/sharers. Differences in willingness regarding these aspects of business are attributed to generational differences in understanding of digitalization. In contrast, unwillingness towards digitalization consists of an ambivalence about the future, skepticism, and a general feeling of being overwhelmed (Ano & Bent, 2022). Bürgel and Hiebl (2024) discovered that individual family members may vary in their willingness, and this sometimes leads to conflict (Bettinelli et al., 2022; Mismetti et al., 2025).

Given that existing family firm digitalization research has only touched upon willingness, a more thorough examination of family willingness is warranted to clarify the factors that lead to (un)willingness, as called for by De Massis et al. (2014). This can be achieved through a deeper exploration of firm disposition in response to environmental stimuli (in this case, digital transformation).

## 3 Methodology

As our research addresses a "how" question, we adopted the qualitative multiple case study method (De Massis & Kotlar, 2014; Yin, 2018). Through several data collection techniques and analysis aided by abductive reasoning, we generate new insights to answer our research question.

### 3.1 Case selection and empirical context

We began our case study by setting the boundaries of the cases according to several criteria. We assessed each criterion at multiple levels of analysis (firm, industry, and country). At the firm level, three conditions had to be met. First, the family had to have influence in the firm to ensure sufficient family ability—defining the family firm according to Chua et al. (1999)—through sufficient levels of family ownership (no less than 100%) and governance influence (at least two family members on the board of directors; De Massis et al., 2014).

Second, at least two generations must be involved in the firm to capture family dynamics and ensure family business transgenerational intention (Chua et al., 1999, 2012). This criterion ensures the presence of the ability–willingness paradox, which grows as the family moves into later generations and power is shared among a larger number of family members (Chrisman et al., 2015: p. 313). Additionally, this criterion ensures heterogeneity of the willingness of different family members (Holt et al., 2015).

Finally, the firm had to be engaged in digital transformation. This was ensured using several strategies. First, the cases had to be of sufficient size (at least 10 employees) to warrant the adoption of technologies, following the recommendations of past digital transformation research (Dieste et al., 2022). Second, cases either had to be associated with the “Cluster Tecnologico Nazionale Fabbrica Intelligente,” a list of more than 100 firms leading digital transformation in Italy (Fabbricaintelligente, 2021) or exhibit evidence of digital transformation. To ensure this, we manually searched cases’ websites for specific digital technologies related to digital transformation (e.g., the [industrial] Internet of Things, cloud technology, big data and analytics, artificial intelligence, simulation, visualization technologies, autonomous and collaborative robots, blockchain, and additive manufacturing; Appleton et al., 2022). Evidence of I4.0 technology and technology applications were double-checked through primary data from respondents and observations.

On the industrial level, the firms were bounded by industry, in this case the manufacturing industry, for two reasons. First, I4.0 technologies are of critical importance to digital transformation within the manufacturing industry (Cohen et al., 2019). Second, previous family firm studies have also been bounded by industry to provide more homogeneity across mechanisms that are not the primary focus (Kammerlander, et al., 2018).

On the country level, the case firms were all located in Northern Italy. This context is of particular importance as this area holds a significant number of family firms and has institutional incentives for adopting I4.0 technologies (Italian Trade Agency, 2018). This also serves to reduce the potential bias that can result from families belonging to different cultures or businesses operating in diverse geographical and economic contexts.

After contacting firms that fulfilled the criteria for case selection and excluding irrelevant cases, a total of 14 family firms were recruited for our analysis. Similar to prior studies (e.g., Kammerlander, et al., 2018), this range of cases ensured multivocality and revealed deeper insights into the phenomena of interest. In addition, interviewing regular engineers (in the initial cases) added technical insights into the heterogeneity of digital transformation and their perceptions of the family’s ability and willingness to engage in digital transformation. We primarily targeted family members and non-family top management team (TMT) members (i.e., managers) who were organizational strategists and worked closely with the owning family. An overview of our case study is presented in Table 1.

### 3.2 Data collection

We used several data collection techniques: primary interviews, secondary interviews, observations, secondary data (e.g., websites, company metrics, books, and company documentation), informal conversations, and financial data.

The interviews were conducted by two or three members of the research team. The first or second author was present in all of the interviews. We initially used semi-structured interviews with exploratory questions regarding digital transformation and family aspects. During the interviews, we deliberately did not interrupt participants to ensure open-endedness matching the open-ended interview techniques used in past family firm research (Barbera et al., 2020). The research team interviewed multiple informants per case to gain more insights and avoid response bias and inaccuracies (Yin, 2018). All interviews were recorded and transcribed verbatim. The interviews lasted anywhere between one and three and a half hours. Second interviews supplemented our first set of interviews and was used to confirm the strategic initiatives of the organization. In addition, due to the novelty of I4.0 technology and digital transformation, as interviewees were

**Table 1** Sample information

ID	Generation Number	Active Generations	Millennials on board	Family Council	Revenue	Manufacturing type	Employees Number	Firm Tour (observations)	Interviews			
									First		Second	
									Family mem	Non -fam	Family	Non-family
A	15	3	1	X	\$458 m	Arms	458	X	1	2	4	
B	3	2	0		\$112 m	Marble	341	X	1	3	1	
C	3	3	0	X	\$73.9 m	Food produce	112	X	3	3		
D	6	2	1	X	\$57.2 m	Textiles	103	X	2	-	2	
E	3	2	0		\$95.7 m	Pharmaceutical	242	X	1	-	1	
F	2	2	1		\$54.3 m	Plastics	261	X	1	1	2	
G	3	2	1		\$144 m	Textile	912	X	3	4	1	
H	3	2	2		\$131 m	Steel	837	X	1	1		
I	2	2	0		\$1.5bn	Steel	1640	X	1	1	1	
J	3	2	0	X	\$11.4 m	Textile	54	X	2	-	1	
K	2	2	2		\$4 m	Food produce	10	X	3	-		
L	2	2	1		\$11.3 m	Steel	53	X	1	1		
M	3	1	0		\$239	Textile	229		1	2	1	
N	5	2	1		\$32.6 m	Food produce	42	X	1	-		
									22	18	14	0

considered industry leaders many of them promoted their strategic initiatives to interested stakeholders through public interviews. A total of 54 interviews were used for this study.

Direct observation was important to see the digital technologies in operation, as has been done in other qualitative research studies on family firms (Fitz-Koch & Nordqvist, 2017). In addition, further evidence was collected through informal interactions with non-family employees and machine operators. The research team made notes during and after these instances. Family members and/or TMT members led observations of detailed examples of I4.0 and/or digitalization in practice as well as provided an explanation of the underlying mechanisms. During the observations, the research team questioned the family's role in the digital transformation strategy and whether the strategy was to enter a new direction (exploratory orientation) or improve efficiency (exploitative orientation). In some cases, the research team was invited to lunch either onsite or at a nearby restaurant with family members and key managers; this provided the opportunity to gain an insight into the sense of community and have an informal conversation on the topic of the study. Again, the research team took notes on the interactions.

In addition, a large volume of various forms of secondary data assisted our primary techniques in the triangulation process (Yin, 2018). Secondary data collection included information from the following sources: ORBIS, company website information, local news, media reports, and company books. This provided demographic information (age, family/non-family) for the case selection. Finally, during all data collection activities the research team had a brief and de-brief meeting. These occasions were used as sense-making activities, which validated our interpretations and the accuracy of our notetaking.

### 3.3 Data analysis

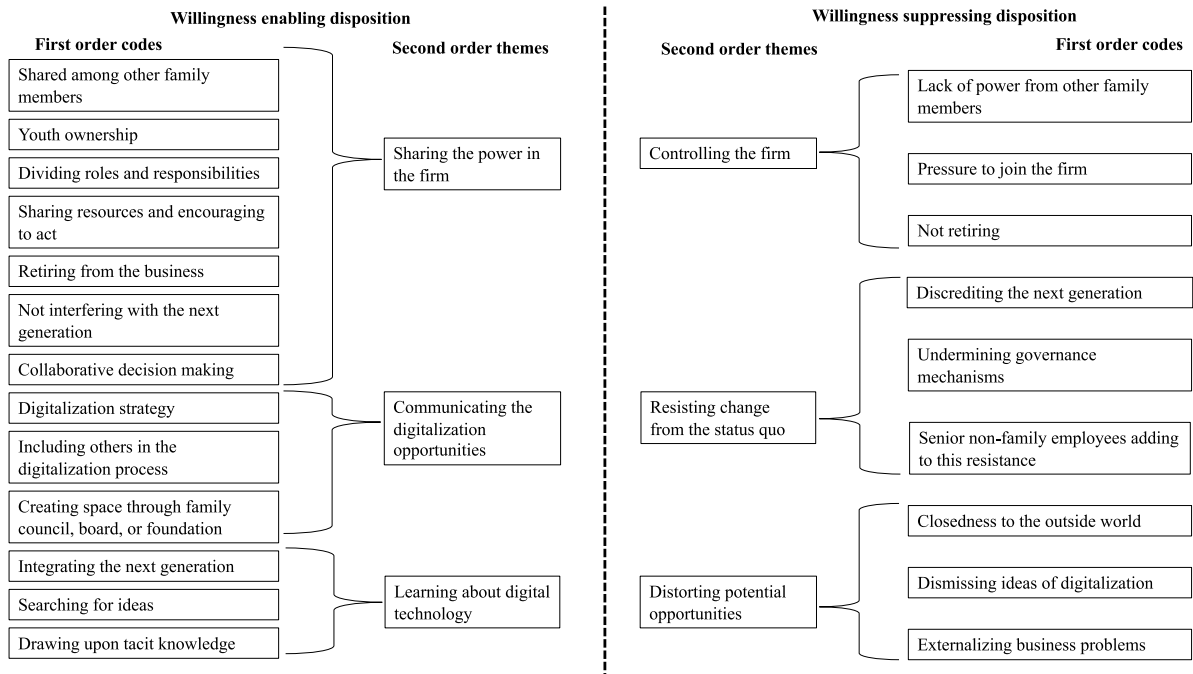
Data analysis followed a series of steps based on a synthesis of qualitative research guidelines (Gioia et al., 2013; Miles & Huberman, 1994; Yin, 2018) and recent family firm qualitative research (De Groote et al., 2023b; Erdogan et al., 2020). The first step involved at least two members of the research team compiling all the evidence for each case. The second step involved a research team meeting to cross-check the individual analysis. Two main focal

points emerged from this discussion. One point related to family members' ability and willingness to engage in digital transformation, and the second point related to detailed information about digital transformation. To conclude this process, the coders compared their codes and a third person from the research team checked for any discrepancies in interpretation. This step was performed through multiple meetings to ensure inter-coder reliability. The coding template helped structure the data (Gioia et al., 2013) and is included in Fig. 1.

Building on the first focal point, to further analyze family member willingness and digital transformation innovation strategy, we followed Grundström et al. (2012) to identify the different attitudes between older and younger family members in the firm towards digital transformation. We noted whether willingness was consistent among older and younger family members or if only the younger generation perceived the opportunities presented by digital transformation while the older generation resisted it.

Our analysis revealed that in some cases there were family members whose willingness to engage in digital transformation was suppressed, while other cases were enabled to engage in the digital transformation. We further analyzed the cases by contrasting the emerging willingness-enabling and willingness-suppressing dispositions. We also attempted to link the family's ability with the different dispositions, but we were unable to do so conclusively (as we explain in Sect. 4.3.). Detailed analysis of the ability of the family can be found in Appendix 1 Table 2. Our analysis resulted in the second-order themes associated with each disposition, shown in Fig. 1.

We identified the digital strategy through recently implemented digital technologies in the firm and assessing these in relation to company size and revenue to determine the level of commitment to digital transformation. We adopted the three dimensions (complexity, velocity, systemic change) from Schwab (2017). We considered whether these technologies needed to be implemented alongside other technologies, the level of training staff required to use such technologies, and the purpose of such technologies; we labelled this dimension "complexity." Furthermore, we analyzed the project timeframe, and the level of financial resources required to understand the family's level of commitment to the innovation; we labeled this dimension "velocity." Based on these considerations, we were also able to examine



**Fig. 1** Coding structure of sample

whether there was the dimension “systemic change”, meaning a change in the underlying structure of the business because of digital transformation. A more detailed analysis of the digital transformation for each case can be found in Appendix 1 Table 1. Finally, we followed Kammerlander et al. (2018) and categorized our cases along a matrix combining the response to the digital transformation and the family’s disposition type. In addition, we reflect upon our findings and generate propositions in Sect. 4.3.

We used a corroboratory strategy to help strengthen the construct validity of the findings (the two dispositions and digital transformation strategies) of the cases, as recommended by Yin (2018). We also benchmarked our corroboratory strategy against recent contributions to the family firm literature (De Groote et al., 2023b; Guffler et al., 2023; Kleine et al., 2024) and the digital transformation literature. Our analysis is more nuanced illustrating the multi-dimensionality of the construct (Kesidou et al., 2025; Matt et al., 2023). The triangulation strategy of the data sources (interviews, observations and secondary sources) was performed at each stage of the data analysis process. At each stage we corroborated what was said with what we saw in our observations and secondary sources.

The observations were particularly useful to understand the extent of the digital transformation strategy, particularly whether the machines were purely manual, assisted with an electronic programming board, or connected to a wide-screen television which presented the real-time analytics of the factory’s performance. In addition, the observations allowed us to ask employees about the digital transformation and the involvement of the family. Such instances helped us corroborate the relevant disposition of the case and related mechanisms.

The secondary sources also helped us corroborate the willingness towards the digital transformation as some cases used online material to signal that they were using the latest digital technology. In some cases, the official involvement of the family members would be connected to the announcements regarding the latest technologies, epitomizing a willingness-enabling disposition. In other cases, there were minimal digital technologies in the firm, which were easier to triangulate, as we did not see the digital technologies in the firm or minimal digital technologies (electronic control board attached to the machine for electronic programming, such as the duration, temperature and speed of the machine).

## 4 Findings

Our findings are presented in three parts. The first part presents the themes and supporting evidence related to the willingness-enabling disposition, defined as *the encouragement to act, use resources, and pursue one's own willingness to direct the innovation strategy of the firm*. The second part presents the themes and supporting evidence related to the willingness-suppressing disposition, defined as *an excessive tension constraining the use of power to act and apply resources when attempting to pursue one's own willingness to direct the innovation strategy of the firm*. The third part summarizes our findings into two propositions, combined with a reflection of what this means for the ability-willingness paradox in the digital transformation, resulting in two further propositions.

We identify a link between disposition, family firm willingness and the firm's strategy for digital transformation. *Willingness-enabling* disposition cases tended to adopt a moderate or optimal digital transformation strategy. The stronger the willingness-enabling disposition was, the more ambitious and methodical the digital transformation strategy was. In contrast, the willingness-suppressing disposition cases tended to

adopt a sub-optimal digital transformation strategy. Such cases also tended to be less ambitious and methodical in their approach to digital transformation and in some cases dismissed digital transformation altogether. Our categorization matrix is presented in Fig. 2 and illustrates the positioning of the cases.

### 4.1 Willingness-enabling disposition

The *willingness-enabling disposition* has three major second-order themes: sharing power in the firm, communicating digitalization opportunities, and learning about digital technology. Table 2 presents illustrative quotes of each second-order theme.

Sharing power in the firm pertains to the legitimacy each family member holds in the firm. The strongest form of power is through ownership shares passed on from the previous generation. Such power is best shared among family members, as one participant explained:

*Right now [in the 15<sup>th</sup> generation], there is me and my brother. Before it was my father and his brother, and before that was my granddad and his brother, and before that were the pair from*

		Strategic response to the digital transformation		
		Sub-optimal strategy	Moderate strategy	Optimal strategy
Family firm's disposition	Willingness-enabling disposition		Case C Case N Case J Case K	Case O Case G Case A
	Willingness-suppressing disposition	Case L Case H Case D Case E Case B Case I Case F		

**Fig. 2** Case categorization according to data analysis

**Table 2** Evidence of the *willingness-enabling* disposition

1st order concept	2nd order theme	Illustrative quote
Sharing the power in the firm	Shared among other family members	<p>“[buying the family out] you have to buy unwilling family members out, but it takes a long time to pay the loan back, which is not easy... it’s easier to only give shares to willing family members back Shane did a good job by giving all his shares to his son, but my father, who had me and my brother interested in the business had to split the shares [between us and our sisters], but then, this dilutes through the generations... and this is a problem because we always have to invest in the company rather than buying anyone out who is not interested” (Senior generation, family member, Case C)</p> <p>“My dad was the majority owner and the chief executive officer (CEO), and then I came in as the CEO but without the majority of shares. I could not make any decisions which I found a little frustrating... In the end, he passed on the shares to my brother and myself. We did something that is called a family pact, which is in Italy a legal framework for the generational succession, where the person willingly gives up their shares and passes them onto the next generation, the siblings who would have inherited the company from them can take over and safeguard the succession, because otherwise it might just become a mess” (Junior generation, family member, Case K)</p>
	Youth ownership	<p>“You need to make a point zero [starting point] and that’s why I feel to be in a very lucky position where my father said one day, David, now it’s your turn... And obviously, it turns out to be a great responsibility, but also a fun one because you can take it into your own hands and drive innovation into new fields where you think that business is going to work out” (Junior generation, family member, Case G)</p>
	Dividing roles and responsibilities	<p>“And the one important aspect for us was to divide the areas between me and my sister. I’m more in charge of the commercial marketing development while my sister is responsible for administration and production” (Senior generation, family member, Case N)</p> <p>“I did a project on the implementation of the scheduling software, my brother did a project on the implementation of production software, and my other brother has done a project on an acquisition of a recent company” (Junior generation, family member, Case J)</p>
	Sharing resources and encouraging to act	<p>“...and also, as children, you visit the company and grow up around the company” (Junior generation, family member, Case C)</p> <p>“We are aligned in the vision now and we have removed people from the business who do not share that vision... we have a long-term goal, it is something you notice as you get older, that you tend to overestimate yourself, but you realize you are every good at a very few things, me and my brother work very well together and our strengths complement one another, so if it continues to be good, then why not...” (Junior generation, family member, Case K)</p>
	Retiring from the business	<p>“...and now they are the managers of the company, and I am now in the position to be retired” (Senior family owner, Case C)</p> <p>“My grandfather left the company to my dad when he was in his twenties because he had health problems, and he preferred just to step down and let him have his freedom to lead, because having two family members it could create problems” (Junior generation, family member, Case J)</p>
	Not interfering with the next generation	<p>“We [me and partner] want to retire when we reach retirement age, although we have a packed that the next generation must have certain capabilities to succeed in the firm, the next generation need to develop, because in the previous succession my father-in-law handed over the firm in a single transaction, but now it’s a bit different, the firm is bigger...” (Senior generation, family member, Case J)</p> <p>“...He gave us the shares of the company and really let us decide about the future of the company is still there. He’s giving us some advice, which sometimes is not very useful, but letting us decide does not usually happen because the founder of the company, especially in the [province], is very proud. So, they typically don’t want to leave the new generation to take over the business... it was not easy for him because he built everything. He really was the pioneer of this concept” (Senior generation, family member, Family Case N)</p>
	Collaborative decision making	<p>“...we will discuss all the things since the last meeting, and ideas development is simply a matter of conversation, it goes like this, I say A, you say B, and the result is C, it’s always a little bit [long] but it allows all the people to voice their opinion” (Senior generation, family member, Case C)</p> <p>“...We have about five people which are form a committee and we make all that most important decisions, we discuss them together, we have the sales manager and then we have the [produce] maker, then the production manager [plus two junior generation family members, not the senior generation family members]. So basically, it’s five people take all the most important decisions about the firm” (Junior generation, family member, Case N)</p>

**Table 2** (continued)

1st order concept	2nd order theme	Illustrative quote
Effectively communicating the digitalization opportunities	Digitalization strategy	<p>“[Digitalization project] We can reduce a lot of the energy what we need to process the product, this is the short-term step, we have another mid-term step where we have a new technique for cooking” (Senior generation, family member, Case L)</p> <p>“Our aim is to become a public company, which you need to be well organized and properly managed, which involves information technology. The information technology allows us to prove our past performance and enables us to look to the future, the digital transformation/You need to be an organized company and have the state of the art in terms of intellectual property if you want to become eligible to for an initial public offering...” (Senior generation, family member, Case M)</p>
	Including others in the digitalization process	<p>“I was hired for the Industry 4.0 project, and you need a really clear concept to help visualize how the technology will be useful” (Junior generation, non-family member, Case C)</p> <p>“We involved a logistics consultant... Which is a German company, which our work with a lot of enterprises around this area, mainly on packaging. We involved a logistics consultancy about a year ago to decide that what was really the best solution for us in order to expand” (Senior generation, family member, Case N)</p>
	Creating space through family council, board, or foundation	<p>“We have a [bi-annual meeting] where people can bring their ideas, we think about what we can do better [not only technology] but in all areas” (Senior generation, family member, Case C)</p> <p>“From the beginning, when we set up the board, he [senior generation] was still involved. But then there were some quarrels between us, especially between my sister and him. And so, he decided to leave and said ‘it’s up to you now, you have the shares, you decide it’s your responsibility and that was his approach” (Junior generation, family member, Case N)</p>
Actively learning about digital technology	Integrating the next generation	<p>“My brother is doing another digitalization project around the costing of all the digital technologies and the staff activities” (Junior generation, family member, Case J)</p> <p>“He (the son CEO) wants to learn about artificial intelligence and use it in the business, which is good...” (Senior generation, family member, Case K)</p>
	Searching for ideas	<p>“I’m going to the US now for a conference that a blockchain conference that takes place next week. And that could be something it involves web three and something where we have a lot of knowledge, and I would like to merge with this world here, but the question is how? Just because you want to do it is not enough, it has to make sense. You need to have a product which is fir for market and be some kind of real-world solution” (Junior generation, family member, Case K)</p> <p>“The family pushed the digitalization project, the old generation pushed technology in the past [which lays the foundation]. Then, there is the cost of production, to do this properly you need to know what is happening in the production line, which adds a driver in terms of competition. This is the priority of the new generation, but you also need to have the right team, some new people are good for pushing this digitalization project” (Junior generation, non-family member, Case C)</p>
	Drawing upon tacit knowledge	<p>“Yes, he was the brave to introduce something which was completely different and not existing in the market and at that stage we’re shaping already the idea that [Company name] was becoming a company which was proposing something which technologically well advanced. We’re talking about waterproof synthetic material, lightweight, warm, and anti-slippery. He was already shaping the attitude of being innovative, which is required for technological innovation” (Junior generation, family member, Case M)</p> <p>“[COMPANY NAME] was a leader in the past of having efficiency systems and processes in place however, this was not updated for a long time, because the previous leader [retired family manager] was a technical minded guy but not an economically minded guy, the visualization was purely technical instead of identifying where value can be created and costs can be saved” (Senior generation, non-family manager, Case C)</p>

the 13<sup>th</sup> generation. (Senior generation, family member, Case A)

To embrace changes in the business environment, sharing power is an effective way of enabling change in the inside world (of the firm). In one case, a current firm owner explained how holding power (through

ownership shares) has enabled them to apply their willingness to pursue innovation strategies:

*You need to make a point zero [starting point], and that’s why I feel I’m in a very lucky position where my father said “Now it’s your turn.” Obviously, it turned out to be a great responsi-*

*bility and a fun one, because you can take things into your own hands and drive innovation in new fields where you think the business is going to work.* (Junior generation, family member, Case G)

Shared ownership was common across the cases with a willingness-enabling disposition. Another aspect of this disposition is to divide the roles and responsibilities of the family members, as explained by one family member:

*The one important aspect was to divide the areas between me and my sister. I'm responsible for commercial marketing development, while my sister is responsible for administration and production.* (Junior generation, family member, Case N)

Another form of power-sharing is the sharing of resources and encouraging other family members to use these resources. This form of power-sharing can become a family tradition to encourage entrepreneurial behavior across generations. One senior family member reflected,

*I very clearly told my son, "When you are ready and you are convinced, we will invest." This is because he must take responsibility and lead people with knowledge on such technologies. We understand and know that part of the role of the entrepreneur—and hopefully in the future he will be in this role—is to take some risks. This also happened in previous generations. For example, when my grandfather invested in the first machinery with certain technology, it was a risk. There was a question mark around that technology.* (Senior generation, family member, Case A)

Part of sharing power is to step down when necessary. In firms with a willingness-enabling disposition, older people are willing to retire from the business. This is not an easy process, as one family participant shared, stating "My father really struggled to retire and hand the business over, but I gradually showed him I was capable of running the business" (Senior generation, family member, Case N). Importantly, retired senior family members are still available to offer advice, and this is appreciated by other family members:

*My brother is the president of the firm, but we will still certainly involve my father, even if he has retired this year, and my uncle retired a few years ago ... They [my father and uncle] still have good understanding, and such understanding is especially important for digital investments, which we always discuss with them.* (Junior generation, family member, Case C)

Encouragement of family members to use resources was not always direct. Indirect forms of encouragement included not interfering with the growth of the next generation and involving them in as many functions of the firm as possible. As one participant reflected regarding his father's mentoring,

*My father tried to leave me alone as much as he could. Obviously, he tried to keep me involved in all aspects of the business. Even if I was only responsible for the sales department, he made sure I was actively sharing ideas with production and product development. It kept me involved and informed on the evolution of the group.* (Senior generation, family member, Case M)

Another facet of sharing power is collaborative decision-making, which involves a combination of family and in most cases non-family members rather than a single family or non-family member. This can be formal or informal as one participant shared,

*...it's not very formal, in fact, it's very informal. For example, I can go into the office and say, "Let's talk about this digital technology, what do you think about it?" or "By the way, what do you think about sharing our know-how?" ... and so it's so back and forth. But in the end, it is me who makes the decisions and that is very comforting.* (Junior generation, family member, Case K)

Effectively communicating digitalization opportunities is the second important theme in the *willingness-enabling disposition*. Effectively communicating digitalization opportunities requires a thoroughly developed digitalization strategy; involving others in the digitalization process; and creating space through either a family council, board, or foundation. The digitalization strategy is well articulated, communicated throughout the firm, and in most cases aims to affect all aspects of the firm. For example,

*The digital area brings tremendous opportunity in every segment, from digitalizing how we do our product design in our creative area to how we coordinate the logistics of our orders. The time to do these activities has drastically shortened, and now they can be done at the touch of a button. That's the digitalization process.* (Junior generation, family member, Case G)

Digitalization strategy included timelines detailing when decisions about changes are to be made and their scheduled order. As one interviewee noted,

*We made a digital expansion plan for the next four years ... At the end of this of this project, we will think of a strategy for the next two years and then decide whether we must invest in a new technology.* (Senior generation, family member, Case N)

The rationale for digitalization is also included in the communication of opportunities. Reasons for digitalization were mainly related to replacing employees because finding new employees was difficult and would have constrained growth. For example, one interviewee commented, “We need this digital technology because we find it hard to find new people” (Junior generation, family member, Case K). Without such technology, the firm would not be able to grow. The level of detail in the digitalization strategy was another significant factor. For example,

*We started with an IoT system to visualize all the important things from the production line. We aim to get 50 data points per production line ... everything which is hidden now will become visible in this visualization system ... you need to have a clear concept of which data is important. To identify this, you really need to integrate the three views— technicians, users, management—and you need to decide based on these three views what is valuable and how you can attain it, and then you go with these clear ideas to a software house, and then the realization is not a big issue.* (Junior generation, non-family manager, Case C)

Various digital technologies are included as part of the digitalization process, and part of this strategy in a willingness-enabling disposition involved integrating others into the digitalization process, including both

family and non-family members and new and existing employees. For example, one participant said, “We always involve research and development managers in the decision-making process when we are facing new technology” (Senior family member, Case J). Another participant realized the importance of employees, hence:

*Employees were one of the points that we thought was of paramount importance to make the financial investment you also needed the skilled employees to execute the digitalization activity, and we thought that it was not a question of the new generation of employees coming in but instead of changing the way existing employees think. This is our approach.* (Senior generation, family member, Case A)

In some cases, the use of consultants was important. For example,

*We involved a logistics consultant ... a German company, which works with a lot of enterprises around this area, mainly on packaging. We involved this logistics consultancy about a year ago to decide what was the best solution for us to expand [through automation and digitalization].* (Junior generation, family member, Case N)

Importantly, involving employees and both family and non-family managers in the digital process required a dedicated space to allow for communication; this was achieved through a family council, board, or foundation. This space allows family and non-family members to express any strategic ideas they have. One family member offered an example: “We have a [bi-annual meeting] where people can bring their ideas. We think about what we can do better [not only in technology] but in all areas” (Senior generation, family member, Case C). Another participant explained,

*We have a family board meeting... four to five times per year, where it is only me, my sisters, my father, and a consultant. The consultant helps to share strategical decisions that might concern the group's future direction. Within these boundaries, we have been able to build up our constitution such that it now has specific rules for how family members can enter the company in the future.* (Senior generation, family member, Case M)

The third theme of a *willingness-enabling disposition* is actively learning about digital technology, which involves integrating the next generation, searching for new ideas, and integrating tacit knowledge. The next generation was more inclined to actively learn about digitalization due to heightened self-awareness. As one participant claimed,

*The Digital Era is my era for sure ... [non-family mentor] told me these are the new opportunities obviously within that segment. We all analyzed the brand aspect and the retail aspect, and we noticed several trends, retail shops were focusing more on the customer digital experience, e-commerce was growing increase and Asia was growing at a ridiculous pace.* (Junior generation, family member, Case G)

In addition, the senior generation also showed a level of self-awareness that differentiated their perceptions of digital technology from those of the next generation. One retired family member observed,

*My sons ... are different from me; they understand artificial intelligence and different things. For me, technology is for online meetings and emails; that is all. But now technology is becoming very important ...* (Senior generation, family member, Case K)

The importance of understanding digital technologies was not just applicable to family members but also non-family members. As one family member commented,

*We employ people who are not old enough to drive but because they understand social media [and other technology] they are preferred to older people.* (Junior generation, family member, Case K)

In addition to integrating the next generation, firms with a *willingness-enabling disposition* also drew upon their tacit knowledge to better understand how digitalization can be implemented into the firm. The idea of digitalization, or at least its role in automation, was not entirely new, but it is only now becoming more viable due to digital technology. One participant elaborated,

*These ideas are old [automation], but the cost to implement them was too high 5 years ago,*

*whereas now it is becoming more realistic. The only remaining issues are the space issue, which is the space the machine takes, and the average number of defects it produces [compared to an employee].* (Senior generation, family member, Case C)

Thus, digitalization is not an entirely new idea but instead a natural evolution that the *willingness-enabling disposition* embraces.

#### 4.2 Willingness-suppressing disposition

In contrast to the *willingness-enabling disposition*, the *willingness-suppressing disposition* has three second-order themes: controlling the firm, resisting changes to the status quo, and distorting potential opportunities. Table 3 lists quotations pertaining to this disposition.

Controlling the firm occurs when one dominant family member holds power in the firm, the owner closely monitors firm activities, and the senior generation enforcing pressure on the junior generation to join the firm. Power is not shared with other family members, and the senior family member does not explain their rationale for decisions; for example, one participant explained how succession is approached in their firm:

*My father will decide [the succession plan]. Currently, everyone is in the same position now [and waiting for him] ... he will never sell the company.* (Junior generation, family member, Case H)

This lack of power suppresses the willingness of the next generation for two reasons. First, they do not have legitimate power to make decisions. Second, they do not wish to upset their leader, jeopardizing their succession prospects. To be uncertain about the future state of the firm is unsettling, and it becomes difficult to plan to invest in digital technologies in such circumstances. Another form of control that suppresses family firm willingness is close monitoring of the firm, which involves one family owner knowing and deciding all key activities. Close monitoring also concerns who delegates the task to whom, one person does all the delegating even if it means an enormous amount of work. For example:

*There are 28,000 or 27,000 activities on this site, and there is video surveillance on these activities. I want to see who can do a project and identify those who manage to keep a warehouse active ... production is done this way, so to do [new] things requires [to have done] things, and there are different moments for this. In the current moment, there are problems of a political nature [between managers].* (Senior generation, family member, Case F)

Another way to maintain close monitoring is to regularly schedule informal meetings with key managers to keep track of all the firm's daily activities. One participant shared how their firm does this:

*We have small regular briefings ... Me, my brother-in-law, my father, and the [non-family] accountant meet once a morning and again in the evening. My father checks the payments during this meeting. He asks us questions—"What is this? What is that?" ... In the morning, we talk about what happened the day before and what we will do today, and in the evening, we talk about tomorrow.* (Junior generation, family member, Case H)

In extreme cases, this controlling of the firm extends into family members' life choices, such as the decision to join the firm. For example,

*Even though my father never [explicitly] said I must join the firm, I felt like I had to join the firm. We share the office, and I am very close to him.* (Junior generation, family member, Case I)

Moreover, controlling owners did not plan to retire, preferring to maintain their hold on the business. This contrasts with the *willingness-enabling* disposition, where power was shared, and structures were in place to encourage a more collaborative approach.

Resisting changes to the status quo consists of discrediting the next generation and undermining governance mechanisms. Senior non-family employees can add to this resistance. Discrediting the next generation is a natural defensive mechanism to maintain the status quo in the face of digital transformation, which may appear to be an overwhelming change. Senior family members can deflect the need to change by labeling the next generation as incompetent. For example, one senior family member claimed,

*They [the junior generation] do not get the same respect as me [senior generation] ... and this is a sensitive issue. Currently, the children would not be up to running the company. I need to bring in some management and do a family-owned but professionally managed company to ensure that the company remains in the family.* (Senior generation, family member, Case F)

In this case, the owner referred to 50-year-old adults as incompetent children who do not have the skill to run the firm, let alone to implement digital transformation strategies. In addition to this attitude towards the next generation was a disregard for governance structures. This disregard led to the undermining of such structures. For example,

*Family member: My daughter entered and will carry on, my daughter with her father ...*  
*Interviewer: Are both you and your daughter both involved in the decision-making process?*  
*Family member: ...it depends, for example, when we have a big problem ... I must intervene.* (Senior generation, family member, Case E)

In extreme cases, there are no governance structures because, from the senior generation's perspective, they are not needed. As one participant explained,

*We don't have board meetings with our staff. We don't have things like that because it's the management that goes around and checks the problems in the situation.* (Junior generation, family member, Case H)

In addition, non-family members, rather than adding balance and objectivity to the situation, may instead strengthen resistance to changing the status quo. One participant shared,

*It [changing the status quo] takes a long time because ... most of them work in our company most of their working life. They also acquire power in the company, so it's difficult to move their position and say to them, "Don't do this anymore."* (Senior generation, family member, Case B)

Thus, in the *willingness-enabling disposition*, employees help to achieve digitalization, but in the *willingness-suppressing disposition*, employees reinforce resistance to changing the status quo.

**Table 3** Evidence of willingness-suppressing disposition

1st order concept	2nd order Theme	Illustrative quote
Controlling the firm	Lack of power from other family members	<p>“My father will decide that [the succession plan]. Everyone is in the same position now...he will never sell the company” (Junior generation, family member, Case H)</p> <p>“Mom and I have always been involved in his decisions, but he pushes in his direction and doesn’t talk to anyone, because he has his own mind, so it’s very, very difficult” (Junior generation, family member, Case L)</p>
	Close monitoring by owner	<p>“We detail everything, the energy used, everything is documented in a systematic manner, this allows us to see the evolution of a product, and then we can sit down with the design and production department and decide” (Senior generation, family member, Case F)</p> <p>“if I lose a customer now, it will not be a problem, because we do not depend on any one customer too much. For example, when a customer surpasses 25% of our revenue that is a problem for my father, and he doesn’t negotiate, neither does he like to have meetings with the team” (Junior generation, family member, Case H)</p>
	Pressure to join the firm	<p>“... [my father] he really sacrificed all for his company. And I think that for him to see some of us that left the company it will be very sad to him. But he never forces us to do the job...” (Junior family member, Case H)</p> <p>“...Maybe I feel some pressure for the trust that the employees have in my family. Because they trust in my father, I feel that they also trust in us” (Junior generation, family member, Case H)</p>
	Not retiring	<p>“It’s strange when I think that my father is 83 and... He has been always ready for the changes and to make innovations” (Junior generation, family member, Case H)</p>
Resisting change from the status quo	Discrediting next generation	<p>“They [the junior generation] do not get the same respect as me [senior generation] ... and this is a sensitive issue. Currently, the children would not be up to running the company. I need to bring in some management and do a family-owned but professionally managed company to ensure that the company remains in the family.” (Senior generation, family member, Case F)</p> <p>“...At the beginning I wanted them to make the choices and feel responsible, as they are difficulties involved, and then I intervene in finding a solution. Every medal has two sides, recognition is attractive but to receive that there is of work to be done. Medals expose a person’s character, to gain medals there must be sacrifices. When that fails, I intervene. Sometimes, if I intervene immediately, it mortifies them [junior generation] because they realize they can’t do it, I hope first that they will admit that. But it is not something we discuss together, because it also serves as a provocation” (Senior generation, family member, Case F)</p>
	Undermining governance mechanisms	<p>“I step back, I certainly do not go to undermine the figure of the new CEO, she is the CEO. But in private we are very different, but she must tend to her responsibilities...” (Senior generation, family member, Case E)</p> <p>“We don’t have board meetings with our staff. We don’t have things like that because it’s the management that goes around and checks the problems in the situation.” (Junior generation, family member, Case H)</p> <p>“We have meetings in the house, but I prefer formal meetings, but my parents prefer informal meetings” (Junior generation, family member, Case L)</p>
	Senior non-family employees adding to this resistance	<p>“It [changing the status quo] takes a long time because ... most of them work in our company most of their working life. They also acquire power in the company, so it’s difficult to move their position and say to them, ‘Don’t do this anymore.’ (Senior generation, family member, Case B)</p> <p>“With digitalization, I would say that [old long-term employees] are problematic... I’ve been here since 2016, and over the years I have noticed the senior managers with decades of experience just do the same thing, they set up a practice and that’s how they look at it...but last year things got easier because senior managers retired who were really stubborn when it came to Industry 4.0” (Junior generation, family member, Case D)</p>

**Table 3** (continued)

1st order concept	2nd order Theme	Illustrative quote
Distorting potential opportunities	Closedness to the outside world	“We left them [the industry associations] because my father said that there was too much politics, and instead I should concentrate 100% on my job. I don’t need to lose time playing politics ... We left every association” (Junior generation, family member, Case H)
	Dismissing ideas of digitalization	“We don’t have so much in common with other fields like fabric or like paper or like wood which Industry 4.0 is more suitable for” (Senior generation, family member, Case D) “.....too much information is useless. What value is added by knowing your daily average of production has changed from 5.2 to 5.3? It is just curiosity; there is not anything to gain from the data. You can have all the data you want, but do you need this data?” (Senior generation, family member, Case D)
	Willingness of next generation	“The structure and the company instead keeping it agile and lean, the flow of materials” (Junior generation, family member, Case D) “We have different opinions on the technology and the technologies we should invest in. For me, I see a lot of time wasted here by inputting the same data multiple times.” (Junior generation, family member, Case L)
	Externalizing business problems	“When I started the business I was a child, Italy was producing 75% of the [product] production, and now they are probably around 20% but now this 20% is 100% more than the 75% because the market [across the globe] grew, they discovered marble all over the world, they built quarries over the world, they set up factories over the world” (Senior generation, family member, Case B) “[describing product] we deal in piece and we in [location] is the 60% of the [product] there are 400 [producers] here, 40 of these are similar size to mine, or there specialize in two or three processes and subcontract to other [producers]” (Senior generation, family member, Case D)

Distorting potential opportunities occurred through being closed to the outside world, dismissing ideas of digitalization, and externalizing business problems despite willingness in the next generation. One case illustrates how the next generation were isolated from the outside world, limiting the potential social interactions which may lead to recognizing new digital transformation opportunities, as one participant explains this isolation from the outside world:

*We left them [the industry associations] because my father said that there was too much politics, and instead I should concentrate 100% on my job. I don’t need to lose time playing politics... We left every association.* (Junior generation, family member, Case H)

Another means of distorting potential opportunities was dismissing ideas of digitalization, which was reflected in responses like the following:

*...too much information is useless. What value is added by knowing your daily average of*

*production has changed from 5.2 to 5.3? It is just curiosity; there is not anything to gain from the data. You can have all the data you want, but do you need this data? (Senior generation, family member, Case D)*

This kind of attitude from the senior generation influences the next generation. In some cases, the next generation took the senior generation’s ideas at face value. For example,

*My father always says—and I really agree with him—that there is nothing left to create in the world in terms of mechanical parts. You just need to use the same ideas from a different context.* (Junior generation, family member, Case H)

In other cases, the next generation did not take the ideas at face value and had different ideas about digitalization, but they lacked power to do anything about it. As one interviewee lamented,

*We have different opinions on the technology and the technologies we should invest in. For me, I see a lot of time wasted here by inputting the same data multiple times.* (Junior generation, family member, Case D)

This further contrasts with the *willingness-enabled disposition*, where the next generation is listened to, encouraged to learn about new technology, provided with the space to discuss such opportunities, and given legitimacy to influence business decisions. Conversely, the *willingness-suppressing disposition* is owner-centered, and the next generation's ideas about digitalization are not listened to. As a result, digitalization is not attained through family-specific behavior, with at most sub-optimal applications of I4.0. This is somewhat unsustainable given that family firms are known for utilizing their family-specific behaviors to remain competitive, and this is especially relevant for digital transformation.

#### 4.3 Proposition development and reflections upon the ability-willingness paradox

Our analysis of the evidence thus far has explored the willingness of the family firm identifying two contrasting dispositions and different levels of digital transformation. Here we aggregate these findings into two propositions to show how the phenomena relate to each other (Strauss & Corbin, 1990; Yin, 2018). In addition, we reflect on why it was not possible (at least directly) to conclusively establish relationships between family firm ability and willingness. Specifically, we reflect on why the willingness—disposition to act—did not always translate to the ability—discretion to act—in the context of the digital transformation.

This first disposition formed of several mechanisms across three themes: sharing power in the business, effectively creating digitalization opportunities and actively learning about the new digital technologies. These mechanisms in combination made it easier for the firms to take action towards the digital transformation. Based on this, we propose:

***P1a*** *Family firms with a willingness-enabling disposition exhibit a higher willingness towards the digital transformation*

The family firm's willingness is closely connected to the ability of the family firm. However, our

evidence did not conclusively show that this disposition to act resolved the ability-willingness paradox. The paradox usually emerges from the presence of ability but the lack of willingness (Chrisman et al., 2015). However, in some cases we found the opposite—a willingness but a lack of ability to digitally transform. We analyzed the ability—involvement in the firm through ownership, governance, and management (see Appendix 1 Table 2)—and found that the mechanisms (sharing power, using proper governance mechanism, etc.) helped develop the family firm ability. Although a willingness-enabling disposition led to a willingness, the family's ability was still constrained by other factors such as human resources (finding talented employees), financial resources (to invest) and the opportunities to use the technology for commercial purposes (due to the maturity of the technologies). Therefore, the family firm's ability to be effective must not be compromised by other factors, which is testament to the complexity of the digital transformation. Therefore, although there is a link between the ability and willingness, the presence of both does not automatically result in a higher level of digital transformation. Therefore, we propose:

***P1b*** *A family firm with a willingness and ability are sometimes unable to fully embrace the digital transformation due to human resources, financial resources, or available opportunities*

In contrast to the willingness-enabling disposition, we also identified the willingness-suppressing disposition and related mechanisms. The related mechanisms were present across three themes: controlling the firm, resisting the status quo and dismissing potential opportunities. Based on the evidence, these together form a willingness-suppressing disposition leading to a lower willingness towards digital transformation and therefore we propose:

***P2a*** *Family firms with a willingness-suppressing disposition exhibit a lower willingness towards digital transformation*

Moreover, the willingness-suppressing disposition was often coupled with the family firm ability, which was largely held by senior generation family members, and often a single family member. On reflection, one plausible explanation is that the digital transformation disrupts the status quo, and indeed, requires a level of change from most members of the

organization, especially those most embedded i.e., senior family members and senior employees. Being a relatively new phenomenon, the digital transformation most likely disrupts traditions and established ways of doing things, and family members with the most power are those most likely to be the most disrupted. Therefore, the family firms with the willingness-suppressing disposition are more likely to use their ability to either avoid the digital transformation as much as possible or change at their pace, most likely through an ad hoc basis. This is before considering other factors such as human resources (finding talented employees), financial resources (to invest) and the opportunities available (due to the maturity of the technologies). Therefore, we propose:

**P2b** *A family firm with a willingness-suppressing disposition are more likely to use their ability to avoid the digital transformation or pursue it in a sub-optimal way*

We have refined the Chrisman et al. (2016) model to illustrate our propositions in response to the wider ability-willingness innovation framework (see Fig. 3). It now includes the crux of our findings—the heterogeneity of willingness and the dispositions that lead to such forms of willingness towards the digital transformation. It also shows our reflection on the family firm’s ability in propositions 1b and 2b. Indeed, we were unable to conclude both that a willingness-enabling disposition resolves the ability-willingness paradox in family firm and that a willingness-suppressing disposition intensifies the ability-willingness paradox in family firms. Instead, we conclude that the ability-willingness interaction in the digital transformation is more complex due to other factors we identified throughout the analysis. The full extent of this interplay is a much-needed promising endeavor for future research.

## 5 Discussion

### 5.1 Contributions to the literature

Generally, the digital transformation literature has recently produced interesting insights and called for more research on exploring factors which could influence firm adoption (Hassan et al., 2024; Kesidou et al., 2025; Nafizah et al., 2024). We respond to these calls by highlighting the importance of the

family influence—the family firm willingness. The recent contributions to the digital transformation literature (Hassan et al., 2024; Kesidou et al., 2025; Nafizah et al., 2024) have not taken into consideration or controlled for the family influence, which is surprising given their samples are based on the German and British small and medium sized enterprises, most of which are family owned (Classen et al., 2014; IFB, 2024). Our research explored the family firm willingness in the context of the digital transformation, generating two strong contributions—to the family firm digital transformation and willingness literatures—and a marginal contribution—to the ability-willingness innovation literature.

First, specifically for the family firm digitalization literature our findings demonstrate the importance of considering family firm willingness towards digital transformation. Specifically, when a family’s disposition is *willingness-enabling*, it tends to create more favorable outcomes for digital transformation. We identified several factors that characterize a *willingness-enabling disposition*, complementing De Groote et al. (2023b) who identified how the family firm’s ability used family firm-specific resources for the digital transformation. Indeed, our willingness-enabling dispositions concur with Ano and Bent’s (2022) idea that open dialogue enhances family willingness to digitalize.

In addition, we identified certain factors can constrict feelings towards digital transformation, especially among the older generation. Thus, the *willingness-suppressing disposition* explains why family firms may not be willing to engage in the digital transformation (Soluk et al., 2021; Ceipak et al., 2021; Heider, et al., 2022; Nieto et al., 2023). Our findings support Heider et al.’s (2022) argument that willingness plays a critical role in digital transformation. Indeed, based on this categorization matrix in Fig. 2, firms with the *willingness-enabling* disposition were generally more responsive to ideas related to digital transformation, as shown in their digital transformation strategies. Therefore, we redirect the current discussion to consider ways of utilizing family willingness, as called for by Ceipek et al. (2021). We offer an alternative explanation to Bornhausen and Wulf (2024), who believe reducing the family’s ability by empowering non-family managers is the solution. Instead, the heterogeneity of the family’s willingness deriving from different dispositions is likely to lead to a (sub) optimal digital transformation strategy.

Second, we answer calls to explicate the factors that lead to family firm willingness (Chrisman et al., 2015; Holt & Daspit, 2015). The family firm willingness literature discusses some ideas of unwillingness, for example Alrubaishi et al. (2021) found the idea of a lack of willingness to potentially block innovation. Scholars have linked unwillingness to internal factors such as risk-taking propensity, tradition attachment, (de Groote et al., 2023b; Guffler et al., 2023; Rondi et al., 2019) and linked willingness to family goal diversity, values, and family cohesion. We extend this stream by unpacking willingness through two types of dispositions—*willingness-enabling* or *willingness-suppressing*. Theoretically, we add nuance to the meaning of disposition to act and in turn family firm willingness.

Finally, from a higher level of abstraction we reflect upon the ability-willingness paradox (Alrubaishi et al., 2021; Chrisman et al., 2015; Holt & Daspit, 2015), our study sheds some light on the paradox in the context of the digital transformation. We concur with the idea that family ability and willingness do not always change simultaneously (Dong et al., 2025) and attention should be paid to the configuration of willingness and ability (Lambrechts et al., 2023). In our analysis, we initially expected to see a higher level of ability due to the willingness-enabling disposition, we actually found it was not always the case due to either the lack of resources at their disposal or the lack of opportunities available. Which gives way to a configuration of a high-level of willingness but a low-level of ability. In our willingness-suppressing disposition most cases seemed to use their ability to either avoid the digital transformation as much as possible or pursued the digital transformation at their own pace and usually on an ad-hoc basis. Thus, although our evidence does not solve the ability-willingness paradox, it highlights the paradox's complexity in the digital transformation and sets the stage for future research to unpack this complexity.

## 5.2 Contributions to practice and policy

Our study holds important contributions for practice and policy. First, we specifically help family firm practitioners by explaining how different dispositions may act as a barrier to or driver of digital transformation. When willingness is suppressed, then to mitigate this barrier the empowerment of non-family managers is recommended as also recommended by Bornhausen and Wulf (2024).

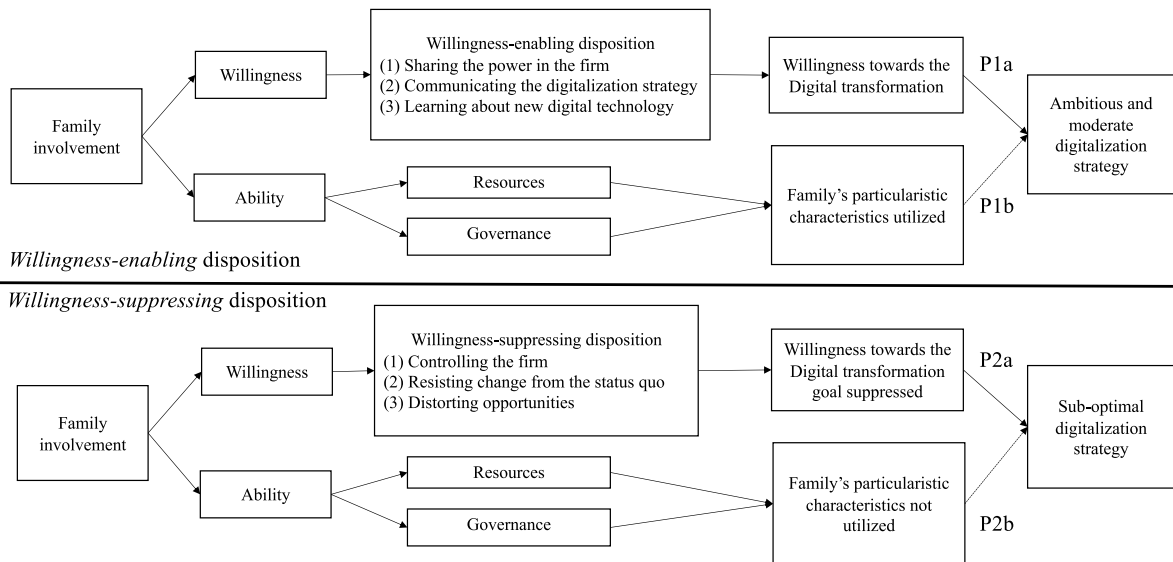
Alternatively, if the family is adamant of remaining in complete control and being involved in management, then proactively implementing a willingness-enabling disposition is warranted. This can be achieved by practitioner interventions which deliberately seek to create a willingness-enabling disposition to help provide conditions for family-specific behaviors (Chrisman et al., 2015), aiming to produce better adaptations to digital transformation.

Furthermore, our study indicates that family firm disposition may influence the firm's innovation approach to digitalization. In our study, cases that exhibited a willingness-enabling disposition implemented more ambitious digital transformation activities. Therefore, policymakers should encourage more ambitious innovation strategies for digital transformation because a) many family firms are currently not engaging in digital transformation (Xie et al., 2023), and b) more ambitious strategies would significantly improve performance (Verhoef et al., 2021) and in turn make a greater contribution to the economy.

## 5.3 Limitations and future research

Our research is not without its limitations; these can serve as a springboard for future research. First, limitation is due to the design of the research. Our sample consists of 14 family firms, and we therefore offer analytical generalizability only. Future studies can overcome this limitation by administering a survey assessing firm disposition and matching this with information on family firms' ability (discretion through ownership, management, and governance) to identify potential patterns between disposition, discretion, and digital transformation. Collecting data on a large sample can ensure statistical population generalization. Similar studies based in other contexts should also be conducted to enrich the findings from this study as Italian culture may feature certain cultural dimensions that are prone to creating a willingness-suppressing disposition.

Second, we have discussed how, our two dispositions are likely to be found in any family firms thinking of engaging in the digital transformation. However, our sample was from the manufacturing industry, which is more closely linked with the digital transformation than other industries (Matt et al., 2023). Therefore, the presence of the two dispositions towards the digital transformation should be studied in other industries. In addition, it is not unreasonable to think that the two



**Fig. 3** Adaptation of model proposed by Chrisman et al. (2016) to explain how dispositions shape the willingness and consequently firm's digitalization strategy. Key: *P* Proposition

dispositions may also influence the family firm's willingness towards other activities. Furthermore, within the family firms this is likely to be heterogeneous depending on the family's characteristics, attitudes, preferences towards different activities i.e., internationalization, succession, innovation. Indeed, some families may suppress succession but not internationalization or vice versa. Therefore, we invite scholars to explore dispositions and willingness towards other business activities and to use the two dispositions identified in this study as a starting block. Finally, as we elaborated in proposition 1b and 2b the family firm's ability in the digital transformation is complex and should be the subject of a more thorough explorative study.

## 6 Conclusion

Digitalization is one of the most current and promising topics in family business research (Siaba & Rivera, 2024). Although the family firm willingness is a wide-ranging topic, it was yet to be comprehensively explored in the digital transformation context. This relatively new context, the digital transformation, provided an opportunity to deepen our understanding of the willingness construct. Through our comparative multiple case study

involving 14 family firms in the manufacturing industry, we identified family-specific factors that influence digitalization strategy. Specifically, our study elucidated two dispositions: *willingness-enabling* and *willingness-suppressing*. In relation to digital transformation, we found that cases with a *willingness-suppressing* disposition were impeded from reaching their potential through digital transformation. Outlining the importance of the family variable. In addition, our analysis revealed that the relationship between the ability and willingness was not so simple in the context of the digital transformation due to other factors such as human resources and financial resources. Thus, we help practitioners understand the connections between family willingness and firm innovation. This can aid practitioners in improving their efforts to digitalize.

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**Data availability** Any additional data available upon request.

**Declarations**

## Appendix

**Appendix Table 1** The family's ability in the firm via discretion in ownership, governance, management of the firm

Case	Willingness Disposition	Ability via Discretion in ownership	Discretion in governance	Discretion in management
A	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>The family firm follows family ownership configurations through the successions and has experienced 14 ownership successions</li> </ul>	<ul style="list-style-type: none"> <li>Involvement of next generation</li> <li>Stewardship approach i.e. the current generation guard the firm for the next generation</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in symbolic management, rather than day-to-day</li> </ul>
B	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Shared ownership among siblings</li> <li>All owners, also are involved in management, have strong relations with customers and buyers</li> <li>No ownership succession plan</li> </ul>	<ul style="list-style-type: none"> <li>The family has informal governance practices</li> <li>Next generation involved in the business without a development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in the day-to-day operations</li> </ul>
C	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>Shared among family members</li> <li>Some owners are also involved in the management of the firm</li> <li>Ownership succession plan with specific blood-rules</li> </ul>	<ul style="list-style-type: none"> <li>Next generation involved in the business without a development plan</li> <li>Family governance through strategy making</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in the day-to-day operations</li> </ul>
D	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership is concentrated in the hands of a senior family member</li> <li>Informal ownership succession plan</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in the governance</li> <li>Next generation involved without a development plan</li> <li>Informal family governance mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in the day-to-day operations</li> </ul>
E	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership in the hands of one family member</li> <li>No ownership succession plan in place</li> </ul>	<ul style="list-style-type: none"> <li>Informal family governance mechanisms</li> <li>Some formal governance mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>The junior generation has a symbolic role in the business</li> <li>The company uses non-family managers to operate the company</li> <li>Family members are involved in the day-to-day running of the business</li> </ul>
F	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership is in the hands of a single family member</li> <li>No ownership succession plan</li> </ul>	<ul style="list-style-type: none"> <li>Some formal governance mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in the day-to-day running of the business</li> </ul>
G	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>Ownership is within the junior generation, recent ownership succession</li> </ul>	<ul style="list-style-type: none"> <li>Formal family firm governance mechanisms (young ownership transfer, board meetings, family trusts and back up plans set up, senior generation advisor)</li> <li>Informal family firm governance mechanisms</li> <li>Next generation involved without a formal development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in symbolic management, rather than day-to-day</li> </ul>
H	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership is in the hands of a single family member</li> <li>No ownership succession plan</li> </ul>	<ul style="list-style-type: none"> <li>Next generation involved without a formal development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in day-to-day operations</li> </ul>

Appendix Table 1 (continued)

Case	Willingness Disposition	Ability via	Discretion in ownership	Discretion in governance	Discretion in management
I	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership within a single family member, and some non-family members</li> <li>No ownership succession plan</li> </ul>	<ul style="list-style-type: none"> <li>Ownership within a single family member, recent succession</li> </ul>	<ul style="list-style-type: none"> <li>Formal governance practices (a family council and family meetings)</li> <li>Next generation involved with a development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in the day-to-day operations</li> </ul>
J	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>Ownership in the next generation, recent succession</li> </ul>	<ul style="list-style-type: none"> <li>Ownership within a single family member</li> </ul>	<ul style="list-style-type: none"> <li>Formal family firm governance mechanisms (family constitution)</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in the day-to-day operations</li> </ul>
K	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership within a single family member</li> </ul>	<ul style="list-style-type: none"> <li>Ownership within a single family member</li> </ul>	<ul style="list-style-type: none"> <li>Informal family firm governance mechanisms</li> <li>Next generation followed a development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family involved in the day-to-day management of the firm</li> </ul>
L	Willingness-suppressing disposition	<ul style="list-style-type: none"> <li>Ownership within a single family member</li> </ul>	<ul style="list-style-type: none"> <li>Ownership within a single family member</li> </ul>	<ul style="list-style-type: none"> <li>No specific governance mechanisms specified</li> <li>Next generation involved in the firm with some development plan</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in the day-to-day operations</li> </ul>
M	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>Ownership shared among family members</li> <li>Recent succession</li> </ul>	<ul style="list-style-type: none"> <li>Ownership shared among family members</li> </ul>	<ul style="list-style-type: none"> <li>Formal family firm governance mechanisms (a family constitution, entry-rules)</li> <li>Family involved in board</li> </ul>	<ul style="list-style-type: none"> <li>Family members involved in the day-to-day operations</li> </ul>
N	Willingness-enabling disposition	<ul style="list-style-type: none"> <li>Ownership shares are shared by family members</li> </ul>	<ul style="list-style-type: none"> <li>Ownership shares are shared by family members</li> </ul>	<ul style="list-style-type: none"> <li>Formal family firm governance (family advisor, family constitution, family council)</li> <li>Next generation has specific rules for entry</li> </ul>	<ul style="list-style-type: none"> <li>The family hold a symbolic management approach rather than being involved in the day-to-day</li> </ul>

**Appendix Table 2** The case analysis of the strategy for the digital transformation

Case	Strategy for the Digital transformation	Velocity	Complexity	Systemic change
A	Large scale digital transformation with the specific objective of I4.0 requiring a high financial commitment	<ul style="list-style-type: none"> <li>High velocity, fuelled by heavy investments, resolutely ahead of the market and competitors</li> </ul>	<ul style="list-style-type: none"> <li>23 identified I4.0 related technologies all functioning and fully implementations</li> </ul>	<ul style="list-style-type: none"> <li>Creating collaborations in the local supply chain and with trusted partners</li> </ul>
B	Large scale digital transformation with the specific objective of I4.0 requiring a high financial commitment	<ul style="list-style-type: none"> <li>High velocity relative to the industry as they are the first company to install an I4.0 factory in the firm</li> </ul>	<ul style="list-style-type: none"> <li>Multiple technologies invested in, of which some are functioning and the firm is experiencing implementation problems</li> </ul>	<ul style="list-style-type: none"> <li>Digital transformation internally focused</li> </ul>
C	Large scale digital transformation, aiming to become fully digitalized but unable to make high financial commitments	<ul style="list-style-type: none"> <li>The potential to become I4.0 is there but the pace of adaptation is relatively slow due to the cost of adopting I4.0 technologies</li> </ul>	<ul style="list-style-type: none"> <li>The business adopted 8 I4.0 technologies</li> </ul>	<ul style="list-style-type: none"> <li>Digital transformation internally focused</li> </ul>
D	Minimal, routine digitalization, not seeking to digitally transform the firm	<ul style="list-style-type: none"> <li>Low velocity because from the owner's perspective I4.0 is unneeded</li> <li>No financial commitment</li> </ul>	<ul style="list-style-type: none"> <li>The case avoided engaging in complex technologies</li> </ul>	<ul style="list-style-type: none"> <li>Not aiming to connect to any firms, even with basic technologies through RFID</li> </ul>
E	A basic digital transformation strategy—the case aimed to use devices and information to increase existing efficiencies	<ul style="list-style-type: none"> <li>Low – The technologies were last invested in more than a decade ago</li> </ul>	<ul style="list-style-type: none"> <li>The quality of the former technologies enabled Fair level of complexity, even of today's standard</li> <li>New data points implementations are planned</li> </ul>	<ul style="list-style-type: none"> <li>A level of systemic change is envisioned in their adaptation to the digital transformation but there is negative experience which has stopped the owner form pursuing this vision</li> </ul>
F	Large scale digital transformation. The firm specifically aims to implement I4.0 in all aspects of the business, the product, and begin opening to the supply chain	<ul style="list-style-type: none"> <li>High velocity as the company is simultaneously making multiple changes</li> <li>The company wants to increase connectivity in the next two to three years</li> <li>Forward planning—new ways to be informed about insight (business intelligence) into the sales and the commercial impact of distributors in the markets</li> </ul>	<ul style="list-style-type: none"> <li>High number of I4.0 technology</li> <li>I4.0 machines to bring eventually a digital twin into realization</li> </ul>	<ul style="list-style-type: none"> <li>High – I4.0 is installed in the products and there is continuous R&amp;D that ensures new features are updated such as sensors and AI that enable customers to achieve their digitalization strategy</li> <li>In addition, the firm plans to use I4.0 to manage managing stock and resources, and quality control, with supplier and buyers (eventually)</li> </ul>
G	Large scale digital transformation strategy, with the objective of I4.0, but then eventually I5.0	<ul style="list-style-type: none"> <li>High speed, financially intensive investment in technologies</li> </ul>	<ul style="list-style-type: none"> <li>The firm is engaging in a high level of complexity with various technologies (sensors, big data analysis, virtual reality, cyber reality, augmented reality) creating new functions and enhancing existing functions (HR, logistics)</li> </ul>	<ul style="list-style-type: none"> <li>High level of systematic change and the firm aspires to connect the supply chain</li> </ul>
H	Routine digital transformation strategy	<ul style="list-style-type: none"> <li>The implementation and investment are intentionally slow to not disrupt existing routines</li> </ul>	<ul style="list-style-type: none"> <li>Not complex, but there are ideas to become more complex in the future regarding production waste, performance of the machines, machine set-up times (reducing cost of changeovers)</li> </ul>	<ul style="list-style-type: none"> <li>Internally focused—the company is absolutely not even considering sharing data with other companies</li> </ul>

Appendix Table 2 (continued)

Case	Strategy for the Digital transformation	Velocity	Complexity	Systemic change
I	Large scale digital transformation strategy, with the objective of I4.0, and this strategy is broken down into smaller projects	<ul style="list-style-type: none"> <li>The velocity of the adaptation is somewhat slowed due to the low-profit margin of the industry and the expensive cost of energy</li> </ul>	<ul style="list-style-type: none"> <li>The complexity of the technology is high (digital twin), new machines enable new data to monitor and control specific processes in production to identify inefficiencies</li> </ul>	<ul style="list-style-type: none"> <li>The firm aims to engage in more systemic change and already engages some buyers and suppliers in compulsory information exchange for certain real-time business functions</li> </ul>
J	The firm has currently made a small adaptation to the digital transformation but aims to eventually create specific AI capabilities to reposition the firm	<ul style="list-style-type: none"> <li>The firm is slowly making adaptations to the digital transformation which is largely due to financial constraints and an inability to define the exact scope of the digitalization project</li> </ul>	<ul style="list-style-type: none"> <li>The firm has engaged in low complexity technologies such as CRM software</li> </ul>	<ul style="list-style-type: none"> <li>The firm aims to utilise customer data to make a systematic change but is struggling to define the scope/value of the project</li> </ul>
K	The firm has a moderate digital transformation strategy, the firm aims to eventually have data on all the machine operations in the company to get an overall view of the organization's performance	<ul style="list-style-type: none"> <li>The firm is currently narrowing the scope on how the activities it performs can be automated or optimised through digitalization</li> </ul>	<ul style="list-style-type: none"> <li>The firm currently uses software to calculate the cost of products, but it is not the most up-to-date and the interface is not very good and time is wasted inputting data</li> </ul>	<ul style="list-style-type: none"> <li>Internally focused—the company is not currently looking to engage in systemic change</li> </ul>
L	The firm has made a small adaptation to the digital transformation but envisions a larger adaptation in the future	<ul style="list-style-type: none"> <li>The firm has a slow velocity to its adaptation since the proof of concept and financial commitment is low in the firm</li> </ul>	<ul style="list-style-type: none"> <li>The firm has installed smart machines to eliminate manual labour from the process, big data analysis is planned to reduce, but interoperability blocks this</li> <li>Plans to use virtual and augmented reality</li> </ul>	<ul style="list-style-type: none"> <li>The firm is open to systemic change and wants to connect with other businesses in the supply chain but lacks proof of concept</li> </ul>
M	This firm has good digital transformation strategy and has recently signed up to a sustainability in business association signalling potential I5.0 logics	<ul style="list-style-type: none"> <li>The firm's digital transformation strategy is being slowed down due to production expansion plan delays and limited financial investments (due to investment being used in other areas of the business)</li> </ul>	<ul style="list-style-type: none"> <li>The firm has an automated production line, but it is not analysed using big data, and installing sensors in storage areas for SMART monitoring but lacks an overall picture</li> </ul>	<ul style="list-style-type: none"> <li>The firm is looking to engage with other members of the supply chain with new technologies such as blockchain but is yet to find buyers or suppliers willing to co-operate in a value adding way</li> </ul>
N	The firm has invested in a large adaptation to the digital transformation. The firm want to create a singular view of the business group by disaggregating each business, function, country of operation and installing software that has interoperability. This started with the accounting department installing the S&P software	<ul style="list-style-type: none"> <li>The firm exhibits an adaptation with high velocity, it is occurring over a 5-year period with a high financial commitment</li> </ul>	<ul style="list-style-type: none"> <li>The firm seeks to consolidate fragmentation and interoperability among the businesses within the group to address the void of information exists between the firms creating in-efficiency and the aim of the digital transformation strategy is to make the firm have a whole perspective of the group</li> </ul>	<ul style="list-style-type: none"> <li>The firm wants to engage more with customers to collect business intelligence and predict demand</li> </ul>

**Competing interests** None.

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