

# Aligning strategy and digitalisation activity as an incremental or radical innovation in family farms

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## Abstract

**Purpose** – Digitalisation is perceived as a new process that may add value to firms. Current theoretical understanding assumes it should be part of a firm's strategy to respond to multiple pressures in the business environment. This paper explores the occurrence of digitalisation in a rare context, that of the English agricultural industry in the United Kingdom, a place disproportionality filled with family farms. The general understanding of digitalisation in family firm settings remains embryonic. The authors' explorations make theoretical contributions to research at the intersection of rural entrepreneurship, family business and innovation.

**Design/methodology/approach** – Utilising a purposive, qualitative approach, primary data was collected from multiple interviews with 28 UK family farms, and secondary data from another 164. Interview transcripts were coded using NVivo, along with secondary data from reports, observations and websites.

**Findings** – The authors present empirical evidence illustrating how digitalisation manifests incrementally and radically in different types of family farms. The authors present a model that shows the areas of farming that have, and continue to be, digitalised. This increases analytical precision when identifying digitalisation activities that differ depending on the strategy to either scale or diversify. The authors propose that incremental digitalising occurs to a great extent during a scaling strategy, and that radical digitalising occurs to a smaller extent during diversification strategies in family farms.

**Research limitations/implications** – This research uses a sample of family-run farms from the UK agricultural sector to explore nuanced elements of digitalisation. It should therefore be explored in other types of family firms located in different sectors and geographies.

**Practical implications** – This research is important because family farms are under increasing pressure and have limited financial resources to deal with the digitalisation agenda. Therefore, empirical evidence helps other farms in similar situations. The authors found digitalisation investments, that tend to be capital intensive, only matter for scalers and less so for diversifiers. Family farms can use the model presented as a tool to evaluate their farm. The tool helps them define what to do, and ideate the potential activities that might be digitalised, to feed into their wider strategy.

**Social implications** – Family firms, in particular farms, are critical to many economies. The general consensus currently assumes all family firms should digitalise, yet the authors' evidence suggests that this is not the case. It is important to create policies that are sensitive to the needs of different types of businesses, in this case between family firm scalers and diversifiers, instead of simply incentivising digitalisation using a blanket approach usually by offering financial aid. Understanding how digitisation can support (or not) family firm resilience and growth in an effective and efficient manner can have significant benefit to individual firms, and across industries.

**Originality/value** – The proposed model extends theoretical understanding linking strategy, digitalisation activity and innovation in family farms. It shows that digitalisation is a key building block of scaling strategies, maximising digitalisation to increase efficiency. Yet, diversifying family farms minimise digitalisation, whereby they only digitalise a small amount of the farming activity. This empirical evidence contrasts with the



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wider narrative that farmers are slower at using new technology. This research found that some are slower because it does not align with their strategy. However, sometimes digitalisation aligns with their strategy during external changes, in which case the diversifiers are quick to act.

**Keywords** Family business, Rural, Technology, Innovation, Qualitative techniques

**Paper type** Research paper

## Introduction

This paper responds to recent calls to deepen our understanding of how family firms foster innovation (Szewczyk *et al.*, 2022) and in particular the uniqueness of digitalisation within innovation in these contexts (Appleton *et al.*, 2022). A recent survey revealed that most family firms are not currently, or preparing to, engage with digital transformation (Xie *et al.*, 2022). Yet digitalisation is often seen as a solution to many problems facing firms. In family firm research, digitalisation is receiving more attention (Correani *et al.*, 2020) but clarity on how digitalisation relates to innovation is limited. Understanding why family firms do not engage in the digital transformation is thus vital.

To focus this research, we set it within family firms based in the agricultural sector in the United Kingdom (UK). Family farms are fundamental to the food supply chain and can help deliver on government policy objectives (Sargani *et al.*, 2020). Yet, they face increasing pressure and uncertainty (Department for Environment Food and Rural Affairs, 2019). This is perpetuated by their “land rich-cash poor” reputation, where research has shown up to 90% of their income may come from subsidies (Abboud, 2018) and that many make a loss (Department for Environment Food and Rural Affairs, 2019). In addition, they sell commodities making it difficult to differentiate their products and globalisation further increases threats to them from food imports. But, given the increasing costs and geo-political tensions influencing transport and infrastructure, opportunities may arise for UK farmers. This supports the rationale to understand how they can digitalise (or whether they need too). The agricultural context facilitates family firm research due to their high proportion, with some estimates suggesting this is 96% of the sector (IFB, 2019).

Farming is traditionally a physical industry where inherited land is transferred throughout generations. Hence, the continuity implies an ability to integrate new technologies into their craft. Recent world events have accelerated the adoption of digital technologies due to the COVID-19 pandemic. This has motivated studies on how family firms innovate in times of crisis (Breier *et al.*, 2021) and specifically COVID-19 (De Massis and Rondi, 2020; Kraus *et al.*, 2020). Yet such studies have seldom focused purely on digitalisation activity. Thus, our overarching research question is “How do family farms approach digitalisation activity?” Answering this question in the family firm context generates three contributions.

Firstly, this research contributes to the literature on digitalisation (Verhoef *et al.*, 2021) by identifying links between family farm type according to their preferred strategy, innovation and digitalisation. Recent studies have called for studies to detail the context of digitalisation and whether it is a discontinuous technology innovation (Szewczyk *et al.*, 2022) or a radical innovation (Hu and Hughes, 2020). Our study found digitalisation activity to emerge incrementally and radically. It identifies several processes that were incrementally digitalised in scaling farms (farming activity). Whereas radical innovations occurred during the COVID-19 pandemic in diversified farms that targeted different processes (marketing activity). For diversifiers, this deliberate avoidance of digitalising farming activity helps understand that digitalisation is not a solution for all firms. This contrasts with narratives in existing literature which has previously overlooked our finding that proposes digitalisation requires an alignment with the overarching strategy.

Secondly, this study synthesises and contributes to both the rural entrepreneurship and family firm heterogeneity research (Daspit *et al.*, 2021). By focusing on a phenomenon at the

intersection of these two literatures, through the family farm, we tease out nuances that allow us to identify variances in their approach to digitalisation. This extends the family farm literature, which identifies different kinds of organisational strategies (Glover and Reay, 2013; McElwee, 2006), which categorise farms according to their characteristics. We update this by refining the McElwee and Smith (2012) typology to incorporate digitalisation. This incorporates the type of digitalisation for diversifiers (various technologies to increase marketing functions: website, online ordering, online booking and blogging) and for scalers (various technologies related to inputs, monitoring, controlling and management information systems).

Thirdly, we assert that family farms that scale to grow prefer incremental digitalisation in their farming activity, aligning with their financing options. Whereas family farms who diversify tend to approach digitalisation rapidly, by mainly digitalising their marketing activities, requiring less financial input, but not many aspects of their farming activities. This makes sense given they have limited financial resources to do so in comparison to larger farms who supply larger supply chains. This identifies the need to align digitalising activities with strategies and how this is an underlying mechanism for innovations (Yin *et al.*, 2022). We extend our understanding of family firm heterogeneity (Daspit *et al.*, 2021) enriching previous literature that has identified family farms entrepreneurial legacies (Jaskiewicz *et al.*, 2015) and resilience (Conz *et al.*, 2020).

We used an exploratory qualitative research approach with multigenerational family farms who have a lifetime of experience. Primary data was collected on 28 family farms, and this was validated by secondary data on 164 family farms. The interviews were analysed using NVivo coding and the model that emerged from the data, is presented in the findings. Data was enhanced through visiting farms, industry events, as well as their online sites.

The remainder of the article is structured as follows. The second section reviews the literature on family firm innovation and digitalisation. The third section details the exploratory qualitative methodology. The fourth section presents the findings. The final section includes the discussion practical implications, limitations and concludes the article.

## Literature review

The phenomenon of the family firm occurs at the intersection of two fundamental sociological systems: the family and the business (Holt *et al.*, 2018). One of many definitions of a family firm is:

... a business governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or a small number of families in a manner that is potentially sustainable across generations of the family or families (Chua *et al.*, 1999, p. 23).

Generally, the presence of the family in the firm leads to the pursuit of non-economic goals (Chrisman *et al.*, 2012), and can generate different learning and skill needs in different contexts (Appleton *et al.*, 2022).

One context is the rural family farm, a phenomenon at the intersection of the family firm and rural entrepreneurship research. These literature have three overlapping characteristics with family firm research (Fitz-Koch and Nordqvist, 2017). Firstly, rural communities are often considered to be closed, aligning with the regional ties of family firms (Basco, 2015). Secondly, a long-shared history and vision of rural farms (Perkins *et al.*, 2017) also occurs in family firms (Pearson *et al.*, 2008). Thirdly, both rural and family enterprises are arguably more motivated to support their local communities (Baù *et al.*, 2018). Despite rural firms being often deemed as less competitive (Welter, 2011), the family farm has been found to possess resilient capabilities (Conz *et al.*, 2020).

A core characteristic of family firms is they often aim to preserve their socio-emotional wealth (SEW) (Gómez-Mejía *et al.*, 2007). SEW is the emotional endowment that builds over time as the family becomes more invested in the firm, generating unique learning and knowledge management systems (Hernández-Perlines *et al.*, 2021). SEW influences their behaviours to remain competitive and retain ownership, and can inhibit some firm capabilities, such as innovation (Cassia *et al.*, 2012). In a farming context, SEW may explain why some family farms are able to move beyond their traditional activities whilst others are not. Furthermore, the level of SEW maybe influenced by the life cycle of the farmer, with research showing that older farmers without children (to succeed the farm) are less likely to innovate (Barnes *et al.*, 2019). Whereas a younger couple with young children may seek to innovate for their future prosperity (Barnes *et al.*, 2019). Family firm innovation literature shares this insight by proposing newly entering family members have less SEW and therefore more likely to identify and pursue opportunities (Kotlar *et al.*, 2020). Consequently, the varying levels of SEW engenders different degrees of heterogeneity (Feranita *et al.*, 2017) of both the family and the firm (Jaskiewicz and Dyer, 2017; Daspit *et al.*, 2021), which can be applied in the farming context.

Innovation requires “development and implementation of new ideas by people who over time engage in transactions with others within an institutional order” (Teece, 1986, p. 590). Innovation is considered fundamental for firm survival (Caves, 1998), with differentiation seen in both the farming and family context. Family firm research argues that family firms may be more innovative due to their quick decision making, long-term orientation (Herrero, 2011; Zellweger *et al.*, 2011), and resource exchange between the family and organisation (Uhlaner *et al.*, 2015). In contrast, research also argues that they are less innovative, due to their resistance to change and preference for the familiar (Chen and Hsu, 2009), low levels of professionalisation, a lack of objectivity (Cassia *et al.*, 2012) and risk aversion (Gómez-Mejía *et al.*, 2007). A caveat to these arguments is that not all innovations involve risk, such as incremental innovations. Thus, to avoid risk and protect their SEW endowment, family firms generally prefer to incrementally innovate (De Massis *et al.*, 2015), although radical innovation is sometimes pursued (Hu and Hughes, 2020), as well as discontinuous innovation (Szewczyk *et al.*, 2022). Consequently, family firm research focuses on family firms innovating incrementally (based on exploitation, new to firm) (De Massis *et al.*, 2015), although recently arguments for radical innovation (based on exploration, new to market) have emerged (Hu and Hughes, 2020). For example, radical innovation activities may enable the family firm to survive dramatic external environmental changes (Hu and Hughes, 2020), and so in particular circumstances they pursue radical innovation.

Family firm innovation research has predominantly focused on antecedents and outcomes. Such as the drivers of innovation, family firms may choose (or not) to develop new products because of competitors’ behaviours (Mazzelli *et al.*, 2020) and other external changes (Allison *et al.*, 2013). However, less attention is paid to family firm innovation activity (De Massis *et al.*, 2022). This is a problem because specific types of innovation activities bring greater benefits (the higher the risk, the higher the reward) (Ghezzi and Cavallo, 2020; Pellizzoni, 2019). Research measures innovation activities as a basis to compare family from non-family firms (Yin *et al.*, 2022). More recently, the literature on family firm digitalisation explores why a family firm may be more (or less) inclined to digitalise. Aligning with farming research, that emphasises consideration of the farm and family composition (De Rosa and Bartoli, 2016).

Literature often describes digitalisation as “a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for a firm” (Verhoef *et al.*, 2021, p. 889). Primarily, it poses many opportunities and threats (Bag *et al.*, 2021) and the value a firm depends on certain factors. Context is one of the

most important factors because digitalisation diffuses differently across different industries/sectors/countries (Bouncken *et al.*, 2018).

In the context of family farming, digitalisation is associated with precision agriculture technologies (PATs) (Barnes *et al.*, 2019). PATs “bring around a change in land use by fostering whole-farm management strategies using information technology highlighting potential improvements on production while reducing environmental impacts” (Vecchio *et al.*, 2020, p. 11). PATs are either embodied knowledge technologies that do not require human skill or information intensive technologies requiring human skill (Barnes *et al.*, 2019). Information intensive technologies apply “machine learning and big data analytics to optimise technical decision making aligned with agricultural knowledge” (Fielke *et al.*, 2020, p. 8). The farms that benefit the most are those with enough technologies to be information heavy and able to optimise their yields. Another potential digitalisation on farms is “increasing technologically mediated (on-line) social interaction (farmer-to-customer etc.)” (Fielke *et al.*, p. 8). This may be more appealing to organic and sustainable practices to facilitate increasing transparency, connectivity and governance (Fielke *et al.*, 2020). Nevertheless, within this context the importance of family (ownership, management, next generation) and business characteristics (size of farm, external environment) in relation to digital activities are yet to fully appreciate the role of strategy.

#### *Family ownership*

From a farming perspective, farmers are attached to their land and incentivised to take care of it (De Rosa and Bartoli, 2016). Since there is some risk with the cost/benefit of PATs due to their capital intensity, high entry costs and fixed transactions (Vecchio *et al.*, 2020), a farmer may not be willing to risk their land to invest in these technologies (De Rosa and Bartoli, 2016).

Family firm research asserts that such firms may be less inclined to invest in new technology and avoid risk (Gómez-Mejía *et al.*, 2007) in order to preserve their SEW (Miller *et al.*, 2015). This is especially true in radical innovations (Hu and Hughes, 2020). Such reluctance is associated with the closed nature and propensity to be inward looking, and consequently not seeking and/or utilising external knowledge of some firms (Cassia *et al.*, 2012). Although this line of argument may not apply to publicly listed family firms (Szewczyk *et al.*, 2022).

Specifically, family ownership may negatively impact the introduction of big data (Arzubiaga *et al.*, 2021) and the internet of Things (Ceipek *et al.*, 2021). Ownership identity may negatively impact the probability of investing due to the additional cost associated with reputational risk of failure, and this is expounded by potential issues that may emerge from using digital technologies, i.e. security issues (Arzubiaga *et al.*, 2021). In contrast, ownership identity positively associates with e-commerce marketing that may utilise the perception as a human brand (Rashid and Ratten, 2020; Muñoz-Bullón *et al.*, 2020).

#### *Family management*

From a farming perspective, farmers must have an awareness and capabilities to ensure their farms are a viable economic entity (McElwee and Smith, 2012). Farmers have had a history of being entrepreneurial (McElwee and Smith, 2012), but in relation to digitalisation, they are assumed to lack digital skills (Rolandi *et al.*, 2021). Farm managers may perceive PATs as complex and exhibit organisational inertia, rooted in familiar routines, reducing adoption speed (Vecchio *et al.*, 2020). Research shows that family farm managers are more likely to adopt PATs if they have knowledge on the technology’s ease of use (Vecchio *et al.*, 2020).

Family firm research on the family management’s influence on digital innovation is mixed. Some studies claim family managers have a negative impact (Liang *et al.*, 2013). Ceipek *et al.*

(2021) illustrate family managers constrain IoT (digitalisation), and this constraint increases the more family managers are involved (as SEW increases in parallel with family members). Higher levels of SEW have been found to alter the research and development (R&D) trajectory (Ceipek *et al.*, 2021). Moreover, Prügl and Spitzley (2020) found that family managers may refrain from external activities to avoid any reputational risk that threaten the firm's SEW (manifested in reputation) despite the potential to advance the firm.

#### *Family's next generation*

Farming research has shown that younger people are more likely to attain funds (such as grants) to trigger the farm's growth (De Rosa and Bartoli, 2016). Whilst, an older farmer correlates more with not adopting digital technologies (Barnes *et al.*, 2019). Furthermore, an older farmer with limited energy attempting to pursue new activities may instead lead to the farm suffering due to neglect of core activities (McElwee and Smith, 2012). In contrast, having some maturity may be helpful since the success of implementation of PATs depends on age, level of education and years of on- and off-farm experience (Vecchio *et al.*, 2020). This aligns with the family firm literature which asserts that the renewal of family bonds through dynastic succession increases the likelihood of innovation using new technologies. New technologies may be championed as a transgenerational investment that is required in the succession process (Arzubiaga *et al.*, 2021).

#### *Size of farm and employees (non-family)*

Farming research shows the larger the farm, the more likely they are to adopt enough technologies to receive a return on investment (Barnes *et al.*, 2019). Large farms have a capacity to absorb costs and risks associated with PATs investments (Vecchio *et al.*, 2020). Thus, the planning of technology adoption is complex and relies on an appropriate strategy (Barnes *et al.*, 2019). Small farms typically face more barriers due to information asymmetry, policy barriers and resource constraints (McElwee and Smith, 2012).

From a family firm perspective, Rashid and Ratten (2020) found family-owned firms enhance their survivability by exploiting "digital skills" from employees. Adding to this, Arzubiaga *et al.* (2021) proposes binding social ties may have a positive impact on digitalisation, with younger family members more likely to understand the technology involved when placed alongside their peers (non-family employees with digital skills). Taken together, young family and non-family employees (with digital skills) may create a growth digital mind-set, which allows the business to reach a larger number of customers (Rashid and Ratten, 2020). In contrast, attention has been paid to non-family members, who may be undermined and their contributions not valued (Hu and Hughes, 2020). In addition, there is the emotional attachment to employees that family firms exhibit (Arregle *et al.*, 2007), this attachment may increase the difficulty of removing obsolete employees. Thus, undermining and/or being too attached to employees may deter digitalisation.

#### *Business national external environment*

Farming research has found that adoption of digital technologies depends on the different countries and their digital agricultural priorities. For example priorities may vary between, domestic or international markets, technology or culture, people, or planet, open or closed, collaboration or competition (Fielke *et al.*, 2020). More specific related external factors that varies per country are the territorial aspects, such as tillage (De Rosa and Bartoli, 2016), upland/midland/lowland (McElwee and Smith, 2012). From a macro perspective, digitalisation is instrumental, and this is shown by the abundance of initiatives the European Union (EU) has launched to enhance digitalisation in rural areas. The most notable

example being the agricultural EU innovation partnership that seeks to increase the competitiveness of farming (EIP-AGRI, 2023). Ultimately, aiming to improve food health and safety, quality and supply. Achieving this requires farmers to accelerate their digital transformation. One means of achieving this is the introduction of innovation hubs to experiment and test artificial intelligence (AI) in agri-food (EIP-AGRI, 2023). A second means is to provide the youth with skills, training and experience to increase participation of digitalisation in rural areas (European Union, 2023). In addition, the EU calls for local and regional level actors to assess any variations between member states (European Union, 2023). Thus, introducing the ambiguity surrounding digitalisation in agriculture due to the insensitivity to the firm size/strategy/family level factors within these initiatives.

From the family firm perspective, geography has an influence, for instance, Pini (2019) found family firms located in southern Italy experienced more barriers to invest in digitalisation compared to family firms in northern Italy. In addition, family firms in the Middlesland digital transformation are resisting digitalisation because of the high reputational risk (protecting their SEW manifested in their reputation for being steadfast engineers). Prügl and Spitzley (2020) propose “enterprising families that strongly identify with the focal family firm tend to refrain from engaging in innovation hubs through entrepreneurial corporate venturing activities, particularly when the acquisitive or alliance forming partner is a new entrant (start-up)” (p. 153).

#### *Firm strategy*

Inside the farming context, little attention has been paid to strategy and digitalisation. In general, Glover and Reay (2013) proposed a typology of family farms as business diversifiers, debt maximisers, “sacrificers” and compromisers. Prior to this, the rural entrepreneurship literature recognises different strategic behaviours according to the different farms’ needs; a seminal contribution is work from McElwee (2006) identifying a farmer as an entrepreneur, rural entrepreneur, contractor or simple farmer. Both typologies identify whether a farm diversifies from traditional activity, invests in machinery and/or lacks the business skills to expand. Research shows 60% of holdings in the UK engage in diversification (McElwee and Smith, 2012) and it is widely known that farmers have moved away from their core business activities due to external pressures (McElwee, 2006). More recently, digitalisation is applied in farms to achieve “optimization of activities (e.g. milking and seeding), and resources (water, energy, land, fertilizer) to achieve economic or social benefits” (Rolandi *et al.*, 2021, p. 4). Research shows that digitisation is a matter of aligning the farming practices and the technology, and how easy it is to integrate into the routine of the farm (Vecchio *et al.*, 2020). However, the farming digitalisation literature does not acknowledge the previously mentioned typologies and more specifically how digitalisation may vary according to type.

From the family firm theory perspective, Correani *et al.* (2020) identify critical building blocks for a successful digitalisation arguing resources, capabilities, activities and stakeholders are all required. Stakeholders particularly contribute, for example Muñoz-Bullón *et al.* (2020) found that family firms benefit from external knowledge when combined with internal loci derived from the long-term history embedded in such firms (such as a long standing farm). Specifically for innovation labs, Schleeff *et al.* (2020) identified drivers (training employees, efficiency gains, to facilitate co-operation with other firms) and barriers (interference of top management, unwillingness of middle management) family firms face.

Overall, research on family firm digitalisation is yet to fully understand how it differentiates from family firm innovation (De Massis *et al.*, 2022) and under appreciates how important family firm heterogeneity is when discussing digitalisation activity. Thus, farming digitalisation research can enrich the family firm digitalisation literature and vice versa, by

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focusing on shared research caveats. We attempt to reduce these caveats by firstly, strengthening the link between family farm innovation and digitalisation. Secondly, considering a context in which innovation activity is most likely to relate digitalisation activity. Therefore, we ask the following research questions:

*RQ1.* What kind of innovation activity does digitalisation relate too?

*RQ2.* How does this link to the family farm's strategy?

### *The research context*

As previously discussed there are a high propensity of family firms in the agricultural sector in the UK (IFB, 2019), with most family firms apparently not engaging in digital activity (Yin *et al.*, 2022). Rural firms are often dichotomised with urban firms (Newbery and Bosworth, 2010) and are thought to underperform compared to urban areas (Department for Business, Energy and Industrial Strategy, 2017). Digitalisation in the research context chosen, is therefore both interesting and with potentially useful findings (Verhoef *et al.*, 2021).

Useful findings are needed to help adjust to the “common agricultural policy” (CAP) scheme which is altering farming (Gove, 2018). This is of significance since some farms get 90% of their income from subsidies (Department for Environment Food and Rural Affairs, 2019). These alterations mean that farms must now meet specific conditions to ensure the sustainable production of food (Gove, 2018) in response to pressures to become more sustainable (Benton, 2020). Thus, innovation is required and insight on family firm innovation and digitalisation may help resolve sustainability issues (De Massis *et al.*, 2022), pertinent to this context given the density of family firms in this area. However, firms in this area are often “cash poor” and make low margins, meaning they may not have the financial means to digitalise.

In addition, the national lockdown in the UK (Government, 2021) related to COVID-19 caused an economic contraction in 2020 (ONS, 2021), and as such findings can help contribute to the literature on family firm reactions to disruptive events (Żukowska *et al.*, 2021; De Massis and Rondi, 2020). Generally, the literature asserts digitalisation occurred due to COVID-19 (Skulmowski and Rey, 2020), thus offering insights for both rural and family firm literature (Stough *et al.*, 2015) in the context of our study.

### **Methodology**

To answer the research questions, an inductive explorative qualitative study was adopted with the purpose to generate new insights (Saunders *et al.*, 2012). We explored family firms and digitalisation in a particular context, rural family farms, with 41 interviews from family members within 28 family farms. We also explored 904 webpages from 164 family farms.

A purposeful sampling strategy is used when participants are intentionally selected because they provide useful insights into the phenomenon under study (Patton, 2002). The phenomenon of study in this case is innovation in family firms and digitalisation. The participants had to be multigeneration family firms from the agriculture industry, who were identified as family farms and showed evidence of engaging in digital activity.

The organisations were identified through the FAME and Endole databases. One advantage of using the databases was their inclusion of financial information, the names of the shareholders and the associated companies. This helped during data collection and data analysis by providing contact details, an estimated generation number, an estimated number of family members, and the relevant background. To ensure the participants were family firms in the agriculture industry and in at least their second generation the following metrics were applied: industry code, size and age. Organisation year of incorporation was important



and set to 1992. The reason being the average length of tenure for a business owner was 26 years (Leach and Bogod, 1999); therefore any firm in our results was likely to be at least a second generation family firm. Table 1 presents the main sample characteristics and Appendix 1, shows how digitalisation has been pursued across 164 farms.

The data collected for this research was primary data through interviewing and secondary data mainly from analysing websites, which helped elaborate insights from the interviews. Interviewing is the most popular data collection technique for inductive qualitative studies (Charmaz, 2014). The semi-structured interview was used as a data collection technique to add depth to the conversations to gather “descriptions of the life world of the interviewee in order to interpret the meaning of the described phenomena” (Brinkman and Kvale, 2015, p. 6). Importantly, interview participants were considered to be “authors of their own utterances” (Brinkman, 2018, p. 581), this is also known as intensive interviewing “as a one sided conversation which explores the research participant’s perspective of their experience” (Charmaz, 2014, p. 84). This offered several advantages, allowing exploration by facilitating unanticipated areas and implicit views (Charmaz, 2014), and positioning the power of the interview participant. In turn, the participants felt a sense of appreciation and value hence intensive interviewing allowed “research participants to be experts, reflect on earlier events, share significant experiences and teach the interviewer how to interpret them” (Charmaz, 2014, p. 69).

ID	Farming	Diversifications	Acreage owned	Acreage	Next gen on farm
A	Horticulture	None	>100	>100	Yes
B	Grain	Tourism	150	150	Yes
C	Grain, Fruit	Real estate	222*	7,042	Yes
D	Vegetables	Packing, marketing	580	1,134	Yes
E	Livestock (cows)	Processing, marketing	150	150	Yes
F	Fruit glasshouse	Packing (internal)	33	33	No
G	Grain	Engineering	>100	>100	Yes
H	Livestock (pigs and cows)	Product	2,100	4,250	Yes
I	Livestock (sheep)	Tourism	1,000	1,000	Yes
J	Fruit	Product	388	388	Yes
K	Grain	Real estate, media	5,438	5,438	Yes
L	Livestock (cows), Grain	Renting industrial units	1,680	1,680	Yes
M	Grain	None	>100	>100	No
N	Grain	None	60	90	No
O	Fruit	Packing, marketing, Tourism	1,000	1,000	Yes
P	Leaks	Packing (internal)	400	3,500	No
Q	Livestock (poultry)	Packing	50*	50*	Yes
R	Vegetables, Grain	Farm shop	470	470	Yes
S	Aquaculture	Fishing lakes	>10	>10	No
T	Horticulture	Garden centre	>10	>10	Yes
U	Livestock (poultry)	None	>10	>10	Yes
V	Livestock (pigs)	Pork processing	>10	>10	No
W	Livestock (cows), Vegetables	Farm shop	500	500	Yes
X	Vegetables, Grain	Renewable energy	3,212	3,212	Yes
Y	Vegetables, Grain	Product, stables	27	600	Yes
Z	Vegetables, Grain	Stone masons	1,400	1,400	Yes

**Table 1.**  
Farm information from sample

**Source(s):** Authors’ own creation

Aligning with [Brinkman \(2018\)](#), this approach valued participants who reciprocated and gave very detailed descriptions generating rich data and “solid material for building significant analysis. Rich data are detailed, focused, and full. They reveal participants’ views, feelings, intentions and actions, as well as the contexts and structures of their lives” ([Charmaz, 2014](#), p. 24). In addition, an interview was conducted with a senior manager at the National Farming Union and observations were made at the Yorkshire Agriculture Society annual conference.

This rich data attained through semi-structured intensive interviewing and observations allowed enough depth to generate new insights into our understanding of family firms and digitalisation. The participants were part of experienced family firms; they were multigenerational and could draw on many stories and insights which were unexpected to the researcher. The researcher had to be actively engaged in the interview and probe repeatedly. Additionally, multivocality ensured a range of perspectives were included rather than a homogeneous range of experiences. The interview questions were an essential part of the data collection, the rationale prior to data analysis, and the related theory after the data analysis.

The secondary data collected included the webpages of the family farms. Each of the 164 identified farms had a webpage with multiple pages that are outputs of engagement in digital activities. The webpages data collection led to 981 items for data analysis.

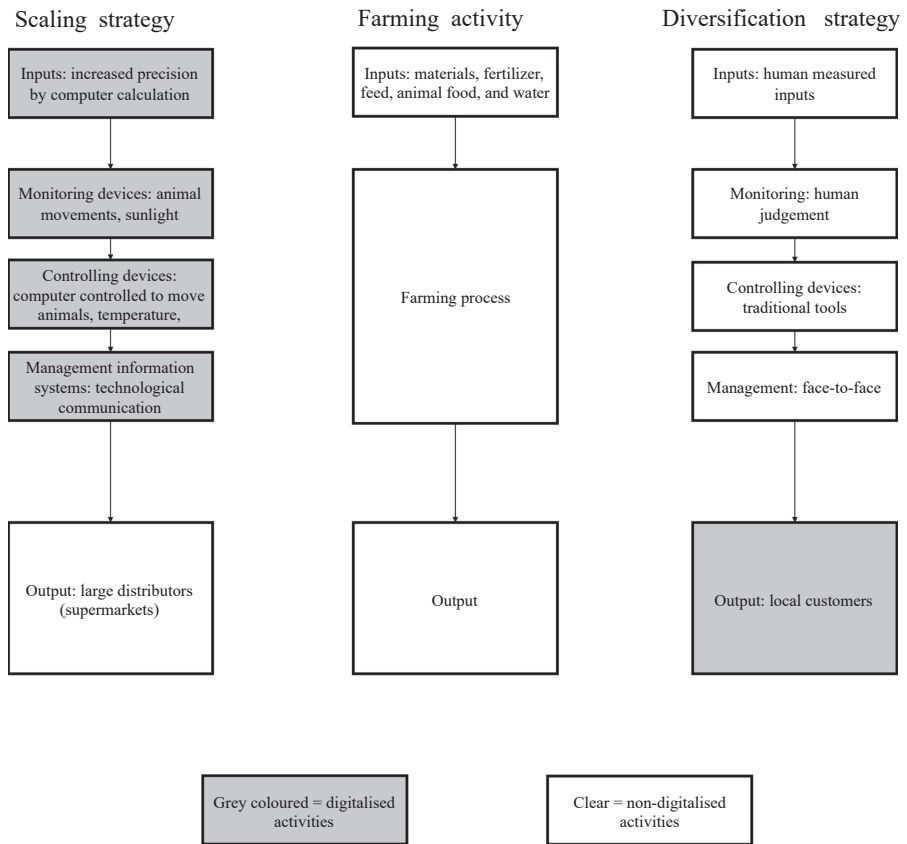
This data was analysed using coding ([Saldaña, 2016](#)). The method integrated methods from [Gioia et al. \(2013\)](#) and [Charmaz \(2014\)](#). NVivo software was used to code first order codes and second order categories following the [Gioia et al. \(2012\)](#) template. The data analysis started coding from a simple question, what are the main changes you experienced in the farm. From this data on digitalisation emerged. The researcher engaged in the data analysis process finding literature on digitalisation and comparing it to the data. At the point when data collection continued and no new categories were created this was recognised as data saturation, where the analysis of data reveals few, if any new insights ([Radic and Frech, 2020](#)).

## Findings

We organise our findings according to the two strategies family farms from our sample adopt: scale up and diversification. More importantly we identify the activities of the farm that are digitalised and explore the difference in these activities according to the strategy pursued. This identifies a fit between strategy and digitalisation activity and is illustrated by our model presented in [Figure 1](#). We explain each model in the subsequent sections of this paper and illustrate with extracted quotes (indicated by participant identification).

### *Linking scaling strategy and incremental digitalisation activity of family farms*

This section presents the activities that have been digitised through incremental innovation within the scaling strategy. It shows that participants have been transforming digitally for some time. This has helped develop their products and efficient production processes, to match the increasing demands of the supply chain. This digitalisation includes product development, process development and management development (operations management, managing staff) operations inputs, monitoring conditions, controlling conditions, monitoring outputs and connections with consumers, buyers and suppliers. The participants recognise the need for managers to be able to use technology, and that managers now must be “computer literate because computers rule everything we do” (P1A). One participant discussed the change management due to computers (P4A) and that this has created vast changes in the way farms operated compared to 20 years ago (PR1). This increases the productivity per person, hence: “this enables one man to cover so much ground because all sorts of things can be detected” (PJ1).



**Figure 1.** Model illustrating digitalised activities comparing scaling and diversification strategies

**Source(s):** Authors' own creation

### *Process development and digitalisation*

Digitalisation in process development includes the ability to control inputs to boost outputs, monitoring and controlling conditions to increase outputs. The point of digitalising this process is to increase output, hence “the computers change how you do the output and the amount you can get out of the farming unit” (PF1).

### *Controlling inputs to increase output*

The findings show that digital devices can reduce waste material, for example “modern technology can reduce the use of sprays” (P4A). This is extremely relevant for increasing costs and sustainability issues, incremental savings aggregately making big improvements. The participants described:

Curious(ity as) to where the technology goes from here as it’s already sophisticated for example GPS mapping, fertilizer is supplied by GPS, soils are analysed, the spinner comes on and puts according to what the soil analysis is and the demands of the crop it’s a very exact science (P6A).

... The past 10 years with GPS, tractor control, all the big tractors that go in straight lines nothing drove straight before then (P6A).

Digital technology precisely measures feed for animals and data can be collected and analysed to make judgements to determine the feed required to make them meet the required weight for slaughtering. For example: “. . . If the chickens don't move the next day, the food and water level will not have moved . . . the water drops when the birds are not very well but if you see it the day before in terms of that lack of movement it's because they don't feel well, so you know when they're not moving before water or feed show up . . . ” (PS1).

In monitoring inputs, digitalisation provides more accurate faster data which enables farmers to become more efficient and intelligent in optimising their produce. Ultimately, it allows farmers to become more efficient, and predict outputs.

#### *Monitoring conditions to increase output*

Monitoring and controlling conditions using digital technology provides the farmer with more information. This enables them to take better actions to increase yield, hence:

Pigs are moved along the slaughtering process through the computer . . . they are less stressed because they don't see any humans in this process, whereas before the humans used to stress the pigs out which makes them tense and reduces the quality of the meat (PM1).

The computer controls allow measurement of sunlight, a mini weather station on-site. Once so many watts of sunlight have clocked up so many watts of radiation, so much water can be inputted (PM1).

. . . We monitor them with sensors. We monitor where they are moving and identify areas where they are too dense. This allows the ventilation to be even throughout the house . . . The computer informs us that there has been a 20% drop in movement (PS1).

The computer provides a list of numbers who haven't drunk enough for today so the temperatures can be checked . . . These little management tools are very, very handy (PS1).

The improvement in technology is described by one participant; “the camera technology is fantastic” (PN1), another participant recognises:

. . . The technology isn't new it's just miniaturised. Now reports can be delivered to a mobile phone every five minutes, specifying the place of the cattle, who's drunk in the last 20 minutes. For instance, with 200 cows the amount they drink can determine who needs milking (PZ1).

This links to profitability hence:

. . . Now with birdhouse management the alarm system can kick-in when there are abnormal readings from the chicken, maybe a bad reaction to a vaccine. Then the vet gets involved to find out how hard that was on the animal and whether the vaccine is appropriate. In chickens the first one is killed in 28 days. If the chickens lose a day in growth (be)cause of x or y, it's been held back for a day, that's money. That's how the technology is involved with growing the birds (PS1).

Thus, monitoring of conditions enables farmers to take better care of their stock and consequently increase profitability. Secondly, family farms can manipulate conditions. For example:

Glass houses are computer controlled the environment is controlling the heat and ventilation . . . The weather station enables us to set these different parameters. The clocked-up watts of radiation activate the irrigation cycle, so the irrigation pump comes on and all the plants will get a predetermined amount of water, it could be a glass full per plant, and then the light metre is set to zero again and once it clocks up another 100 W . . . The environment is controllable; it's not like growing a field of crops in Cambridgeshire . . . the levels of humidity and CO<sup>2</sup> is controlled (PC1)

Overall, monitoring and controlling conditions helps appropriate value to the farm, through this form of digitalisation.

### *Digitalisation of outputs*

Product development, the change in farming, has led to it being more sophisticated, but this has not necessarily equated to more income, at least from the participants' perspectives. One participant discusses:

... [Discussing the change] now more processing of the product in the last 40 years ... Before it was sold on the bone and the farmer was getting more pence per pound than now ... Now with bacon the rhymed is being removed, the bones are being taken out, it is being defatted, sliced, and selling for between £1.15-£1.30 a pound whereas in 1984 the price was between 97p and £1.10 and that would be rhymed on the bone as a piece. This kicks back down the chain (PA2).

This illustrates that the production processes added to the product that the customer expects. This kind of development has been required to keep up-to-date with the rising standards of the industry. The findings also show how technology was integrated into monitoring outputs through traceability and quality checks:

The traceability is now far greater ... All the meat now is tagged electronically ... However, accountability has always existed and look at the pork industry slaughterhouses as an example ... For decades they've known what the date was, what the pig number was, they could go into their [analogous] records and say they have got a problem with this pig which has come from this farm; it would work by phoning up the agency and identifying a problem with the leg of a beast, the code could then indicate which slaughterhouse it was, from which farm and the date it had been killed (whereas now it's digital) (PP1).

Detectors are also used in milk detectors ... Milk detectors detect anything wrong with the milk and put it online. Online milk detectors detect anything that is wrong with the milk, all sorts of issues (PPJA).

This creates an increase in quality control and means that farmers experience more than before as another participant notices the increased "demands for farms. From a technological point of view, traceability, systems for cleanliness have gone through the roof" (PM1). Another participant said: "the changes are of the better because they are customer driven, it has to be for the better, more money no, work harder, yes, but it's for the better" (PS1).

This has been facilitated by "... supplier closeness" (PS1) and the increasing sophistication of the supply chain compared to 20 years ago (PN1). However, supplier traceability has always existed.

Traceability traditionally, you could follow along the chain these were minor things that cause problems because generally everywhere vets are on site do that process hasn't changed and you know it hasn't (PE1)

This is complemented by the digitalisation in processes in buyers' businesses, hence:

Before the packets, self-checkouts, and mobile shopping the customer had to go to the counter and specify the size and type of produce and interact with people, sometimes people didn't know what to ask for ... Especially for young people to go and ask for something it is considered embarrassing ... For example, cheese a customer would go and ask for what variety of cheese, what weight and the nervousness of asking, and whether it's obviously the right product or right weight, because most people wanted a certain amount of weight in the old days, so many ounces etc ... The customer now looks at a packet and picks it up rather than going to a counter and saying I want that one ... The customers as the generations have changed, they prefer less interaction with the counter staff (PM1).

Overall, the empirical evidence indicates that monitoring outputs and the power of buyers have increased, partly due to digitalisation.

### *Management digitalisation*

Digitalisation has impacted the management of the farm by increasing communication and connectivity. Hence, "... it allowed us to gradually move things towards computers and

systems determining what needs to be done and how to do it" (P1B). The communication is "... so much better and allows all the information to be centralised in one office" (P1R). Software, for instance cloud-based software, is used for rostering staff and providing financial information to reduce cost (P3A). This is incremental because it was first done in the 80's as a few participants recalled placing management information systems into their business at this time (PW1). Regarding connectivity and speed, a participant reflects:

You can now email things, scan things, mobile technology has changed operations. For example, if somebody is planting spuds five mile away previously the only time to know would be to go and see them. Now the mobile phone has come along you can ring them up and say how it is going, so long as their judgement is trusted, even by photograph evidence. So long as the judgement is trusted (PR4).

As noted above, this does not replace trust and other key mechanisms required for a functioning farm, but digitisation has "made people more and more efficient" (P2A). Whilst this has enabled increased communication, it can create problems with other communication technologies described as "taking things out of context and leading to misinterpretations" (P5A).

#### *Radical digitalisation as part of the diversification strategy*

The incremental and scaling strategy serves larger farms, whereas a diversification strategy aims to serve customers and is for the smaller farms. In smaller farms, that tend to diversify by either a farm shop, attraction and/or café (as well as a few other unique ventures), digitalisation has influenced this strategy by creating new channels to interact with customers and in a few instances to digitalise the product.

#### *Digitalisation of interactions with customers*

Digitalisation of interactions with customers was accelerated due to social restrictions during the COVID-19 pandemic. This specifically involved alterations to the business model, new access channels for customers and communications with the customers including blogging.

The research findings indicate that many family farms performed alterations to their business model during this time. For example, requesting customers to book online, rather than allowing customers to walk in. This means customers must add an element of planning to their experience, making the customer experience more complexity and potentially reducing the appeal of the experience. However, for the business digitisation allows these alterations.

... Software enables interaction with staff to process their receipts. It also allows to sell tickets online and keep a database of anyone who buys tickets online which allows the business to communicate what offers are on (PA3).

Another digitalisation innovation was the creation of a new process and generating new access channels for customers. One example of this is the "click and collect" service offered by family farms. This involved family farms creating online stores and then arranging the purchased products to be collected from the farm or offering a delivery service.

#### *Digitalisation of product*

The pandemic encouraged farmers to digitalise their products, however this occurred less than the digitalisation of interactions with customers. Many diversifiers began online blogging to sell the image of the family farm and generating connections with potential customers and retain ties with their existing customers. Secondly, other digital products/services involved transforming the physical attraction into a cyber-attraction. We identified examples such as an online zoom session with pets, an adopt an animal campaign and an online escape room, which replaced the physical farm as an attraction into a cyber-attraction.

These activities require continuous effort from the farmer on top of all their other farming activity.

#### *Digitalisation avoidance strategy*

A selection of farms did not digitalise and instead closed parts, or all, of the farming attraction business during the pandemic. Perhaps this was because they did not have the skill or finances required to invest in digitalising activities. In addition, because they usually own their land they may not need to digitalise as the CAP subsidy would have provided them with some a subsistence level of income, reinforcing the “land rich-asset poor” reputation of some family farms.

### **Discussion**

This research set out to clarify the link between digitalisation and innovation activity in family firms, in response to concerns that family firms are not preparing to engage in the digital transformation. The literature argues for and against family firms being better equipped to digitalise, as well as why both the family (the ownership, management and next generation) and the firm (size, environment) may influence this digitalisation but seldom attention has been paid to the importance of strategy alignment.

This research found that a fit between digital activity and the strategy is a significant determinant of how much of the family farm, in our case, is digitalised. We found that the family farm diversifiers had not engaged in digital activity to the same extent as family farms that pursued a scaling strategy. Furthermore, we found these two groups to undertake digitalisation through different activities involving different technologies. This is important for the digitalisation literature because it identifies strategy as an additional building block to the previously identified resources, capabilities, activities and stakeholders (Correani *et al.*, 2020). In addition, our results provide the various activities that family farms engage in to digitalise (as illustrated further in Appendix 1). Consequently, we make three contributions to the literature.

Firstly, in response to calls for contextualising digitalisation in family firms (Verhoef *et al.*, 2021), we advance understanding as to whether it is a discontinuous technology innovation (Szewczyk *et al.*, 2022) or a radical innovation (Hu and Hughes, 2020). Our study found digitalisation activity emerged in two forms, as an incremental activity (contributing to a scaling strategy) and a radical activity (contributing to a diversification strategy). Our model presents digitalisation of the farming process as an input-process-output model. The model illustrates which activities are digitalised according to the relevant strategy; it shows us that digitalisation activity is an incremental innovation within a scaling strategy. This answers calls to identify which innovation activity is most effective within specific contexts (Ghezzi and Cavallo, 2020; Pellizzoni, 2019). The findings extend the idea of family firms’ preferences for incremental innovation (De Massis *et al.*, 2015), reaffirming their preference for incremental digitalisation. Whilst also providing evidence of an alternative approach (Hu and Hughes, 2020) emerging, that of radically digitalising customer channels induced by the pandemic.

This research addresses a caveat in our thinking on digitalisation by offering empirical evidence on the phenomenon. We assert that digitalisation has been occurring gradually over time and not just recently in some firms, supporting the idea that family firms prefer to make continuous low risk investments (Gómez-Mejía *et al.*, 2007). In contrast, digitalisation is only a small part (online shopping, booking and/or blogging) of family farms that diversify, which makes sense because they are known to be “land rich-cash poor”. Therefore, we show that there must be a fit between digitalisation activity and strategy of the organisation, which then

influences whether it is an incrementally or radically approached. This is potentially explained by farmer's SEW endowment (Gómez-Mejía *et al.*, 2007), which inhibits radical investments in technology leveraged against the land, implying a family focused SEW (rather than a firm) (Hsueh *et al.*, 2023).

In addition, the empirical evidence identifies several processes that capture incremental digitalisation as well as some activity during the pandemic of the family farm diversifiers. These specific activities, functions and activities add precision to what we mean by digitalisation in this context. Furthermore, the resultant increasing monitoring and control of the employees helps the ecological environment. This shows how family farms update their traditional practice by utilising new knowledge similar to previous studies (Muñoz-Bullón *et al.*, 2020; Gusenbauer *et al.*, 2023), implying a firm focused SEW (rather than a family) (Hsueh *et al.*, 2023).

Secondly, this study makes several specific contributions to discussions surrounding family firm heterogeneity (Daspit *et al.*, 2021). By focusing on the family farm, we actually uncover two typical strategies, counter to existing literature (Glover and Reay, 2013; McElwee, 2006). Thus, we can say that family farms in the UK are of two types: *scalers* and *diversifiers*. In relation to discussions on entrepreneurial legacies (Jaskiewicz *et al.*, 2015), we found *scalers* achieve legacy through continuous innovations enabling them to meet the increasing demand of the supply chain. This shows the triad between the strategy, the external demands and the digitalisation activity. It complements the idea that family members will seek non-family members, so they are not short of skills that enable investing in technologies (Arzubiaga *et al.*, 2021). Perhaps this is due to the family's long tenure and long-term orientation, which provides them with tacit knowledge to follow the industry evolution. In showing the practice of digitalisation in family firms, this research extends the claim that binding social ties may have a positive impact on family firms since younger family members and outside members are able to implement new technologies (Arzubiaga *et al.*, 2021).

In relation to discussions on resilience (Conz *et al.*, 2020), we propose resilience occurs along two trajectories. The first is family firms that have a tendency for incremental innovations, evolving their traditional farm activities. Whereas family farm diversifiers exhibit a resilience towards protecting their traditional farming activities. This extends our understanding as to why family firms may be prone to either incrementally or radically digital innovate compared to their non-family counterparts. This categorisation of family farms as to their strategies enriches our understanding of the heterogeneity of the family firm (Daspit *et al.*, 2021) and how family firms make successful adoption of these innovations (Yin *et al.*, 2022).

The diversification strategies lead to radical digitalisation because the family farms had adjusted their service offering in response to social restrictions. Thus, reinforcing the idea of a branding as an ethical local farm embedded in the community, complementing findings from Rashid and Ratten (2020). The findings specifically contribute empirical evidence that family firms attempt to create the human-centric brand through their family imaging and stewardship of the land on their websites, and more so during times of crisis (such as COVID-19). Yet, the family firms that scaled up, which are more growth orientated, pursued incremental innovations for economic gain and to satisfy customers without altering their product offering during the pandemic. This contrast underpins the different strategies (finances, pressure from buyers in the supply chain) to digitalise farming activity.

Finally, we strengthen the link between the family firm and rural entrepreneurship literature. We update and extend the McElwee and Smith (2012) typology by adding a digitalisation aspect, in which a diversifier can identify whether it has digitalised (webpage, online booking, online ordering, blogging). Specifically in relation to scalers, the implementations of PATs may be a threat for local employees because it replaces people in the farms for technology, this problem is magnified if they are attached to their employees



as it threatens the community embedded vision of rural firms (Perkins *et al.*, 2017). On the one hand, given the recent geo-political tensions, digitalisation may lead to food security for their communities, and so motivates family firms (Baù *et al.*, 2018). Irrespectively, the evidence of digitalisation shows their resilience which is a characteristic of rural firms (Welter, 2011).

#### *Contributions to practice*

This study is significant for practice in responding to the assumption that digitalisation is a solution to the current geo-political and environmental problems. Digitalisation is often posed as a solution to a firm's problems without consideration of it being unsuccessful. We recommend that practitioners should tread with caution and instead first consider the strategy of the farm. Since digitalisation is an investment, cash-poor family farms should not pursue digitalisation if it does not make sense strategically; meaning it is not always a solution. We should not assume all family firms want to digitalise all their activities that could potentially be digitalised. We found that family farm diversifiers preferred to keep their products natural, and this is often dichotomised with digitalisation, which may explain why some family farms are not planning on engaging in the digital transformation.

In contrast, family farms that want to digitalise to achieve their aim to scale can use our model as a tool to help them identify what is currently (not) digitalised, what needs to be done and to help them ideate solutions. This can help them to become more competitive and this may make them less dependent on the economic subsidies.

#### *Contributions to policy*

The UK is dependent on exports from other countries, which accumulates food miles, contributes to sustainability problems and heightens the consequences of geo-political tensions on our cost of living. To reduce this problem, digitalisation can help *scalers* increase their yields. Thus, future UK policy can help farms invest in digital technologies, for example by providing finance and knowledge through innovation centres to attempt to design new equipment that can further the digitalisation of farming, like initiatives in the EU (EIP-AGRI, 2023). In addition, to use this technology family farms should receive money for training family and non-family management in digitalisation planning and implementing along commercial farming activities. This can help accelerate diffusion in rural areas which may not be aware of the latest digitalisation processes.

#### *Future work and limitations*

Naturally, the limitations of explorative qualitative work arise from the purposeful sampling and subjective approach resulting in an inability to universally apply our findings beyond the local context. Indeed, a boundary of such a sample is the inability to generalise beyond our sample due to firm and local context heterogeneity. Future research can address the limitations of generalisability through the adoption of another method, specifically a deductive quantitative approach through surveys. A survey that could capture a large enough sample of the farming population would help to further objectify our findings and this would provide policy makers with stronger more robust evidence.

Furthermore, future work can address the generalisability by exploring whether the factors identified within Figure 1 and the resultant strategies are occurring in different contexts, particular mainland Europe. Mainland Europe is different geographically; it has much better growing conditions and much more farming land available, and they also have much more co-operatives, which may syndicate finances to invest in technology, such as the olive industry in Sicily and Puglia (southern Italy). On the other hand, farm shops (as a selected strategy by some respondents) are not so common throughout Europe. For instance,

few are found in Italy due to their food culture and close-knit communities, who are loyal customers to the local grocery stores. Policy also calls for recognition of these nuances across EU member states to be explained at national and regional level (European Union, 2023). Therefore, a study of farms in these different contexts would be interesting to compare not only their digital capabilities but their business capabilities simultaneously. It would be interesting to find out whether family farms have a structured approach to digitalisation and innovation and whether they are managing to implement digital technologies into different processes. It should also be noted our use of secondary data from publicly available sources may not fully capture the extent of all digitalisation activities happening on the farm if this information is not publicly disclosed.

## Conclusion

To conclude, this research has further contextualised the concept of digitalisation in family firms. A qualitative study using a purposeful sample and data collection and analysis methods led to findings that were interpreted in a model that presented two dominant strategies: scale and diversification. Interestingly, the scale strategy involved incremental digital innovations whereas diversification involved radical digital innovation. In addition, the findings indicate that just because something can be digitalised (input and process farming activities), does not automatically mean it should be digitalised from a business viability perspective. Not all family farms can viably digitalise, highlighting the importance of fit between digital activity and strategy. This helps clarify the link between digitalisation and family farm strategy; that digitalisation is a choice rather than a must in the eyes of some family farmers; whether this is generalisable across different industries and countries is an area for future inquiry. However, this research concludes that policy and practice should not assume that all family farms seek to digitalise. This contributes to, and synthesises, the family firm innovation literature and the family firm digitalisation industry.

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## Appendix

The supplementary material for this article can be found online.

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