



Exploring digital transformation and dynamic capabilities in agrifood SMEs

Rita Cannas

To cite this article: Rita Cannas (2021): Exploring digital transformation and dynamic capabilities in agrifood SMEs, Journal of Small Business Management, DOI: [10.1080/00472778.2020.1844494](https://doi.org/10.1080/00472778.2020.1844494)

To link to this article: <https://doi.org/10.1080/00472778.2020.1844494>



Published online: 12 Feb 2021.



Submit your article to this journal [↗](#)



Article views: 220



View related articles [↗](#)



View Crossmark data [↗](#)



Exploring digital transformation and dynamic capabilities in agrifood SMEs

Rita Cannas 

Department of Economic and Business Science, University of Cagliari, Italy

ABSTRACT

The study explores digital transformation in agrifood small and medium enterprises (SMEs) through a framework of dynamic capabilities. The research question is addressed to identify unique firms' capabilities to face the change in agrifood environments. The study adopts a qualitative approach and is based on in-depth interviews of 21 key respondents such as CEOs, owners, and managers of both public bodies and agrofirms in Sardinia (Italy). As new concepts, the study finds that distinctive dynamic capabilities are led by a sense of belonging in territorial value-oriented enterprises and collaboration among firms' stakeholders, who feel as members of an extended family. It also shows that personal capabilities are associated with a gender domain and that digitalization reshapes not only organizational structures but also societal ones. The study aims to contribute theoretically and empirically through novel meanings of dynamic capabilities for digital transformation in the context of small and medium-sized agrofirms.

KEYWORDS

Digital transformation;
dynamic capabilities;
agrifood businesses; SMEs

Introduction

Small and medium-sized enterprises (SMEs) are increasingly impacted by digital transformation (DT). DT has been defined as “precipitated by a transformational information technology” (Lucas et al., 2013, p. 372) that involves critical changes in business processes (Venkatraman, 1994), operational routines (Chen et al., 2014), and organizational capabilities (Tan et al., 2015), as well as in entering new markets (Dehning et al., 2003). According to Oswald and Kleinemeier (2017), digitalization is an obligatory step for firms rather than an opportunity, but little is known in terms of conceptual and empirical research on how organizations are digitally transformed (Warner & Wäger, 2019).

In the agribusiness industry, DT is altering production, process-manufacturing, the supply chain, distribution, wholesale retailing, and consumption (Anastasiadis et al., 2018). The literature offers diverse conceptualizations regarding digitalization, big data, and technological innovation issues in the agrifood sector (Bronson & Knezevic, 2016; Fulton & Port 2018; Jayaraman et al., 2015; Schiefer, 2004; van Es et al., 2016). In fact, digitalization in the context of agrifood firms differs

CONTACT Rita Cannas  rita.cannas@unica.it  Department of Economic and Business Science, University of Cagliari (Italy), Cagliari 09123, Italy.

© 2021 International Council for Small Business

significantly, which depends on the economic status and development level of the region in which agribusinesses are conducted. For instance, agricultural firms in developed countries show fewer obstacles in adopting digitalization than those located in developing countries (Anastasiadis et al., 2018). Digitalization may also differ given the firms' sizing characteristics: large farms tend to engage in digital agriculture more readily because capital investments provide earlier returns on investment due to scale efficiencies (van Es & Woodard, 2017). Instead, SMEs tend to implement short-term digital strategies, which do not favor the long-term investments required to deeply enhance investment capacity and working performance in comparison to large firms (Zambon et al., 2019).

However, achieving DT goals is strictly related to the firms' capabilities to leverage digital technologies, which often implies changes in their resources, processes, products, strategies, and business models. In other words, the theoretical framework of dynamic capabilities (DCs), for which resources and capabilities are an essential factor to compete in turbulent environments, offers a proper lens to investigate DT. In fact, past studies have analyzed DCs (Eisenhardt & Martin, 2000; Teece et al., 1997) that address DT by identifying information technology (IT) (Benitez et al., 2018), information communication technology (ICT) (Teece, 2009; Valdez-Juárez et al., 2018), digital capabilities (Piccoli & Watson, 2008; Vitari, 2009), and business model change (Witschel et al., 2019). These challenges underline the need to use IT in the food industry, with increased demands for improved digital capability through which firms manage their resources to address and shape the rapidly changing business environments (Teece, 2014). Although these capabilities appear most appropriate in DT, the extant literature shows no evidence of implementation of DCs in the agribusiness sector; this represents the focus of the present study.

This study applies a DCs framework within agrifood firms and provides conceptual and empirical insights to explain how and to what extent SMEs face a turbulent external environment and societal change, and how they create value with DT. In particular, the study is based on the following research question:

What are the distinct factors that shape DCs developed by agribusiness firms involved in DT?

The study addresses gaps in the literature by (a) providing an empirical implementation of DCs, for which there is limited study; and (b) showing that empirical implementation occurs in the context of the agrifood sector, mainly composed of SMEs, where DCs for DT are completely unexplored. It seeks to expand the microfoundations of DCs (Teece, 2007) by identifying distinctive capabilities that lead to innovation in products and processes.

Given the need to do in-depth analysis to achieve a better understanding of the mechanisms in play, a qualitative approach was adopted. The method

included semistructured interviews in situ in which a total of 21 respondents identified among public stakeholders and agribusinesses entrepreneurs established in Sardinia, Italy, took part.

The present study contributes mainly in two ways. First, SMEs' agribusinesses struggle in implementing DT mainly due to cultural resistance to change, which depends on societal norms and values. Therefore, the present study recommends implementing empirical investigations to provide contextualized knowledge that can help in removing barriers to DT. Second, among the growing number of studies on DCs that identify IT, ICT, and digital capabilities (Konlechner et al., 2018), this study implements sensing, seizing, and transforming capabilities as a pioneer study in the agrifood sector about which little is known and enriches the literature about DCs for DT (Warner & Wäger, 2019) through novel concepts—for example, territorial value-oriented corporate identity and personal capabilities such as intuition, creativity, and empathy linked with gender issues.

The article is structured as follows: the Context of Digital Transformation section introduces the main aspects related to the firms' digitalization, then the theoretical backbone of the study is discussed in the Theoretical Framework: Dynamic Capabilities Conceptualization section. Followed by an explanation of the whole research design in the Methodology section, the results of the in-field investigation are presented in the Findings section by describing the responses to the interviews on how digital transformation occurs in agribusinesses, and what the DCs that create innovation and new opportunity for firms are. Novel meanings related to DCs are revealed in the Discussion section, and previous knowledge is combined with the concepts that emerge in the present study. Finally, the main theoretical and practical contribution of this study and suggestions for future research are presented in the Conclusions section.

The context of digital transformation

DT is defined “as the use of new digital technologies (social media, mobile, analytics or embedded devices) to enable major business improvements (such as enhancing customer experience, streamlining operations or creating new business models)” (Fitzgerald et al., 2014, p. 1). Similarly, digital technology contributes to a firm's innovation and management capability (Foroudi et al., 2017) as well as to a firm's performance (Gërguri-Rashiti et al., 2017). DT demonstrates organizational transformation that integrates digital technologies and business processes in a digital economy (Liu et al., 2011), and it involves key business operations, products, and processing that reshape business models (Horlacher et al., 2016).

Although DT has become a strategic imperative for leadership agendas (Fitzgerald et al., 2014; Hess et al., 2016; Singh & Hess, 2017), there is little conceptual or empirical research that examines how organizations are digitally

transformed. Similarly, only a few studies examine how organizations build dynamic capabilities for DT (Warner & Wäger, 2019).

Integrating and exploiting new digital technologies is clearly one of the main challenges that organizations of all sectors currently face (Hess et al., 2016). The market-changing potential of digital technologies appears broader than products, business processes, sales channels, or supply chains. The question is no longer about when companies need to make DT a strategic priority but how to embrace and use it as a competitive advantage (Hess et al., 2016). Similar to other sectors, the agrifood sector also experiences the challenge of DT; for instance, digitalization is strongly affecting the food retail sector, where new digital technologies have increased the methods for buyers to consume and consequently the retailer's bottom line (Sánchez-Montesinos et al., 2018). Moreover, as stated by Porter and Heppelmann (2014), digital capabilities enable firms to design, realize, and deliver new products that change how they compete.

However, a critical question relates to the technological divide between digital technologies and their effective implementation within agribusinesses (van Es et al., 2016). In other words, the question is not "whether the global agricultural industry should adopt digital technologies, but how this adoption process can occur in an environment that encourages it to fully capitalise on the potential production gains" (van Es & Woodard, 2017, p. 99). The reasons why agribusinesses struggle to implement effective digital technology are, for instance, ease of access, training, and engagement with digital technologies for most of their stakeholders (Anastasiadis et al., 2018). Undoubtedly, technology is part of a broader context of knowledge, tools, techniques, and systems available for the generation, production, distribution, and appropriate final destination of goods and services. Digitalization implies significantly more than just a conversion from analogical to digital data; it involves a stronger correlation between business processes, efficient interfaces, and integrated data exchange and management (Bogner et al., 2016).

DT is certainly a matter of firms' capabilities with regard to absorption, use, adaptation, creation, development, transfer, and dissemination of technologies that materialize through a set of resources, skills (operational, organizational and relational), and learning mechanisms employed by the firm (De Mori et al., 2016). However, digitalization is also a matter of power and authority: it can be an agent to reorder society or to maintain the *status quo* (Bronson, 2018). For example, small-scale farmers are gathering information passively collected by precision agricultural equipment. A question naturally arises about who holds and controls the data sets, such as in the case of the multinational Monsanto, which collects big data from users of its products (Bronson, 2018; Bronson & Knezevic, 2016). Therefore, digitalization should be also debated in broader conversations about the desired kinds of societies to foster *responsible innovation* in agriculture and the agro-industry (Bronson,

2018; Stilgoe et al. 2013), as well as to promote sustainable entrepreneurship in farmers' markets (Ratten et al., 2017).

Despite the growing diffusion of digitalization in agrifood, few studies apply the technological capability concept specifically to food companies. Researchers mainly focus on large-scale firms; therefore, there is limited study of DCs (Lanza & Passarelli, 2014) and DT within medium- and small-scale firms, particularly for agribusinesses. These gaps, the scant knowledge about digital capabilities, and DCs applied to agrifood SMEs, suggest the need to investigate digitalization in agro-SMEs with the aim to explore the mechanisms by which they implement digital technology and build dynamic capabilities addressed to reshaping internal and external resources to face rapid changes.

Theoretical framework: Dynamic capabilities conceptualization

Given the disruptive nature of DT, the body of knowledge on DCs (Amit & Zott, 2001; Eisenhardt & Martin, 2000; Helfat et al., 2007; Helfat & Martin, 2015; Pavlou & El Sawy, 2011; Teece 2017; Teece et al., 1997; Zollo & Winter, 2002) can be understood as a well-appropriated lens for analyzing the DT of firms.

In essence, DCs represent the organization's ability to achieve new and innovative forms of competitive advantage (Teece et al., 1997). This implies that firms' capabilities need to be understood in terms of the organizational structures and managerial processes that are the basis of the productive activity. From another perspective, DCs are firms' processes that use resources to match and even create market change (Eisenhardt & Martin, 2000, p. 1107).

The origins of DCs are strictly related to a resource-based view (RBV) (Barney, 1991), meaning that organizations are similar to bundles of resources heterogeneously distributed across firms (Amit & Schoemaker, 1993). The core concept that combines a RBV with DCs relies on firm resources that are valuable, rare, and inimitable, and they are seen as the basis to achieve a competitive advantage by implementing creative strategies that cannot be easily duplicated by competing firms (Eisenhardt & Martin, 2000).

DCs involve higher-level activities through which the firms' resources are managed to address rapidly changing business environments (Teece, 2014). In other words, DCs occur in the processes of organizational renewal (Ellonen et al., 2011) and can be considered higher-order organizational capabilities that enable learning about new domains, create new assets combinations, and build new capabilities to satisfy market needs (Danneels, 2008; Helfat et al., 2007; Newey & Zahra, 2009).

Teece (2007, p. 1319) stated that DCs "can be disaggregated in the capacity (a) to sense and shape opportunities and threats, (b) to seize opportunities, and (c) to maintain competitiveness through enhancing, combining, protecting, and, when

necessary, reconfiguring the business enterprise's intangible and tangible assets.” Digital sensing capabilities are considered to scan the external environments (Hernández-Linares et al., 2018) for capturing trends that could disrupt the firm. They also consist of learning and interpretation activity to analyze diverse information and provide insights to managers or, more generally, to incumbents (Teece & Linden, 2017). Digital seizing allows firms to address opportunities or neutralize threats by using techniques such as rapid prototyping and options logic to effectively balance risk and reward (Day & Schoemaker, 2016). Transforming capabilities help firms in executing a digital strategy (Yeow et al., 2018), which is associated with the continuous strategic renewal of assets and organizational structures (Day & Schoemaker, 2016; Teece, 2014).

By adopting the three overarching clusters of sensing, seizing, and transforming proposed by Teece (2007), Day and Schoemaker (2016) found six components of DCs: with regard to sensing, they identified *peripheral vision* and *vigilant learning*, which refer to managers' personal capabilities. *Peripheral vision* means the capacity to focus on signals that are right in front of the leadership team but are yet unnoticed; *vigilant learning* consists of interpreting the signals in a vigilant manner. With regard to seizing, these researchers found microfoundations such as *probe and learn* and *flexible investing*: the former implies that managers need to embed trial-and-error learning before achieving positive results; the latter derives from the corporate need to test investments before deploying internal resources. Finally, in transforming, they found *organizational redesign* and *external shaping*, which refer to the capabilities to restructure strategies and structures to face disrupting technologies and reshape internal design to renegotiate the environment and shape the company's ecosystem.

In the context of DT, Warner and Wäger (2019) identified *digital sensing*, *digital seizing*, and *digital transforming* capabilities. *Digital sensing* refers to developing new capabilities in *digital scenario planning* and *digital scouting* addressed to eliciting new technological-, customer-, and competitor-based trends. In digital sensing, the importance of big data analytics and artificial intelligence is considered essential for strategic planners. *Digital seizing* capabilities are based on *strategic agility*, which implies that managers need to adopt flexible, agile, and dynamic thinking to promptly exploit technological and market opportunity. *Strategic agility* emphasizes the role of rapid prototyping, which is needed when building digital innovation labs and garnering customers' feedback in real time. *Digital transforming* involves capabilities in improving the *digital maturity* of the workforce—for example, by involving younger digital natives in the organizational rebuilding processes. These reshaping processes play a significant role in *redesigning internal structures* through transformational leadership and decentralization of roles or business units.

Strictly interlinked with digital DCs addressed to business exploitation is the research area of IT and ICT. For instance, Benitez et al. (2018) stated that IT capability influences the firm process through operational and organizational capabilities, such as organizational learning, knowledge management, talent management, new product development, business agility, and proactive environmental management. Valdez-Juárez et al. (2018) analyzed firms through the transformation of their resources and ordinary capabilities into DCs, such as the efficient use of ICT in knowledge management processes, which can generate better results in innovation and profitability (Augier & Teece, 2009).

Methodology

Research question and research design

The research question—*What are the distinct factors that shape DCs developed by agribusiness firms involved in DT?*—addresses gaps in the literature by (a) providing an empirical implementation of DCs, about which there is limited study; and (b) showing that empirical implementation occurs in the context of the agrifood sector, mainly composed by SMEs, where DCs are completely unexplored. In the analysis of DT in agribusinesses, the study seeks to identify distinctive capabilities (Teece, 2007) that generate innovation in products and processes and help firms in remaining competitive and achieving new competitive advantages.

The newness of the phenomenon under study suggests a qualitative approach based on an interpretive viewpoint, assuming that organizations are socially constructed and that people construct their subjective organizational realities (Gioia et al., 2012). We believe that DCs need to be strengthened by empirical investigations aimed at understanding better how organizations' DCs are specifically shaped within different firm size and in different types of agrifood firms. Thus, our study is developed through an *ad hoc* investigation, and in-depth interview with stakeholders is the method chosen.

Taking into consideration that there is limited information on how and under what conditions firms implement DCs for DT, the study identifies such conditions through face-to-face interviews within a panel of agrifood entrepreneurs facing the challenge of digitalization. In doing so, a total of 21 interviews with two types of stakeholders were realized: eight of them were conducted to interpret the main characteristics of the agricultural sector in Sulcis and Sardinia, with a focus on firms involved in digitalization activity; semistructured interviews were then conducted with 13 representatives of eight firms who implemented digital technology in their businesses.

From a theoretical perspective, the research design is built on a general conceptual framework of DCs (Teece et al., 1997). By segregating DCs into the capacities of sensing, seizing, and transforming (Teece, 2007), the present study identified specific capabilities that facilitate and shape DT (Day & Schoemaker, 2016; Warner & Wäger, 2019) within agrifood firms.

A novelty of this study suggests considering the specific context in which DCs are analyzed, the agrifood sector, where firms are different in terms of type of production (for example, dairy factories and livestock firms), size (such as large and small firms), and institutional shape (for example, company business and family business). In fact, this heterogeneity has been ascertained among the interviewees. Only in the subsequent step were similarities with previous studies focusing on subcapabilities considered, as shown in the data analysis.

Setting

The setting of the in-field research is Sardinia, a region of Italy, where both traditional agrifood firms that do not implement digital technology and other firms that are committed to digitalization processes coexist. This coexistence represents a favorable backdrop for this study. In particular, the study mainly focused on Sulcis, a southern province of Sardinia, and later extended to the overall region. The choice of the setting was a requirement of the research project funded by the Autonomous Region of Sardinia, which supported the present study. It was further extended to the entirety of Sardinia because digitalization is not as popular in Sulcis. In fact, Sulcis is one of the poorest places in Italy, characterized by a huge presence of small agricultural firms, where it appears very difficult to frame strategies of economic cohesion between firms, to contrast the high fragmentation of businesses and even the socioeconomic decline.

Unfortunately, there are no available statistics about agrifood firms that implement digitalization or statistics regarding the real number and consistency of traditional businesses. Therefore, a first level of interviews with gatekeepers was conducted to gather information on agricultural characteristics related to the research question in Sulcis and in the rest of Sardinia.

Official data (Sardegna Statistiche, 2016) showed that there are about 49,000 agricultural firms in Sardinia. Among them, 45,000 are individual firms, 62 are cooperatives, and only 153 are companies. These data suggest that the backbone of the Sardinian agrifood sector is basically composed of small firms, individually managed and assisted by the relatives of entrepreneurs.

Data collection

The data collection was broken down into three phases: (a) interviews with key informants; (b) selection of firms from a list provided by the key informants;

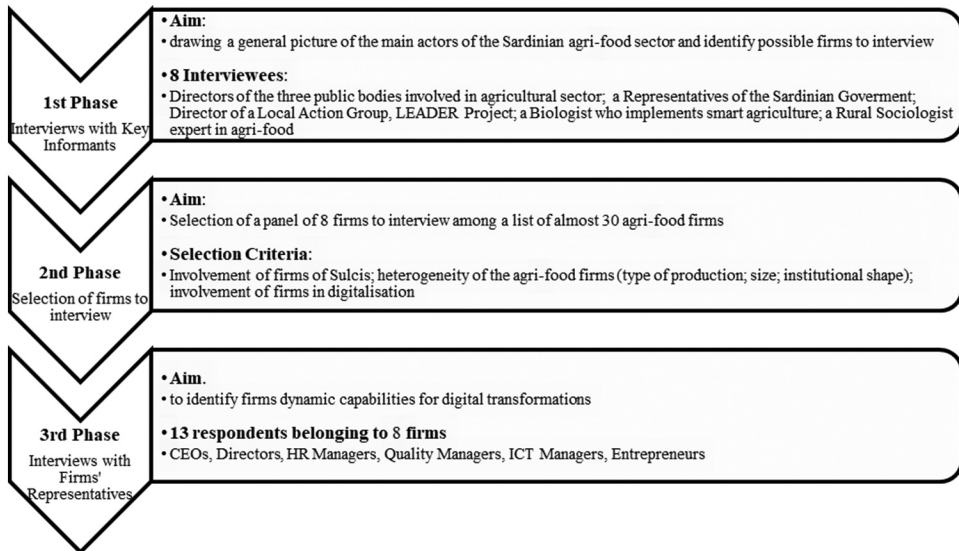


Figure 1. The data collection process.

and (c) semistructured interviews with CEOs, managers, and owners of agrifood firms. The three phases are outlined in [Figure 1](#).

The first phase intended to draw a general picture of the main actors of the Sardinian agrifood sector and specifically to identify possible firms to interview. Unfortunately, statistics and secondary data about agrifood innovators were unavailable. Thus it was decided to gather information from different key informants, particularly from those belonging to local government bodies involved in agriculture, to identify certain firms involved in digitalization. Eight face-to-face interviews with key informants, which lasted from 30 minutes to 1.5 hours, were conducted between April and July 2019.

The interviews were conducted mainly in Cagliari (the main city of Sardinia) with the respective general directors of the three public bodies (Laore, Agris, and Argea) that serve as the operational arms of the Sardinian government. Five interviews were conducted with a representative of the Regional Ministry of Agriculture, who is involved in agrifood traceability; the director of the Local Action Group (LAG) of Sulcis, who designs training projects addressed to local farmers; the Italian coordinator of “SheepNet,” a European Union network that aims at increasing sheep productivity and flock profitability by knowledge exchange; a biologist, who implemented precision agriculture in his family agribusiness; and a sociologist, who knows the Sardinian agrifood sector. The interview with key informants was mainly focused on gathering information about agribusinesses implementing digital technology in both Sulcis and the rest of Sardinia.

The second phase was dedicated to the selection of the firms to interview, which appeared to be a complex process. There was a dilemma on how to

identify, from around 30 agribusinesses suggested by the key informants, the “right ones” for the study purpose. The “right ones” could not be preidentified, except for certain agrofirms that are well known in the Sardinian market, such as the biggest cooperative operating in the dairy sector and others in Sulcis. Thus, preinterviews with firms engaging in digitalization at different stages, from a high to a low level of technology implementation, were conducted.

Finally, eight firms on the list provided by key informants were selected, ensuring that—by previous phone calls and information gathered through Web resources—these were effectively and deeply involved in digitalization. The criteria of selection were inspired by the following principles: ensuring that the involvement of certain Sulcis firms fit a research project requirement and representing the heterogeneity of the agrifood firms in terms of type of production (for example, firms operating in agriculture, farming, fishing productions), size (such as large and small firms), and institutional shape (for example, company business and family business). Although the main research focus was about SMEs, we also selected a large firm because it is fully involved in digitalization processes. The eight firms interviewed are listed in [Table 1](#).

In the third phase, face-to-face and semistructured interviews were conducted with 13 respondents belonging to eight agribusinesses between September and October 2019. The number of eight firms was not predetermined but was a result of the screening process of information provided by key informants. However, the number of respondents varied by one firm to another, depending on the availability of the representatives of the selected firms and the organizational and operational complexity of each firm investigated. For instance, in large and medium-sized firms we had interviews with representatives playing different roles, such as in the case of Firm 1, in which the general director, the HR manager, and ICT manager were interviewed ([Table 1](#)). Interviews lasted from 1 to 2 hours. All the interviews were reordered and then electronically transcribed in the original language (Italian).

The protocol of the semistructured interview was classified into four parts, as described in [Table 2](#): (a) a general firm’s description, covering various information such as type of firm, mission and corporate philosophy, digital technology stock, and so on; (b) capability of sensing with regard to the development and assessment of technological opportunities; (c) capacity of seizing, referred to the mobilization of resources to capture value; and (d) capacity of transforming, which addresses realignment and development of actions for reconfiguring organizational resources (Day & Schoemaker, 2016; Teece, 2007; Warner & Wäger, 2019).

Along with the interview process, the study adapted the protocol to the specific context of each interview. In fact, for those firms characterized by low digitalization, the interview protocol had to be curtailed. In these cases, the

Table 1. General information of firms.

General information	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Firm 6	Firm 7	Firm 8
Firm type	Cooperative	Family business	Cooperative	Cooperative	Family business	Family business	Individual firm	Company
Number of Respondents (R) and role	230 members 3 people: R1 General Director; R2 HR manager; R3 ICT manager	3 people R4 Marketing manager; R5 Commercial manager; R6 Quality manager	33 members 2 people R7 General manager; R8 Quality consultant	210 members 1 person R9 Commercial and marketing Director	1 person R10 Owner and responsible for the cattle farm	1 person R11 Owner and Responsible for the breeding farm	1 person R12 Owner and Responsible for the breeding farm	1 person R13 CEO
Year of foundation and Mission and philosophy	1956 Value creation for members and customers; Strong local identity	1982 Value creation for company; Territorial value-oriented	1990 Satisfaction of members; Territorial value-oriented	1960 Value creation for farmers within a town Strong local identity	1961 Quality farming	1978 Improving genetic and wellness of flock and firm's efficiency	1985 Quality farming	2016 Improving sustainable farming by digital technology
Subsector	Milk processing Dairy and Cheese factory	Milk processing Cheese factory	Vegetable farming	Wine cultivation	Cattle farming	Ovine farming	Ovine farming	Ovine and-goat farming
Product/service provided	Fresh cow milk; yogurt; cow cheese	Ovine and goat cheese	Fresh vegetable	Vinery	Cow milk	Sheep milk	Sheep milk	Software production, IT assistance, Training
Market focus	50% local 47% national 3% international	80% national 20% local	100% local	50% local and national 50% international	100% local	100% local	100% local	60% national 30% local 10% international
Employees/workers	415 employees	50 employees 20 seasonal contracts	15 employees	32 employees	2 brothers and 1 son 1 employee	3 brothers' owners 2 employees	1 owner 1 seasonal contract	4 members 3 employees 2 temporary contracts
Revenue	€181 million	€16 million	€5,6 million	€10 million	€0,9 million	€0,5 million	€0,1 million	€0,2 million

Table 2. Semistructured interview framework to agribusinesses.

1) General information	2) Capacity of Sensing	3) Capacity of Seizing	4) Capacity of Transforming
Firm type	<i>Scanning:</i>	<i>Designing:</i>	<i>Leveraging:</i>
Year of foundation	Exploration of new opportunities	Planning of the activity:	Who/how/with who
Subsector	and markets: who/what/how;	who/what/how.	manage the change;
Mission and philosophy	role of ICT sources of	<i>Selecting:</i>	procedures, sources.
Product/service provided	information, e.g., data	Sources and use of	<i>Creating:</i>
Market focus	analytics; role of internal	digital data and ICT,	How new actions, and
Number employees/ workers	procedures.	procedures.	new resources are
Revenue	<i>Learning:</i>	<i>Committing:</i>	created; role of
Digital technology stock	Monitoring activity;who is	Involvement of	competencies (new
	involved	employees/teams;	ones).
	<i>Calibrating:</i>	role of relational	<i>Accessing:</i>
	modus operandi;use of digital	capabilities;	Use of external
	data for redirecting decisions;	monitoring activity.	resources (vendors,
	procedures.		partners, digital
			platforms).
			<i>Releasing:</i>
			Reducing work-force;
			resources
			recombination

focus was more on understanding the reasons why firms struggle to implement digitalization.

Data analysis

Data were analyzed qualitatively (Assarroudi et al., 2018; Kohlbacher, 2006; Mayring, 2000). According to Hsieh and Shannon (2005), content is analyzed for the subjective interpretation of the content of text data through a systematic classification process of double coding and identifying themes or patterns. Typically, qualitative content analysis is implemented by inductive or deductive processes (Groenland & Dana, 2019; Hsieh & Shannon, 2005; Kohlbacher, 2006; Mayring, 2000). The present study adopted the inductive process.

Following the interview protocol for agribusinesses, a first level of general “coding” was based on the DCs’ theoretical framework in which organizations develop sensing, seizing, and transforming capacities. Consistent with the qualitative approach on which the present study is based, the focus was mainly on the means by which agribusinesses make sense of their personal and organizational capacities of managing their firms, rather than on the number or frequency of measurable patterns. The main aim of the study was to give voice to the interviewees, represent their views, and explore new concepts rather than affirm the existing ones. Thus, in the analysis of the text contents, ex post coding processes derived by the interpretation of the means (Gioia et al., 2012) expressed by interviewees about sensing, seizing, and transforming processes were sought.

Basically, the contents of the agribusiness interviews were analyzed by maintaining the research question regarding the exploration of DCs for DT as the main interpretive thread. Operatively, within their transcripts, the pertinent contents were highlighted and their quotations extracted. This corresponded with the interviewees' sense-making representations as the basis of the first-order level of data analysis, and then multiple data sources (statistics, reports, field observation, media, and Web documentation) were combined with the respondents' views.

In the data analysis we focused on the assertions of the 13 respondents representing the panel of eight agribusinesses' interviews by quoting their voices and discussing the interpretation of conditions, capacities, and processes needed for implementing digitalization and exploiting new value. This study hoped to explore potential novel concepts in DCs related to digitalization. As argued by Dana and Dumez (2015), theory must not be excessively constrictive during the early stage of qualitative research; therefore, only in a second step of the analysis were the data considered with the lenses of knowledge already established to discuss critically the characterizations that emerged in the present study in comparison with previous literature.

Findings

Table 1 presents general information about the firms studied for which interviews with 13 representatives from eight agribusinesses were conducted. The analysis of such DCs within sensing, sizing, and transforming capacities were found within the firms studied by quoting the pertinent voices expressed by their representatives.

Sensing

The general director—respondent one (R1)—of the biggest firm of our panel of interviews, Firm 1 (F1), surprisingly introduced *serendipity* as a “capacity that drives the company’s exploration of new opportunity.” He explained that the company’s core business is based in Sardinia, where the dairy sector has been monopolized; at an international level, they export to large countries, such as China, where the information is dispersive. Thus, sensing is driven by the case, such as meeting the “right people” during international fairs in Hong Kong.

Meanwhile, the commercial director of a winery (R9 of F4) has contrasting views; he contends that the search for new opportunities, such as the overall firms’ activity, is driven by a *sense to belong* to a specific territory—or in other terms, his firm is oriented toward *territorial value*:

The territorial element is what gives the competitive advantage of the company: this means that the company develops its business, management, relationship with customers and suppliers, based on its corporate philosophy. Machines and digitalization are only means which support the territorial value of the product.

This unique perspective can be understood better by considering the firm's type of production, which is derived from ancient roots, originating nearly 3,500 years ago. The winery produces a rare grape cultivar considered as one of the best cultivars in Italy. This suggests that DCs need to be contextualized to understand the interviewees' sense-making in shaping the organizational worldview and capabilities.

Another perspective is offered by a farmer (R11 of F6) operating in ovine farming, who considers the family environment the key to learning within sensing capacity, which can be also broadened to seizing and transforming capacities:

A great luck is that I have brothers who fully follow me; we are all innovators and ready to change. The ingredients for being innovators are openness and sharing. Our parents have encouraged us to be independent since we were kids.

These ideas are similar to the views expressed by another sheep farmer (R12 of F 7), who considers individual attitudes, such as the logical reasoning, the key for implementing innovative technology in his business:

In my village, only I use a flock management software. Farmers cannot act on the price of milk decided by industrial cheese factories, but they can do it in farm management and have savings and greater efficiency. I understand this reasoning well.

With regard to ovine farming, usually farmers work together with veterinarians and nutritionists, who play key roles in supporting farmers' decisions. Thus, "trusting technicians" appears as a means for implementing digitalization, similar to the case of F7. However, both farmers and technicians need to be open-minded to embrace change and innovation.

Considering the personal capabilities of entrepreneurs and managers, a perspective was offered by a family business running a cheese factory (F2), which focuses on organizational routines mainly based on the use of digital resources. The marketing manager (R4 of F2) says:

We also work with databases and indexes to understand what interesting markets may be captured. Once we select a market of interest, we can identify the customers who are involved in that market: Each company has a website, and we do research on the products that are used, and what are the main competitors.

Calibrating actions are, for instance, initiated in meetings with department managers aimed at finding solutions by discussing and recalibrating previous actions. As specified by the quality manager (R6) of the same company, the management staff adopts ordinary routines that normally combine the use of relational (meetings) and digital (data of internal/external reports and internet

information) capabilities. One dimension observed during the interview with three representatives (R4, R5, and R6) of F2, who are a niece and two nephews of the two founder brothers of the firm, is that they showed empathy and synergy, which fosters a collaborative environment among themselves and all the employees. They asserted that they are like an “extended family” where employees feel and act like family members. This value (feeling and acting like a family) can be interpreted as a potential capability that managers can elicit in solving corporate problems and overcoming change and handling DT.

Seizing

Capturing value is usually a process that involves a firm as a whole. Agribusinesses managed by one or a few people show simplified routines. A representative of a start-up firm (R13 of F 8) that created an app called Sementusa (Abruzzo et al., 2014), which farmers R11 of F6 and R12 of F 7 combine with the use of other digital equipment such as feeder and milking machines, gave interesting insights. He observed that implementing digital equipment like an app elicits new behaviors and roles among workers’ farms:

We know 50- to 60-year-old gentlemen who upload data easier by smartphones. Then there is the inclusion of farmers’ children who enter data in their smartphone and take part in the company. Even their immigrant workers upload data to their smartphone, while previously they were not so actively involved in the company management. By digitalization you can make them responsible.

Implementation of this app can be seen as a shift in the workforce commitment and organizational roles in which people are encouraged to assume greater responsibility in their duties, as shown in Table 3, which synthesizes the interviews’ findings.

A similar consideration was expressed by the manager (R7) of F3. The entire internal processes of this business have recently been digitalized. The employees found the change difficult to manage, but it brought corporate benefits, such as a shared sense of responsibility. As the manager claims:

Today the warehouse worker who receives the crates of vegetables from the producers does his job independently: before digitalization he had to go to another operator who informed him of the weight of the goods. Today the same person does everything, so if he makes a mistake, it is easy to identify it. Digitalization is not used to identify the culprits but to avoid mistakes and increase awareness of people who play a role of responsibility within the business process.

Most respondents—such as R1, R2, R4, R5, R7, R9, and R11—affirm that digitalization has had no influence on their historical portfolio of suppliers and clients acquired over time. Instead, digital resources can help entrepreneurs and management staff in making decisions about new suppliers/clients, as experienced by F1 and F2, which use data analytics and online platforms.

Table 3. Foundations of dynamic capabilities in high-digitalized firms.

Foundations of DCs		Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Firm 6	Firm 7	Firm 8
Sensing	Serendipity: "meeting the right people"	Relational capabilities	Digital sources: databases, online search	Personal capabilities such as humility and a strong character	Sense of belonging to "territory" is the added value of the product"	Family environment as the context for developing personal capabilities able to scan new opportunity	Family environment as the context for developing personal capabilities able to scan new opportunity	Personal capabilities (logical reasoning)	Personal capabilities (open-minded; good observer)
	Digital sources in scanning as new opportunity		Relational capabilities (meetings with departments' managers) Personal capabilities (empathy) "feeling as a family"		Digital scanning led by organizational routines based on relational capabilities	Digital scanning led by personal capabilities of entrepreneurs (open-minded)	Digital sources in scanning new opportunity led by curiosity to innovation		Relational capabilities (innovations are collective creations)
Seizing	Digital platforms combined with internal and external relational networks		Digital platforms combined with internal and external relational networks	Digitalization increases workers' commitment and responsibility	Digital platforms combined with relational networks based on trust	Relational capabilities (sharing innovations with the main client)	Collaboration within workers Collaborative relationship with technicians	Collaborative relationship with technicians	Digitalization elicits collaboration among workers/entrepreneurs, and increases workers' commitment and responsibility
Transforming	Restructuring internal resources and procedures by relational capabilities of top managers Strong corporate/territorial attachment of employees as a key for reshaping internal structures/roles		Relational capabilities (meetings) Digital sources and platforms as means to serve the firm's territorial vocation Value cocreation with customers (e.g., in packaging)	Personal capabilities (human interpretation of digital data; empathy for collaborative working) Women as a key factor in facilitating organizational change	Digital equipment and digital sources are seen as "tools" that support relational and personal capabilities	Personal capabilities (open-minded; opening to change)	Personal capabilities (trusting each other) Women as creative entrepreneurs who hold distinctive capabilities (e.g., determination, esthetic sense, creativity)	Valuable collaborators (such as the technicians)	Strategic role of open-minded technicians in promoting digital innovations

Online platforms provide information on potential suppliers or collaborators and are used in selection processes of workers as well, such as professional networks (for example, LinkedIn) and other social networks. But as representatives of F2 and F4 agree, the use of digital information is always combined with relational networks.

Transforming

Most firms were born as traditional businesses; only recently they have implemented digital technology that has had a strong impact on their organizational structures, procedures, routines, and behaviors. In some of them, such as R4 and 6 of F2 argue, digitalization appears as a flowing process facilitated by the generational change within the corporate management.

In others, similar to F1, digitalization is an ongoing process that mainly faces internal obstacles associated with the mental shift that is needed in the entire workforce to adapt routines to a new corporate scenario. In this case, digitalization occurs in the firm owing to the acquisition of new businesses in other parts of Italy and in China. The cooperative has grown in terms of market share, employees, organizational structures, and IT platforms. Thus, F1 is facing a deep change for which, as affirmed by R1, they feel unprepared: “We are experiencing a corporate transformation which is managed empirically. (...) There is a vision, but there is no operational plan yet.”

It is assumed that the lack of operational plan is similar to that in organizational and management procedures. However, F1 is working through corporate transformation that in parallel employs DT by restructuring internal resources, such as human resources. As the human resource (HR) manager (R2) affirms: “Here we have HRs that have a strong corporate attachment and such a love for this company, but also for Sardinia. These people must be accompanied on a path of business change.”

This appears to be one of the main challenges currently faced by companies implementing DT. In managerial terms, the managers must rework ordinary routines within the work environment. The R2 of F1 argues that employees regard a shift in *modus operandi* as a criticism; however, she believes that implementing digitalization is the only way to solve corporate problems, even if digitalization appears to be a problem in itself.

Implementing digitalization in small firms is less complex. Within the panel of interviews, small agribusinesses adopted digitalization, in both production and management activity aimed at increasing internal performance, through cost reduction and efficiency. There is no need to enlarge market outlets as they sell to stable clients, such as firms operating in livestock farming (F5, F6, and F7). Transforming capacities largely depend on entrepreneurial personal attitudes, such as “trusting each other” (R5 of F5) and being “open-minded,

curious, and collaborative” (R11 of F6) rather than on organizational capacities, which were not mentioned in the interviews.

The manager (R7) of F3 emphasized the important role of “human interpretation of data” as the key for creating DT in reality, which reminded him of a mix of his previous experience in managing firms with human empathy. The general director (R1) of F1 had a similar view and noticed that data need interpretation; a problem that his company is facing in reconfiguring organizational resources due to digitalization of procedures is due to generating too much information and missing a logic thread to leverage the potential data.

In interpreting the views of the representatives, digitalization appears to be a distressing phenomenon for which firms are unprepared to lead transformation and fully leverage the opportunity that digital data provide. It is likely that such agribusinesses are not ready for demonstrating the capabilities needed for digitalization.

Finally, a topic that emerged in some interviews relates to distinctive capabilities that men recognize in women within the ongoing process of DT of firms. The manager (R7) of F3 underlined the positive role of women in facilitating corporate transformation and restructuring procedures to satisfy the new organizational needs: “Here, there is a difference in relationships between men and women. Women are much more precise and proactive in facilitating the organizational change, rather than men.”

Similar views were expressed by the representative (R11) of F6: “Women are more precise, more fussier, more concrete in all jobs, not only in breeding. Even in terms of productivity, women are superior in comparison to men, and they have a great determination.”

Discussion

Although the most favorable context for exploring and identifying DCs is that of multinational companies operating in high-technology sectors and strongly oriented toward international markets (Teece, 2007), the present study shows that DCs can also be investigated in small and medium-sized agribusinesses enterprises, where the propensity for innovation and improvement of corporate performance is visible in the local context.

For example, in the case of the livestock farm with 1,500 sheep and 500 hectares of fodder land managed by three brothers (F6) who showed a constant interest in improvements, a curiosity for continuing research for innovations is transferred to daily practices. In other words, they deploy DCs that update and reconfigure the assets of their firm through a continual and iterative process of knowledge acquisition and innovation (Rodríguez-Serrano & Martín-Armario, 2019). According to Day and Schoemaker (2016), these farmers adopt peripheral vision on scanning opportunities: they learn from the past, thanks also to a family history in which their parents have been reinforcing them with trust and freedom in

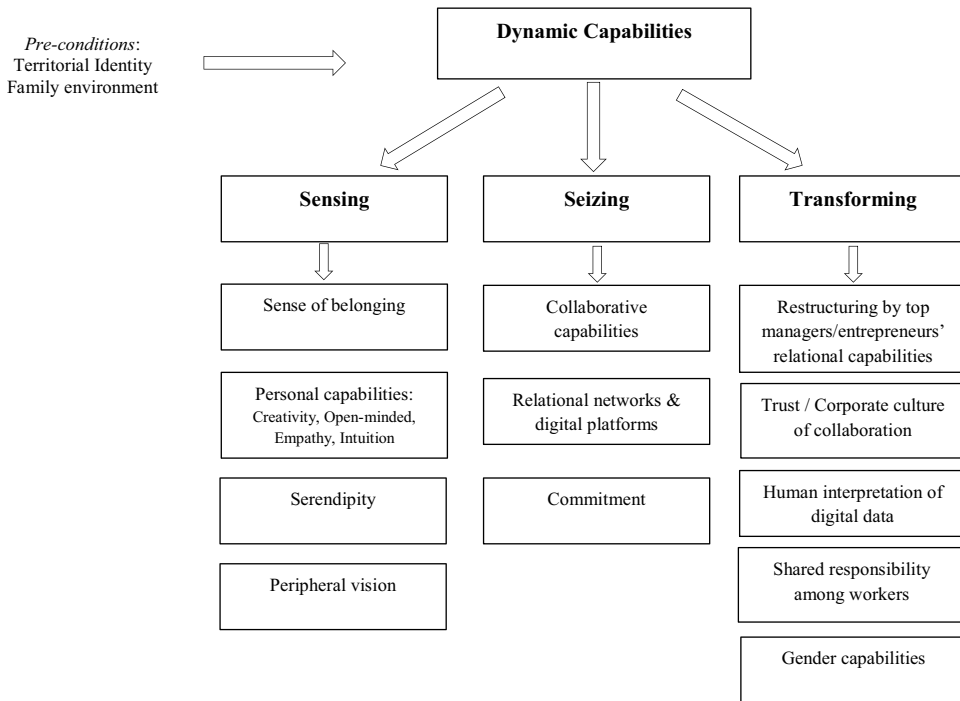


Figure 2. Findings of dynamic capabilities for digital transformation in agrifood firms.

taking risks. As shown in [Figure 2](#), the family environment, which is a dynamic asset in the evolutionary human capital of organizations (Leitão et al., 2020), is considered a *precondition* for building personal DCs, such as curiosity and open-mindedness, among entrepreneurs.

The three entrepreneurs constantly search online for new tricks to be included in the small firm, and they find new digital tools to be applied to mechanical means for the cultivation of fodder. Although, in this case, the emerging capabilities are not oriented to acquire new international markets, such as in the case of small *born-global* firms (Rodríguez-Serrano & Martín-Armario, 2019), they address the need to increase business efficiency, product quality, and sustainability of production processes that involve energy and resource savings so that the company plans to open a mini dairy and promote female entrepreneurship. In essence, these are the capabilities that allow a firm to stay alive and face, with their own distinctive *integrative capabilities* (Liao et al., 2009), market turbulences, such as the change in the price of milk that causes crises for companies that have not improved their production processes.

The original meanings related to the implementation of a DCs framework in the context of DT within the agrifood sector that emerged from this study are a sense of belonging to territorial value-oriented enterprises and development of a more conscious sense of responsibility and corporate attachment of workers. A strong sense of territorial identity (considered a precapability for building DCs, as

shown in Figure 2) shapes agrifood enterprises and can be considered a precondition in eliciting sensing, seizing, and transforming capabilities. For instance, according to Witschel et al. (2019), critical capabilities for sensing, such as trend monitoring and market screening, exchange with cross-divisional units, and analysis of best practices, depend on the maintenance of the territorial values on which the corporate identity of agribusinesses are based. In other words, scanning new market opportunities in the cooperative that produces wine from a rare cultivar (F4) is driven by the need to sustain the uniqueness that characterizes that firm and from which derives the essential source of competitive advantage.

A high-level commitment among managers and employees plays a key role in facing the design of new activities (for example, in F1). Relational capabilities are elicited by the combined use of digital sources and platforms within a plethora of firms' actors who were not involved before the DT. In F6, a breeding management mobile application was implemented, which encompassed the firm's workers, who were used to working independently.

In organizational redesign (Day & Schoemaker, 2016) and in building digital transforming capabilities, such as redesigning internal structures (Warner & Wäger, 2019), the sharing of responsibility is critical when digitalization is implemented in traditional businesses. This is seen in agribusinesses (F1, F2, F3, and F6) that are facing changes with varying degrees of difficulty. Some authors (Lowik et al., 2012; Matanda et al., 2016) observed in the context of small-scale businesses that firms are requested to engage relational capabilities with other companies, which has a positive effect on the acquisition of new knowledge and innovation performance. This is shown in the present study, for example, in the relational capabilities of a livestock farmer (F5) dealing with a cheese factory (F1) who acquired new knowledge by implementing digital equipment management software that increased farming efficiency.

One aspect highlighted by R6 of F3 and R11 of F6 is the gender issue that has not been dealt with in the literature of the DCs, nor does it emerge in the study of DT. According to the interviewees, both ordinary and dynamic female capabilities play a decisive role in promoting innovation processes. Thus, as other novel results of this study, creativity of the entrepreneur and manager who belong to the microfoundations identified by Teece (2007) can be further distinguished by gender: male entrepreneurs interviewed in this study attributed to women a greater intuition and creativity in sensing new opportunities than to men (F6). In addition, women showed greater ease in finding ways to deal with the changes required in the company (F3). Bronson (2018) observed that innovations by definition offer technical novelties and ingenuity, but they often reproduce, rather than disrupt, societal relationships of power and authority. It is interesting to observe that, in this study, DT may reshape the societal *status quo*, such as the predominance of the patriarchy, for instance, by the highest presence of women in the agrifood sector who take the lead in innovations. National

trends (as underlined by Puglia Reporter, 2019) and research outputs (Sanlorenzo, 2011) show that most innovators in agriculture are women.

Conclusions

Contributions and implications

Digitalization has the power to disrupt and reshape managerial and organizational corporate structures and mindsets. As any new agent of transformative change, it needs to be led by entrepreneurs and managers' capabilities to develop its positive potential aimed at enhancing the whole value chain.

The domain of DCs looks at a challenging lens for investigating the implementation of DT in agribusiness as well because it is an unexplored field of research. The present study adopted the conceptual framework of DCs within the Sardinian agrifood sector where DT is occurring among firms with different size, speeds, and outcomes. The study addressed gaps in the literature by (a) providing an empirical implementation of DCs, for which there is limited study; and (b) showing that empirical implementation occurred in the context of the agrifood sector, mainly composed by SMEs, where DCs are completely unexplored.

In investigating the distinct factors that shape DCs developed by agribusiness involved in DT, novel concepts of personal and organizational capabilities were found to further enrich the literature. These were grouped into three main points. First, the setting of the present study provides a capability to agribusinesses who shape their corporate identity by the uniqueness of environmental, cultural, and social territorial sources of competitive advantage: an old tradition in farming a rare wine cultivar and producing cheese offer the basis for marketing high-quality products that are commercialized locally and globally. In other words, territorial identity is a source of competitive advantage combined with personal/managerial and organizational DCs, which allows firms to respond quickly to rapid changes in the market and in technology.

Second, the sense of belonging to a corporation that entrepreneurs, managers, and workers of both small and large firms showed in this study suggests that organizational and managerial microfoundations or subcapabilities are strictly intertwined with culture and corporate identity. While digitalization processes are reshaping corporate structures, procedures, and mindsets, the role of workers who feel like members of an extended family and show a high sense of responsibility in facing change emerged. Moreover, personal capabilities such as creativity, empathy, and intuition that may derive from serendipity, in addition to the peripheral vision held by entrepreneurs and managers, help in facing the disturbing organizational transformations created by digitalization.

Third, the aforementioned personal capabilities appear to assume distinct features, such as gender issues: women are seen by men as holders of higher abilities in sensing new opportunities, balancing internal and external options

in seizing activities, and eliciting faster decision-making and redesigning internal structures. The present study does not provide absolute truths; therefore, researchers are encouraged to probe the terrain of gender differences with respect to the topic of DCs within SMEs.

Limitations and directions for future research

Digital data genesis capabilities need further research (Raguseo & Vitari, 2014): some companies we interviewed generate data in digital form. When more direct questions on how these firms benefit from native digital data were explored, the answers were unanimously aimed at highlighting the human role in the interpretation of data. Data, as well as digital tools, are considered fundamental supports to human capacities but not generators of specific capacities.

According to the companies interviewed, the relationships between workers and all the stakeholders of the company, sharing of information, and respect of the territorial values that are sources of corporate competitiveness are the key factors of the DCs that allow firms to recombine their internal resources to respond to the turbulence and challenges of local/global markets. However, further research is warranted to enrich this field of study by deepening the DCs conceptualization for DT within agrifood firms.

Acknowledgments

This study was initiated by The Autonomous Region of Sardinia and coordinated by Professor Francesca Cabiddu of the Department of Economic and Business Science of the University of Cagliari (Italy).

Funding

This study was funded by The Autonomous Region of Sardinia

ORCID

Rita Cannas  <http://orcid.org/0000-0002-2809-4147>

References

- Abruzzo, N., Marino, G., Falsone, L., Accursio Marino, D., Brianti, E., Boi, R., Chiofalo, G., & Argiolas, G. (2014). Improvement of reproductive performances with a combined strategy (Sementusa®) in sheep farms in Sicily. *Large Animal Review*, 20(5), 209–213. https://www.researchgate.net/profile/Luigi_Falsone/publication/279035840_Improvement_of_reproductive_performances_with_a_combined_strategy_Sementusa_R_in_sheep_farms_in_Sicily/links/59428d124585159427203991/Improvement-of-reproductive-performances-with-a-combined-strategy-Sementusa-R-in-sheep-farms-in-Sicily.pdf

- Amit, R., & Schoemaker, P. J. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, 14(1), 33–46. <https://doi.org/10.1002/smj.4250140105>
- Amit, R., & Zott, C. (2001). Value creation in e-business. *Strategic Management Journal*, 22(7), 493–520. <https://doi.org/10.1002/smj.187>
- Anastasiadis, F., Tsolakis, N., & Srai, J. (2018). Digital technologies towards resource efficiency in the agri-food sector: Key challenges in developing countries. *Sustainability*, 10(12), 4850. <https://doi.org/10.3390/su10124850>
- Assarroudi, A., Heshmati Nabavi, F., Armat, M. R., Ebadi, A., & Vaismoradi, M. (2018). Directed qualitative content analysis: The description and elaboration of its underpinning methods and data analysis process. *Journal of Research in Nursing*, 23(1), 42–55. <https://doi.org/10.1177/1744987117741667>
- Augier, M., & Teece, D. J. (2009). Dynamic capabilities and the role of managers in business strategy and economic performance. *Organization Science*, 20(2), 410–421. <https://doi.org/10.1287/orsc.1090.0424>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Benitez, J., Castillo, A., Llorens, J., & Braojos, J. (2018). IT-enabled knowledge ambidexterity and innovation performance in small US firms: The moderator role of social media capability. *Information & Management*, 55(1), 131–143. <https://doi.org/10.1016/j.im.2017.09.004>
- Bogner, E., Voelklein, T., Schroedel, O., & Franke, J. (2016). Study based analysis on the current digitalization degree in the manufacturing industry in Germany. *Procedia CIRP*, 57, 14–19. <https://doi.org/10.1016/j.procir.2016.11.004>
- Bronson, K. (2018). Smart farming: Including rights holders for responsible agricultural innovation. *Technology Innovation Management Review*, 8(2), 7–14. <https://doi.org/10.22215/timreview/1135>
- Bronson, K., & Knezevic, I. (2016). Big Data in food and agriculture. *Big Data & Society*, 3(1), 1–5. <https://doi.org/10.1177/2053951716648174>
- Chen, J. E., Pan, S. L., & Ouyang, T. H. (2014). Routine reconfiguration in traditional companies' e-commerce strategy implementation: A trajectory perspective. *Information Management*, 51(2), 270–282. <https://doi.org/10.1016/j.im.2013.11.008>
- Dana, L. P., & Dumez, H. (2015). Qualitative research revisited: Epistemology of a comprehensive approach. *International Journal of Entrepreneurship and Small Business*, 26(2), 154–170. <https://doi.org/10.1504/IJESB.2015.071822>
- Danneels, E. (2008). Organization antecedents of second order competences. *Strategic Management Journal*, 29(5), 519–543. <https://doi.org/10.1002/smj.684>
- Day, G. S., & Schoemaker, P. J. (2016). Adapting to fast-changing markets and technologies. *California Management Review*, 58(4), 59–77. <https://doi.org/10.1525/cmr.2016.58.4.59>
- De Mori, C., Batalha, M. O., & Alfranca, O. (2016). A model for measuring technology capability in the agri-food industry companies. *British Food Journal*, 118(6), 1422–1461. <https://doi.org/10.1108/BFJ-10-2015-0386>
- Dehning, B., Richardson, V. J., & Zmud, R. W. (2003). The value relevance of announcements of transformational information technology investments. *MIS Quarterly*, 27(4), 637–656. <https://doi.org/10.2307/30036551>
- Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121. [https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E)
- Ellonen, H. K., Jantunen, A., & Kuivalainen, O. (2011). The role of dynamic capabilities in developing innovation-related capabilities. *International Journal of Innovation Management*, 15(3), 459–478. <https://doi.org/10.1142/S1363919611003246>

- Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT Sloan Management Review*, 55(2), 1. https://d1wqtxts1xzle7.cloudfront.net/48780763/MIT_Digital_Technology.pdf?1473710748=&response-content-disposition=inline%3B+filename%3DEmbracing_Digital_Technology_A_New_Strat.pdf&Expires=1605543237&Signature=e2aBExiyH0koQQcgcT-Zyuj4s6vXB5aLr-ZIXaPVQwgMbOoapcmYdbem94jsgTwZY5BbFNuWzVAOfGAh7GM-mM66VBrugrqKOpfljJB19IxSZ6Q8KaSPGV2SUMqJn4gHCN89ugim7802WrxAivyLsiBM P9WmaStDGT9o4CFjbIJhsTNFXff-iFZDawoqSVgnNzKOLm9goZB3uQ1qZOJVCx6RnC XXzDXDOuCL9qWcWf5Fpvdrt~FZZ-nO~LaE8zzZv4oeRdCo7rr505YYWBGJ4drCu6 GPLQpGIzOr-KDm5H53aQo80A9nFu6nkvbl2O2YzEmeeTLnS2MVuEq6-dYw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA
- Foroudi, P., Gupta, S., Nazarian, A., & Duda, M. (2017). Digital technology and marketing management capability: Achieving growth in SMEs. *Qualitative Market Research: An International Journal*, 20(2), 230–246. <https://doi.org/10.1108/QMR-01-2017-0014>
- Fulton, J. P., & Port, K. (2018). Precision agriculture data management. In D. K. Shannon, D. E. Clay, & N. R. Kitchen (Eds.), *Precision Agriculture Basics* (pp. 169–187). ASA, CSSA, and SSSA Books. <https://doi.org/10.2134/precisionagbasics.2016.0095>
- Gërguri-Rashiti, S., Ramadani, V., Abazi-Alili, H., Dana, L. P., & Ratten, V. (2017). ICT, innovation and firm performance: The transition economies context. *Thunderbird International Business Review*, 59(1), 93–102. <https://doi.org/10.1002/tie.21772>
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2012). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>
- Groenland, E., & Dana, L. P. (2019). The content analysis methodology. In E. Groenland & L.P. Dana (Eds.), *Qualitative methodologies and data collection methods: Toward increased rigour in management research* (pp. 109–124). World Scientific.
- Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell Publishing.
- Helfat, C. E., & Martin, J. A. (2015). Dynamic managerial capabilities: Review and assessment of managerial impact on strategic change. *Journal of Management*, 41(5), 1281–1312. <https://doi.org/10.1177/0149206314561301>
- Hernández-Linares, R., Kellermanns, F. W., & López-Fernández, M. C. (2018). Dynamic capabilities and SME performance: The moderating effect of market orientation. *Journal of Small Business Management*, 1–26. <https://doi.org/10.1111/jsbm.12474>
- Hess, T., Matt, C., Benlian, A., & Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, 15(2), 123–139. <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=8cf8ea53-25fd-41de-8004-d70420d7ba6e%40pdc-v-sessmgr04>
- Horlacher, A., Klarner, P., & Hess, T. (2016). Crossing boundaries: Organization design parameters surrounding CDOs and their digital transformation activities. *22nd Americas Conference on Information Systems (AMCIS)*, San Diego, CA.
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- Jayaraman, P. P., Palmer, D., Zaslavsky, A., & Georgakopoulos, D. (2015). Do-it-Yourself Digital Agriculture applications with semantically enhanced IoT platform. *2015 IEEE tenth international conference on intelligent sensors, sensor networks and information processing (IP)*. IEEE.
- Kohlbacher, F. (2006). The use of qualitative content analysis in case study research. *Forum: Qualitative Social Research*, 7(1), 1–30. <http://dx.doi.org/10.17169/fqs-7.1.75>

- Konlechner, S., Müller, B., & Güttel, W. H. (2018). A dynamic capabilities perspective on managing technological change: A review, framework and research agenda. *International Journal of Technology Management*, 76(3–4), 188–213. <https://doi.org/10.1504/IJTM.2018.091285>
- Lanza, A., & Passarelli, M. (2014). Technology change and dynamic entrepreneurial capabilities. *Journal of Small Business Management*, 52(3), 427–450. <https://doi.org/10.1111/jsbm.12042>
- Leitão, J., Nunes, A., Pereira, D., & Ramadani, V. (2020). Insights into a new research agenda for the behavioural theory of the firm. In J. Leitão, A. Nunes, D. Pereira & V. Ramadani (Eds.), *Intrapreneurship and sustainable human capital* (pp. 1–8). Springer.
- Liao, J., Kickul, J. R., & Ma, H. (2009). Organizational dynamic capability and innovation: An empirical examination of internet firms. *Journal of Small Business Management*, 47(3), 263–286. <https://doi.org/10.1111/j.1540-627X.2009.00271.x>
- Liu, D., Chen, S., & Chou, T. (2011). Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project. *Management Decision*, 49(10), 1728–1742. <https://doi.org/10.1108/00251741111183852>
- Lowik, S., van Rossum, D., Kraaijenbrink, J., & Groen, A. (2012). Strong ties as sources of new knowledge: How small firms innovate through bridging capabilities. *Journal of Small Business Management*, 50(2), 239–256. <https://doi.org/10.1111/j.1540-627X.2012.00352.x>
- Lucas, H. C. J., Agarwal, R., Clemons, E. K., El Sawy, O. A., & Weber, B. W. (2013). Impactful research on transformational information technology: An opportunity to inform new audiences. *MIS Quarterly*, 37(2), 371–382. <https://doi.org/10.25300/MISQ/2013/37.2.03>
- Matanda, M. J., Ndubisi, N. O., & Jie, F. (2016). Effects of relational capabilities and power asymmetry on innovativeness and flexibility of Sub-Sahara Africa small exporting firms. *Journal of Small Business Management*, 54(1), 118–138. <https://doi.org/10.1111/jsbm.12134>
- Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research*, 1(2), 1–10. <https://www.qualitative-research.net/index.php/fqs/article/view/1089/2386>
- Newey, L. R., & Zahra, S. A. (2009). The evolving firm: How dynamic and operating capabilities interact to enable entrepreneurship. *British Journal of Management*, 20, 81–100. <https://doi.org/10.1111/j.1467-8551.2008.00614.x>
- Oswald, G., & Kleinemeier, M. (2017). *Shaping the digital enterprise*. Springer International Publishing.
- Pavlou, P. A., & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision Sciences*, 42(1), 239–273. <https://doi.org/10.1111/j.1540-5915.2010.00287.x>
- Piccoli, G., & Watson, R. T. (2008). Profit from customer data by identifying strategic opportunities and adopting the “born digital” approach. *MIS Quarterly Executive*, 7(3), 113–122. https://dds.cct.lsu.edu/ddslab/pdf/profit_from_customer_data.pdf
- Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64–88. [https://econtent.liba.edu/Cases%20ordered%20fresh%20list/Smart%20connected%20products%20\(HBR\).PDF](https://econtent.liba.edu/Cases%20ordered%20fresh%20list/Smart%20connected%20products%20(HBR).PDF)
- Puglia Reporter. (2019). *Puglia – Le donne acculturate tornano alla terra e rilanciano l'agricoltura rispettando l'ambiente: Un'azienda su 3 è gestita da loro con studi e tecnologia avanzata*. Puglia Reporter. 8 Maggio. https://www.pugliareporter.com/2019/05/08/puglia-le-donne-acculturate-tornano-alla-terra-rilanciano-lagricoltura-rispettando-lambiente-unazienda-3-gestita-studi-tecnologia-avanzata/?fbclid=IwAR1tIT-Mmw3UL_xhb1LSHi4hztjxJm-KZHFYOWjEKfXEL6jx2xwcObJFU0U
- Raguseo, E., & Vitari, C. (2014). The development of the DDG-capability in firms: An evaluation of its impact on firm financial performance. In L. Caporarello, B. Di Martino, & M. Martinez (Eds.), *Smart organizations and smart artifacts* (pp. 97–104). Springer.

- Ratten, V., Ramadani, V., & Fayolle, A. (2017). Exploring family farms and sustainable entrepreneurship in Australian farmers' markets. In W. Frost & J. Laing (Eds), *Exhibitions, trade fairs and industrial events* (pp. 173–182). Routledge.
- Rodríguez-Serrano, M. Á., & Martín-Armario, E. (2019). Born-global SMEs, performance, and dynamic absorptive capacity: Evidence from Spanish firms. *Journal of Small Business Management*, 57(2), 298–326. <https://doi.org/10.1111/jsbm.12319>
- Sánchez-Montesinos, F., Opazo Basáez, M., Arias Aranda, D., & Bustinza, O. F. (2018). Creating isolating mechanisms through digital servitization: The case of Covirán. *Strategic Change*, 27(2), 121–128. <https://doi.org/10.1002/jsc.2187>
- Sanlorenzo, G. (2011, Settembre). Il ruolo della donna nell'agricoltura contemporanea, multi-funzionale e innovativa. *Agriregionieuropa*, 7(26), 91. <https://agriregionieuropa.univpm.it/it/content/article/31/26/il-ruolo-della-donna-nellagricoltura-contemporanea-multifunzionale-e-sardegna-statistiche>
- Sardegna Statistiche. (2016). *Tavola 3 - Aziende agricole per forma giuridica, regione e ripartizione geografica. Anno 2016. Tavola 12 - Persone per categoria di manodopera agricola, regione e ripartizione geografica. Anno 2016.* <http://www.sardegna-statistiche.it/argomenti/agricoltura/>.
- Schiefer, G. (2004). New technologies and their impact on the agri-food sector: An economists view. *Computers and Electronics in Agriculture*, 43(2), 163–172. <https://doi.org/10.1016/j.compag.2003.12.002>
- Singh, A., & Hess, T. (2017). How chief digital officers promote the digital transformation of their companies. *MIS Quarterly Executive*, 16(1), 1–18. <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=63a973b8-4c36-4665-9b5d-329a384772a6%40pdc-v-sessmgr04>
- Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42, 1568–1580. <https://doi.org/10.1016/j.respol.2013.05.008>
- Tan, B., Pan, S. L., Lu, X., & Huang, L. (2015). The role of IS capabilities in the development of multi-sided platforms: The digital ecosystem strategy of Alibaba.Com. *Journal of the Association for Information Systems*, 16(4), 248–280. <https://doi.org/10.17705/1jais.00393>
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and micro foundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Teece, D. J. (2009). *Dynamic capabilities and strategic management: Organizing for innovation and growth*. Oxford University Press.
- Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives*, 28(4), 328–352. <https://doi.org/10.5465/amp.2013.0116>
- Teece, D. J. (2017). Dynamic capabilities and (digital) platform lifecycles. *Entrepreneurship, Innovation, and Platforms*, 37, 211–225. <https://doi.org/10.1108/S0742-332220170000037008>
- Teece, D. J., & Linden, G. (2017). Business models, value capture, and the digital enterprise. *Journal of Organization Design*, 6(1), 1–14. <https://doi.org/10.1186/s41469-017-0018-x>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Valdez-Juárez, L. E., García-Pérez-de-Lema, D., & Maldonado-Guzmán, G. (2018). ICT and KM, drivers of innovation and profitability in SMEs. *Journal of Information & Knowledge Management*, 17(1), 1850007. <https://doi.org/10.1142/S0219649218500077>
- van Es, H. M., & Woodard, J. D. (2017). Innovation in agriculture and food systems in the digital age. In S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.), *The Global Innovation Index 2017: Innovation Feeding the World* (pp. 97–104). Cornell University. Retrieved 23 Febraury, 2020, from <https://d1wqtxts1xzle7.cloudfront.net/54308881/gii-full-report-2017>.

pdf?1504257281=&response-content-disposition=inline%3B+filename%3DThe_Global_Innovation_Index_2017_Innovat.pdf&Expires=1605555230&Signature=D-hzR N H U 3 p i 6 8 F T O o P T F 5 k F ~ m 8 ~ 8 o c 4 Y b R v 2 Y u N c e M x - i G Z R X Q P K k N I 6 2 x 9 L I S a a 9 C H N K o z d S 2 U z k b O c P w L Z T Q S V X K 9 z 9 c J k D B n V E w s J 2 T U C I F f 5 M O f B x E A H s j C G D ~ i q Y w r A z z G L 4 ~ n S i M ~ F 2 I m ~ Q S m 0 5 D 0 ~ Z 9 p ~ C y 0 4 d b h 3 7 f 8 y c m - 6 A L 6 8 i 4 c Y Z v A Y y U x q I E Z Q S u Y K d 9 L J a 7 Z W M h H s X x T v T l z q - 4 P I B h v x E k h h z ~ m p M k s P S q P l v m R d s i x f H d 0 u E Y j Y B P j I J M x A I v W h D f 5 D W f v l J h 3 Y I n 1 G 6 z a S W b C f Z O D P d z F R - 5 l i c Y j 9 X 5 d N B 8 J l C 0 6 x r ~ t k 8 G z O 3 K b w 9 h 2 5 8 g _ _ & Key - P a i r - I d = A P K A J L O H F 5 G G S L R B V 4 Z A # p a g e = 1 2 7

- van Es, H. M., Woodard, J. D., Glos, M., Chiu, L. V., Dutta, T., & Ristow, A. (2016). *Digital agriculture in New York state: Report and recommendations*. Cornell University.
- Venkatraman, N. (1994). IT-enabled business transformation: From automation to business scope redefinition. *Sloan Management Review*, 35(2), 73–87. http://www.cs.jyu.fi/el/tjtse56_10/TJTSE56_Syllabus_files/Venkatraman%20-%20IT%20Enabled%20Business%20Transformation%20-%20From%20Automation%20to%20Business%20Scope%20Redefinition.pdf
- Vitari, C. (2009). IT dynamic capability development in the context of data genesis capability. *The 17th European Conference on Information Systems*.
- Warner, K. S., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, 52(3), 326–349. <https://doi.org/10.1016/j.lrp.2018.12.001>
- Witschel, D., Döhla, A., Kaiser, M., Voigt, K. I., & Pfletschinger, T. (2019). Riding on the wave of digitization: Insights how and under what settings dynamic capabilities facilitate digital-driven business model change. *Journal of Business Economics*, 89(8–9), 1023–1095. <https://doi.org/10.1007/s11573-019-00950-5>
- Yeow, A., Soh, C., & Hansen, R. (2018). Aligning with new digital strategy: A dynamic capabilities approach. *The Journal of Strategic Information Systems*, 27(1), 43–58. <http://dx.doi.org/10.1016/j.jsis.2017.09.001>
- Zambon, I., Cecchini, M., Egidi, G., Saporito, M. G., & Colantoni, A. (2019). Revolution 4.0: Industry vs. agriculture in a future development for SMEs. *Processes*, 7(1), 36. <https://doi.org/10.3390/pr7010036>
- Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organisation Science*, 13(3), 339–351. <https://doi.org/10.1287/orsc.13.3.339.2780>