Food 4.0 for competing during the COVID-19 pandemic: experimenting digitalization in family firms

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Abstract

Purpose – Within food industry several changes and innovations are affecting the management of the entire supply chain (production, logistics, etc.). As strategy for the survival and competition, digitalization has assumed a crucial role during the pandemic emergence by causing the reconfiguration of traditional chains and business models. Framed in these premises, the research analyses how digital technologies have innovated the sub-chains of bakery products and pasta within food industry with reference to customers’ interactions, delivery and marketing during the COVID-19 pandemic emergence.

Design/methodology/approach – Moving from a critical literature review about the perspectives of digital technologies within the tradition of food industry, action research has been adopted to analyze in deep a case study of the start-up “ArteBianca Delivery” located in South Italy. Through this method, researchers have been deeply involved within the start-up to face the challenge of transforming the marketing and customer care into digital ones due to the COVID-19 restriction.

Findings – Findings provide empirical evidence about the reconfiguration of the traditional business model of a family firm in the food sector into a digital one with the start-up “ArteBianca Delivery”. The marketing, delivery, e-commerce and customer care components of the business models have been supported and enhanced through the adoption of digital tools, such as mobile applications and social technologies useful both for users and for a more urgent digitization of company.

Practical implications – Implications for practice can be identified into the pattern of digital transformation implemented as well as in the opportunity of replication and contextualization of the results to other companies looking for setting up a digital strategy.

Originality/value – Elements of original contribution can be identified into: (1) the exploration of digital transformation in food family firms caused by the pandemic emergence, (2) the contextualization of the digital transformation to the sub-chains of bakery and pasta and (3) the geographical location of the case.

Keywords Food 4.0, Digital transformation, Digital marketing, Action research, Family firm

Paper type Research paper

1. Introduction

Food industry is one of the sectors most affected by the digital transformation (Brem et al., 2021; Zeng et al., 2017; Troise et al., 2022; Rondi et al., 2022). Despite it is traditionally considered not very inclined to innovation, it has been revolutionized by the digitalization not only in terms of improving efficiency but also for the realization of responses to new requirements, new food and food safety needs (Scuotto et al., 2017). Within food industry several changes and innovations are affecting the management of the entire supply chain (production, logistics, etc.) where the combination of tradition and innovation still implies certain challenges today coming from the application of digital technologies (Torero, 2020). In the meantime, the digitalization is also impacting on the consumers’ behaviors (Marinković et al., 2021), with the growth of the online sales volumes and the virtualization of the customers’ journeys (Statista, Inc, 2019).

Indeed, the different families of digital technologies at the basis of the digital transformation paradigm (i.e. artificial intelligence, blockchain, virtual reality, big data,
etc.) have drastically transformed the way of doing business and the customers’ experience, by enabling new competitive and consumption experiences more based on information (Bresciani et al., 2018; Troise et al., 2022). Industry 4.0 before being a technological change is a social change. According to Cimini et al. (2021), digital technologies impact both at the micro level (individual organizations) and at the macro level (industrial sectors and the entire economy). These technologies can support companies competing in this new scenario, in which the consumer’s communication and decision-making process has been completely transformed (Corvello et al., 2022a, 2022b).

In replying to this, firms operating in food industry have demonstrated to have a high reactivity towards the implementation of digital technologies in business models considered as useful to increase performance, to search for new opportunities and new markets (Henderson et al., 2018). In this scenario of radical change, also entrepreneurs must become revolutionary together with the digital revolution (Shane, 2003; Ambrish, 2014). Therefore, new initiatives are born that also lead to transformations as digital entrepreneur (Pinem, 2019; Hsieh and Wu, 2019).

Although several specific studies have been developed on the food industry, few scholars studied the digital transformation process in the context of food family firms. Family firms are characterized by the lack of resources impede the high propensity for business model innovation through the adoption of digital technologies (Vrontis et al., 2016; Bresciani, 2017; Del Vecchio et al., 2019). It is, therefore, necessary to identify support tools useful for the realization of innovative, technological and digital business models (Michelini et al., 2020). The competitiveness of companies in this industry depends from their ability to make production more efficient, to create new products (Guoqing et al., 2020) but “also promotes automation of operations, data management and access to a new range of management tools” (Panetto et al., 2019). In the meantime, food firms are called to afford the challenges associated to the innovation in customers’ behaviors by leveraging on their often limited sized and resources (Scuotto et al., 2017).

Despite the growing interest reserved to these issues, the full understanding of how digitalization has been implemented in the context of food family firms in replying to the limitations due to COVID-19, requires additional efforts both from the theoretical and empirical point of view (Rondi et al., 2022). Moving from the above premises, the research aims to clarify the following research question:

**RQ1. How can bakery products and pasta sub-chains, within the food industry, digitalize activities related to customer interactions, delivery and marketing?**

This guiding research question is driven by the context of digital transition also disrupted by the COVID-19 pandemic (Corvello et al., 2022a).

Moving from a critical literature review about the innovative perspectives of digital technologies in the traditional food industry, action research has been adopted to analyze in deep a case study of the start-up “ArteBianca Delivery”, a family firm located in Apulia Region in south Italy. The action research methodology aims to solve an immediate problematic issue in order to reach a desired future situation, a “searchable question” by carrying out the development of a series of actions to be activated (Susman and Evered, 1978). Through this method, researchers have been deeply involved within the case to solve the problem of transforming the marketing and customer care into a digital marketing and for assessing the digital transition of the start-up in the field of bakery and pasta.

Findings offer factual proof of the transformation of family firms’ conventional business models in the food industry into a digital one with the launch of “ArteBianca Delivery. Start-up.” The use of digital tools like mobile applications, which are helpful for both consumers and for a more rapid digitization of businesses, has supported and improved the marketing,
delivery, e-commerce and customer service components of the traditional business models. The application of the digital maturity model (DMM) to the family firm “Panificio Flli Barile SRLS,” highlighted the importance that some digital tools may have to support the knowledge path toward the digital transition of companies belonging to more traditional sector, the bakery and past products.

The remainder of the paper is organized as follows: section 2 introduces the background about digital transformation in the food industry, section 3 describes the research design, the methodology used data collection and data analysis. Section 4 presents the research findings. The last section presents the discussion and conclusion of the paper in which are discussed implication and further research.

2. Background

2.1 Digital transformation and food 4.0

In recent years we are assisting to a rapid evolution of digital technologies. We are immersed in the fourth industrial revolution, the web 4.0 revolution characterizing the Industry 4.0 paradigm in which digital technologies impact on businesses, companies and citizens (Mihai, 2020). In the fourth industrial revolution nine enabling technologies are protagonists: augmented reality, IoT, advanced manufacturing solutions, big data (BD) analytics, cloud computing, cyber security, simulation, additive manufacturing, horizontal and vertical integration (Bresciani et al., 2018; Buchi et al., 2020; Troise et al., 2022). These technologies are considered as the drivers of business model innovation and they are able to capture and create value as well as to develop new business models or to innovate existing business models (Müller et al., 2018; Dressler and Paunovic, 2020).

The digital transformation is enhancing the importance of human capital and of digital skills by transforming the company under a strategic, organizational, social, cultural dimension, to create value by leveraging the power of digital technologies (Elia et al., 2020a, b) allowing significant service improvements to build relationships and communication with customers (Kraus and Kraus, 2021). Industry 4.0 also paves the way for the development of digital systems coupled with Internet technologies in the form of “smart” businesses based on data. Data are a central element both for the production of knowledge and for the information processing (Klingenberg et al., 2019). Data are the competitive advantage of many companies which, thanks to the use of predictive algorithms, are able to decipher the tastes of their customers, targeting specific and personalized advertising offers (Brem et al., 2021; Sussan et al., 2017). Several businesses today have made the decision to digitize their operations and to innovate their business models. Because it may improve economic efficiency at all levels of analysis, digitalization is increasingly serving as a catalyst for the growth of Industry 4.0, the core of which is data, information processing through the pervasive use of digital technologies to connect, govern and innovate the industrial chains (Elia et al., 2020a, b). Utilizing digital technology paves the way for the modernization of established economic sectors and encourages the establishment of fresh, creative business models (Kraus and Kraus, 2021).

The idea of “Industry 4.0” developed by the European Union combines digital transformation and digitalization (Gupta, 2020). Digitalization is a complex process occurring at the convergence among virtual and physical worlds and supporting change and innovation (Trzaska et al., 2021). According to Bärfänger and Otto (2015), the digital business model is a business strategy “whose underlying business logic deliberately acknowledges the characteristics of digitalization and takes advantage of them; both in interaction with customers and business partners and in its internal operations.” There are business models for goods and services offered via digital platforms (El Sawy and Pereira, 2013). If this model introduces digital technology that
begin to fundamentally alter how company is conducted and revenues are earned, then
that business model is considered to be digital (Roblek et al., 2020). Digital business
models describe how various industry companies interact with their clients digitally to
generate value using platforms like websites and mobile devices (Weill and Woerner,
2013). The focus of this study is about digitalization. Among the industries in which
technologies become protagonists the food industry is playing a relevant role (Trivelli
et al., 2019). Food industry needs to maintain competitive advantage in the market
but also to comply with a series of requirements related to the production and trade of
food products, including: quality, flexibility in the supply and delivery of food,
traceability, food tracking reliability, food safety, control and respect for the
environment, efficiency of organizational and production processes (Schiefer, 2004) but
also to satisfy new food consumption trends and the price volatility (Bowen and Morris,
2019). An important role in this path is played by new digital technologies, and by the
adoption of digital innovative strategies (Schiefer, 2004; McFadden and Gorman, 2016;
Dressler and Paunovic, 2020) as well as by the emerging on new business models
(Michelini et al., 2020).

The food industry is evolving toward a 4.0 configuration, a definition that emerged
similarly to the emergence of the Industry 4.0 paradigm, that integrates the latest
developments in digital technologies and the interoperability of processes (Lezoche et al.,
2020). Decentralization, interoperability, virtualization, real-time capability, modularity and
service orientation are the main architectural tenets of Industry 4.0. In the food industry, one
or more of these ideas can be put into practice (Jagtap et al., 2020, 2021). The digital
technologies enable the generation, collection and real-time analysis of data across all supply
chain participants, enabling improved decision-making, the development of new business
models, and the redesign and reinvention of production methods. In the end, it will lead to
increased productivity, customization, and income generating (Jagtap et al., 2020, 2021). The
majority of tasks performed in the food business are often very labor intensive, but they
might be replaced by Industry 4.0 technology, which would foster innovation, allow for the
resolution of complicated problems, and improve decision-making (Jagtap et al., 2020, 2021).
As established by the “Food and Agriculture Organization of the United Nations” (FAO) in
addition to the “field to fork” approach in the agrifood supply chain, all those processes
ranging from agricultural production of food to the food processing events including
commercial activities are involved. All the activities carried out within the agri-food chain are
dominated by one factor: “the transferred agriculture knowledge, from generation to
generation” (Lezoche et al., 2020). All the agricultural processes that will be carried out will be
integrated into the food chain through the use of semantically active technologies from the
beginning of the supply chain processes to the final consumer (Lezoche et al., 2020).

2.2 Digital technologies for entrepreneurial food family firms

The restrictions due to the COVID-19 have impacted on the context of family firms by
accelerating their process of adoption of digital technologies for the development of
innovative processes, products and business model (Soluk, 2022; Felicetti et al., 2022).
The several lockdowns that have been imposed over the world has have disrupted and
delayed many businesses by disclosing the need of new managerial practices and strategies
(Foss, 2020; Felicetti et al., 2022). Digital technologies have been clearly identified as suitable
platforms for reducing the sales restriction, for assuring the continuity of jobs and the
collaboration among people, for guaranteeing the survival (Rouleau et al., 2020; Verma and
Gustafsson, 2020).

This challenging and turbulent period has recalled the attention on the archetype of digital
entrepreneur. Introduced by the European Commission in 2015, the concept of digital
entrepreneur is associated to the emergence of new business initiatives but also to the modification of existing business models thanks to the use of digital technologies, Internet, digital platforms useful for carrying out activities of different kinds such as customer and supplier management or sales and marketing of products (Zhao and Collier, 2016; Shen et al., 2018).

The new emerging paradigm of digital entrepreneur is characterized on the one hand by the use of the internet and digital technologies and on the other hand incorporates the concepts of innovation as well as the innovative backgrounds that characterize the activities carried out by other entrepreneurs (Elia et al., 2020a, b). It is in this perspective that it can provide useful insights for the investigation of what has changed in the context of family firms operating in the food industry since it can allow to evaluate the entrepreneurial propensity that food family firms have demonstrated in adopting digital technologies in overcoming the limitations and changes due to the COVID-19 (Corvello et al., 2022a; Felicetti et al., 2022). According to Oricchio et al. (2020) the management leadership style in the food industry influences the survival capacity of a company and at the same time there is the probability that leadership style had an impact on the default probability of a company in particular during crisis period. As argued by Soluk (2022), the understanding of these trends can enlarge the view on the research on innovation in family firms. The debate in this field is, indeed, populated by several perspectives focused on the influence of firms’ tradition (De Massis et al., 2016; Petruzzelli and Albino, 2014), of family membership (De Massis et al., 2013), of decision-making process (Del Giudice et al., 2010), of the equilibrium between organizational and managerial innovation (Kraus et al., 2012), networking and open innovation practices (Bresciani, 2017; Del Vecchio et al., 2019; Ferraris et al., 2020).

Despite having more potential to do so than non-family enterprises, family firms are less inclined to engage in innovative activities (Casprini et al., 2017). Although family businesses do not have the same “inclination to engage in open innovation in comparison with nonfamily firms […]”, a recent body of open innovation research stressed that they are believed to have superior ability in identifying opportunities and acquiring knowledge from outside their boundaries because of their non-economic goals (Chrisman et al., 2015, p. 312). However, little focus has been placed on identifying the skills that enable family businesses to get over obstacles to knowledge transfer and acquisition while implementing an open innovation (OI) approach (Casprini et al., 2017).

A distributed invention method called “open innovation” relies on purposefully controlled knowledge inflows and outflows across corporate boundaries. While outgoing activities are revealing and selling, inbound procedures comprise sourcing and purchasing (Dahlander and Gann, 2010). One of the most common definitions of OI is: “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively” (Chesbrough and Crowther, 2006). The OI considers outside-in and inside-out actions concerning the acquisition and exploitation of technologies and ideas (Lichtenthaler, 2008a, b). Despite the evidence of their entrepreneurial orientation (Bresciani et al., 2013), family firms are characterized by several barriers to the innovation in terms of locked into traditions, lower propensity to the adoption of technologies innovation (Chrisman et al., 2015; Vrontis et al., 2016) and more conservative structures (Zahra et al., 2004).

These trends are confirmed also in the food industry, largely populated by small and medium enterprises associated to weak economic capabilities, limited investment in R&D, limited managerial competencies (Scuotto et al., 2017). However, food firms have demonstrated to be the most inclined to the adoption of OI approaches for their competitiveness (Costa et al., 2016; Bresciani, 2017; Ferraris et al., 2020).

The scenario of digital technologies for food industry is largely populated by different solutions including social media, but also BD technologies, Internet of things, precision
agriculture and farming techniques, farm management information system, artificial intelligence, smart agriculture, knowledge model approaches and decision support system (to transform data from different sources and to create profitable services and support to the decision making processes of stakeholders), robots, remote sensing, cloud computing, blockchain, smart devices, mobile apps, e-marketplaces platforms, e-commerce. These technologies lead the industry to move and evolve into an agile, data-driven and autonomous system (Lezoche et al., 2020). Vlachopoulou et al. (2021) illustrates the most widely used technologies, also considered as “disruptive technology drivers” in the food industry and the implications that distinguish them towards digital transformation. The spread of these disruptive technologies specifically BD analytics and digital platform impact in several activities related to the management and help them to the birth of new business opportunities (Marinelli and Gregori, 2015), new business initiatives and new digital start-ups (Von Briel et al., 2018). Ghazawneh and Henfridsson (2015) defined digital platforms as: “software-based external platforms consisting of the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate”. BD refers to any amount of data, whether structured, unstructured, or semi-structured, that cannot be processed by a given system. BD is defined as “a set of techniques and technologies that require new forms of integration to discover great sets” (Hashem et al., 2015). Firms have long concentrated on gathering and storing vast amounts of data that have a positive impact on organizations belonging from different sectors (Cappa et al., 2022; Irfan et al., 2008). As a result, BD will require specialized equipment and technologies to manage it, and it can be described using the word 5Vs (volume, velocity, variety, veracity and value) (Cappa et al., 2021; Benabdellah et al., 2016; Jin et al., 2015). The characteristics of data, sometimes referred to as the “5 V’s of big data,” are typically used to classify it as BD with a high values of: Volume, that refers to the enormous volumes of data that are produced every second, including all the emails, tweets, images, videos, sensor data, etc. Velocity, refers to data generated and gathered during a shorter time period; Variety, several data sources, ranging from free text to structured data; Veracity, relates to how messy or reliable the data are; Value, for which a more subjective issue is the underutilization of these large datasets (Cappa et al., 2021; Benabdellah et al., 2016; Jin et al., 2015). The tools or technologies needed to effectively process massive data are known as BD technology (Amanullah et al., 2020). Businesses gather security-related data for post-hoc forensic investigation and regulatory compliance. They produce 10 to 100 billion events daily. BD analytics have been utilized to effectively analyze and correlate security-related data at previously unheard-of scales, and that conventional systems are incapable of processing at huge volumes (Amanullah et al., 2020).

A corporation has to create the architecture for its BD in order to model its BD and benefit from it, which calls for an answer to questions about the nature of the business. The use of BD is widespread in life, and there are numerous platforms available to handle it. The implementation of BD is actually fraught with difficulties and restrictions, and there are numerous reasons to do BD research (Alwan and Ku-Mahamud, 2020).

Despite the large consensus on the acceleration that the pandemic emergence has generated in the context of family firms as well as in the food industry, the full comprehension of how this process of digital transformation has occurred is far from a full understanding and requires a deeper analysis. This is the main motivation behind this study that focuses at the intersection between the theory on food industry and family firms to explore how the digitalization has been implemented.
3. Research design

Moving from the above premises, the purpose of the study is to provide an answer to the following research question:

RQ2. How can bakery products and pasta sub-chains, within the food industry, digitalize activities related to customer interactions, delivery and marketing?

This guiding research question is driven by the context of digital transition also disrupted by the COVID-19 pandemic. In particular, the research will analyze the case study of “ArteBianca Delivery” start-up through the action research methodology. The research context is represented by the company “Panificio F.lli Barile SRLS”, a traditional family firm located in Acquaviva delle Fonti (BA), South Italy, that during the pandemic emergence of COVID-19 decided to start a digitalization process in replying to the limitations occurred during the lockdown phases as well as to the new behaviors of market demand. The family firm “Panificio F.lli Barile Srls” will be subjected to the analysis of the level of digital maturity through the use of the DMM in order to identify critical for implementing a digital transformation process.

3.1 Research context

Panificio F.lli Barile SRLS is a traditional family firm belonging to the food industry. It is located in South Italy, in particular in Acquaviva delle Fonti (BA) and belongs to the bakery supply chain. It wants to start a digitalization process but does not have adequate resources, financial resources and skills to fully take the advantages of digital technologies.

During the COVID-19 pandemic it decided to start a digitalization process but does not have adequate resources, financial resources and skills to fully take the advantages of digital technologies. However, the pandemic emergence has enhanced the need of investing in this direction, despite the several limitations due to the traditions and the organizational assets.

3.2 Methodology

The single case study of the start-up “ArteBianca Delivery”, located in southern Italy, is analyzed through the action research methodology. This singular case study was chosen as it allows you to explore a significant phenomenon in a particular circumstance by specifically why a particular phenomenon exists (Eisenhardt and Graebner, 2007). “Artebianca Delivery” represents for companies in the food industry an idea capable of digitizing highly traditional companies, without economic resources and without skills, in an economic and accessible way for all.

The Action Research methodology aims to solve an immediate problematic issue in order to reach a desired future situation, a “searchable question” by carrying out the development of a series of actions to be activated (Susman and Evered, 1978). Through this method the researcher has been deeply involved within the case to solve the problem of transforming the traditional business model into a digital business model about family firms in the field of bakery and pasta. In particular, in this case the action research methodology is useful for identifying how to best design the start-up “Artebianca delivery” business model in order to digitize the family firm “Panificio F.lli Barile SRLS”.

The methodology of action research is characterized by five-phase cycles (Trist, 1977):

1. Diagnosing, that is, the identification and definition of the problem;
2. Action planning, actions that lead to solving the problem;
3. Action taking, selection and execution of actions;
4. Evaluating, of the consequences of the actions to be implemented;
Specifying learning, i.e. the identification of the results.

Table 1 shows for each phase of the action research description, technique and output obtained by the researchers and members of the project team:

According to the literature, the starting of a digital transformation process in a company requires the analysis of the digital maturity level through the use of the DMM. For the development of the “ArteBianca Delivery” business model it was necessary to apply the DMM to the family firm “Panificio F.lli Barile Srl”. At this purpose the “Test Industry 4.0” developed by “Politecnico di Milano” in collaboration with “Confindustria Assoconsult” has been used to identify the gaps in terms of digital maturity to intervene with the design and development of a pilot project named “Artebianca delivery”, a start-up focused on the delivery of a novel service to digitalize “Panificio F.lli Barile SRLS” in a simple and economical way. A DMM has been used to assess the initial level of maturity in terms of digital tools of the companies (VanBoskirk et al., 2017) especially in their function more related to the interaction with customers such as marketing and communication, Delivery and customer care. The DMM is also used to analyze processes more strictly internal to the company such as production, supply chain, logistics that “ArteBianca Delivery” will try to digitize and make more efficient. The focus has been to the digital technologies as essential source for a more immediate digitization process of digitally underdeveloped companies.

The questionnaire carried out is the “Test Industry 4.0” developed by “Politecnico di Milano” in collaboration with “Confindustria Assoconsult”. The test led to results that can be shared with most Family firms in the food industry. This was possible to confirm through surveys and interviews made directly with entrepreneurs in the sector during the Action Research methodology. The analysis carried out by the DMM regards the level of digitalization of eight areas of business process for each area a set of key questions are used to measure digital maturity with respect to the macro processes of the sectors: design and engineering, maintenance, human resources, manufacturing, supply chain, quality, logistics, marketing, customer care and sales. The overall test duration is approximately 90 min at the end of which an analysis of the company’s digital maturity level is obtained. The results of the questionnaire are divided into four dimensions of analysis: execution, monitoring and control

<table>
<thead>
<tr>
<th>Research phase</th>
<th>Description</th>
<th>Techniques</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>Diagnosing Needs and expectations are discussed by researchers</td>
<td>Literature review, meeting focus group</td>
<td>Definition of needs and requirements for the realization of the pitch and the start-up Business Model</td>
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<tr>
<td>Application of “Test Industry 4.0” to “Panificio F.lli Barile SRLS”</td>
<td>DMM - Digital Maturity Model</td>
<td>Data collection</td>
<td></td>
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<tr>
<td>Action Planning Structuring plans for the identification of key roles, actions and phases for the creation of the start-up</td>
<td>Literature review, meeting focus group</td>
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<tr>
<td>Action taking The team conducts interviews to collect data and documents and to structure the digital business model Implementation of actions for the realization of the APP</td>
<td>Interviews, analysis of data and documents, meetings</td>
<td>Project’s deliverables</td>
<td></td>
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<tr>
<td>Evaluating Specific learning Collecting feedback on start-ups Processes, feedback and tips are discussed. This is useful to make further improvements and interpretations</td>
<td>Meetings Internal meeting and interviews</td>
<td>Feedback interpretation and discussion of feedback and data collected</td>
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Table 1. The action research methodology
of processes, technologies, and organizational structure. The level of digital maturity (DMM) of the family firm “Panificio F.lli Barile SRLS” was studied, which led to results that confirm the value that the digital start-up “ArteBianca Delivery” wanted to generate.

3.3 The data collection and data analysis
The collection and analysis of data took place mainly through a plurality of instruments, in particular meetings, interviews and focus groups consistent with what the methodology of action research requires (Susman and Evered, 1978). The data collection took place between June 2020 and October 2021.

The first focus groups carried out with the research team has been useful to identify needs and main requirements functional to the realization of pitch and case study business model. The focus group is carried out by the researchers and team members through the presentation of a series of questions followed by an internal discussion related to the realization of the business model of the idea and therefore to the identification of the requisites necessary for its creation. The researchers in this phase take notes and realize a report that in a second phase has been analyzed. Among the subjects involved there are also professors and members of the K-HUB Lum Business Idea Incubator that is the business accelerator of the LUM Giuseppe Degenarro University (in Bari, Italy) accredited to the measure of the Puglia Region “Extraction of Talents”. K-HUB operates in the field of digital, inclusive and creative community.

Subsequently, interviews (Appendix) were carried out with entrepreneurs in the industry and ordinary people (customers of sector activities), on a total sample of 10 local entrepreneurs with a semi-structured interview and 20 customers directly in “Panificio F.lli Barile srls” with an unstructured interview in order to collect feedback and evaluate the actual need for traditional food firms that wants to digitalize their business. Feedbacks are useful to the new digital tool represented by “Artebianca Delivery” digital platform. The interviews were carried out through open questions, directly to customers of the “Panificio F.lli Barile SRLS” and to managers of others firms belonging to the food sector through a tour of the various locations, mainly focused on the territories of Acquaviva delle Fonti (BA), Cassano delle Murge (BA), Gioia del Colle (BA), Altamura (BA), Massafra (TA). The recorded interviews were consequently categorized and used to make improvements to the “Artebianca Delivery” business model. Table 2 represents a scheme about interview carried out to entrepreneurs.

4. Findings
Framed into the theoretical premises of the literature review about research on food sector and family firms during global pandemic, the action research allowed to analyze in depth the single case study “Artebianca Delivery”. On the basis of data collected and analyzed also through the application of DMM on family firm “Panificio F.lli Barile SRLS”, in the paragraphs that follow findings are described to provide evidences about the digitalization of business model implemented into the case in replying to the challenges of COVID-19 pandemic.

4.1 The digital maturity level of family firm “Panificio Flli Barile SRLS”
The creation of the business model of the start-up “Artebianca Delivery” starts from the results of the analysis carried out thanks to the DMM “Test Industry 4.0” on the eight areas of business process (design and engineering, production, quality, logistics, maintenance, human resources, supply chain and marketing/sales/customer care) that confirmed a low degree of maturity towards Industry 4.0 but above all towards digital. In each of the eight process areas
that make up a firm’s value chain, the maturity of the company is assessed in relation to four analytical dimensions: execution, monitoring and control, technologies and organization (Zappacosta, 2021).

The Industry 4.0 test, created through a partnership between Confindustria Assoconsult and Politecnico di Milano, is a free self-assessment questionnaire to assess a company’s level of digital maturity in relation to global best practices, with the goal of capturing its position in relation to the opportunities provided by Industry 4.0 and offering potential solutions to increase its competitiveness (Zappacosta, 2021).

The degree of digital maturity of the company is only one point below the industry average, marking 1.7 out of 4 (Figure 1). It is therefore necessary on the one hand to introduce digital tools and solutions for sharing information between processes as well as preparing employees for change by encouraging their training for the adoption of digital technologies. All this meets with a low degree of maturity in terms of marketing and digital marketing.

Figure 2 summarizes the digital maturity to 2020 of the company “Panificio F.lli Barile SRLS” and makes a snapshot of the company’s gap in term of digital maturity rate. All emerging needs are summarized with the implementation of the “ArteBianca Delivery” application, that aims to support companies in the long path of digitization with very low management costs also trying to transform and make efficient and digital the processes of quality, production, logistics and transport, marketing, customer care and after-sales of the value chain of the sector with a digital platform (app mobile) that include technologies and services to make more efficient and to digitalize the above processes.

4.2 The “ArteBianca delivery” digital business model
This section will introduce the innovative business model of “ArteBianca delivery” (Figure 3) a start-up aiming to enhance the Italian tradition and craftsmanship and all the products made by bakeries, pastry shops, pasta factories through the offer of an innovative service developed through the tool of the digital platform. Another goal of the start-up is to overcome the knowledge barriers that block entrepreneurs in the path of digital transformation.
In particular, ArteBianca Delivery offers the possibility of receiving high daily quality of artisan products at home through a delivery service that exploits the technologies of the app and that creates value for the activities and for the final consumer. In particular, the different technologies integrated into the app are: artificial intelligence, cloud computing, BD analytics,
marketing analytics, GPS systems, online payments, locker for withdrawals, e-commerce, email and SMS marketing, SEO tools, etc. cybersecurity, horizontal and vertical integration. ArteBianca Delivery also aims to obtain internal certifications and/or to be distributed within the network of partner activities (e.g. PDO, PGI, TSG, BIO, PGI). The business model
of ArteBianca Delivery is proposed both in B2B (business-to-business) and B2C (business-to-consumer) perspective, responding to a series of needs through corresponding solutions.

The problems related to the B2C model concern: the lack of time that distinguishes customers, customer satisfaction and problems of convenience in the purchase of products. The solutions identified are: possibility to book the desired product through the app and organization of delivery quickly. In case of non-congruence with the customer’s schedules to receive the product at home or to collect it directly at the activity, it was decided to create lockers where you can leave the same, so that it can be picked up at any time.

Moreover, other issues of the B2B business model, concern situations of customer dissatisfaction, since the activity may not satisfy the customer looking for a certain product, problems concerning the management of delivery with proprietary means and finally the efficient rendering of production processes as well as the excessive final inventories of products with high perishability. Artebianca delivery responds by structuring a booking service through an app linked to management software that allows you to actually produce what is required and solves the issue of delivery by introducing the innovative figure of the “artebianca shopper”. Companies will be able through the simple payment of a fee, to buy a package that will give them the opportunity to take advantage of a series of services in a simple, direct and economical way.

The user should be able to realize the purchase journey entirely on the site or on the app equipped with a user-friendly interface. The collection of data deriving from technologies has

<table>
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<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Propositions</th>
<th>Customer Relationships</th>
<th>Customer Segments</th>
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<tbody>
<tr>
<td>- Bakers, Pasta factories, Pastry shops. Consortia and industry associations. - Marketing and communication companies. Suppliers of sector products (e.g. flour). - Partnerships with local production companies of wine and agricultural products.</td>
<td>-Platform/Network -E-commerce -Managed delivery from the activity -Customer / earn a fee. -Production activities design, creation and distribution of quality products.</td>
<td>App/Platform for the delivery of high quality products, traditional bakeries, pasta factories, pastry shops. Value creation in a B2B and B2C perspective.</td>
<td>-Firm subscription to the app -Customer that become “ArteBianca Shopper” -Booking service online. -Delivery service -Takeaway service</td>
<td>-Generation Z (18-23 years) -Millennials (24-42 years) -Generation X (43-54 years) -Workers and professionals with little time available. -Person who prefers the convenience of receiving products at home.</td>
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</tbody>
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<tr>
<th>Key Resources</th>
<th>Channels</th>
<th>Revenues Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology (app/platform) -Human (Customers, suppliers) -Financial (credit lines, loans)</td>
<td>Digital channel App platform Physical channel (Physical Stores) Locker for delivery</td>
<td>-Revenue related to the app management fee for suppliers. -Revenue deriving from percentages, fees, recovered from a series of services offered. -Revenue from advertising, ads and development of other marketing services.</td>
</tr>
</tbody>
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<table>
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<tr>
<th>Cost Structure</th>
<th>Revenue Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>- App/platform development and maintenance expenses. -Administrative costs -Advertising / marketing costs -Fixed structural costs -Costs operators/ service developers -Delivery costs(ArteBianca Shopper fee)</td>
<td>-Revenue related to the app management fee for suppliers. -Revenue deriving from percentages, fees, recovered from a series of services offered. -Revenue from advertising, ads and development of other marketing services.</td>
</tr>
</tbody>
</table>

**Figure 3.** “Artebianca delivery” business model canvas

Food 4.0 and family firms during COVID-19

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to allow the identification in advance of the needs and expectations of customers. The use of cookies can also allow the definition on the first page of suggestions for purchases in line with orders already placed and with preferences expressed by users. The user can also have the opportunity to read information, feedback, reviews about the product sought as well as information, data and real-time knowledge on the product, considering the components, nutritional values, ingredients, origin and any allergens. The product catalogue must have a wide assortment so that the custom has a choice of alternatives. Arrived at the cart, the passage to check out and purchase must be very simple and intuitive. Customer satisfaction also derives from the easy possibility of modifying what he has placed in the cart, with the storage of data and the direct connection with the email for the confirmation receipt.

All this element united with communication technologies, BD & analytics, e-commerce and service-oriented logistics (flexible, sustainable, fast and with valuable delivery services), cybersecurity, cloud services, vertical and horizontal integration create the perfect “delivery experience” for the user but on the other hand support the digitalization of different companies process area. Apps are, today, among the best touchpoints to allow interactivity between brand and user. AI allows, for example to an e-commerce, to keep track of all the actions performed by the user giving indications for any improvements that can be made to marketing strategies, as well as on what type of layout and user interface to offer.

The “ArteBianca Delivery” app will implement mobile marketing techniques to increase interactivity with the consumer, becoming the most efficient communication vehicle of a no longer unidirectional, but bidirectional nature, in which the same customer is at the center of communication and can decide what to look for and what to see. Among the technologies and tools that will be implemented are: SMS and MMS, mobile SEO/SEM, mobile site, email marketing and social media and influencer marketing will be used as an advertising boost.

5. Discussion and conclusions
The COVID-19 pandemic has accelerated the digital transformation process in the food industry, with particular attention to the pasta and bakery supply chain. The research focused on family firm belonging to the latter two sub-chains. New ways of working and new approaches to work, production and sales activities have been born in replying to the limitations associated to the pandemic emergence (Di Vaio et al., 2020). What has always been seen as one of the sectors least prone to digitalization has begun to look different. Many companies have intensified their digital employee training activities, thanks to courses and webinars also available online (Di Vaio et al., 2020). This highlights the crucial role played by human resources in driving the process of digital transformation (Elia et al., 2020a, b; Kraus and Kraus, 2021) As a result, companies have had to adapt to these new ways of searching, structuring the sale through proprietary e-commerce or managed by existing platforms that allow a management of the sale until the delivery of the products. Mobile apps, digital and technological solutions have contributed to the collection of data that has become increasingly essential for the companies themselves.

Online has made it possible to shorten the distances between companies and customers, strengthening the role of trust among them (Galhotra and Dewan, 2020). Even small businesses have had to adapt to meet customers’ needs and preferences. Often online platforms and simple instant messaging services have come to the rescue that have allowed the receipt of orders and the organization of delivery for those who are unable or for those who are afraid to leave home to recover the product to be purchased. The pandemic has played a “Boost” role for the approach to digital, making it possible to build a resilient,
dynamic and “smart” supply chain. E-Commerce and mobile apps are protagonists of the
digital transformation of companies during the COVID-19 pandemic (Galhotra and Dewan,
2020). Furthermore, the evidences about the start-up related to the case study also highlights
the relevance of digital entrepreneurship into the process of renewal of traditional industry by
demonstrating the crucial role that the entrepreneurial discovery process can provide to the
full exploration of market opportunities resulting from the digital technologies (Pinem, 2019;
Hsieh and Wu, 2019).

5.1 Implication for the theory
The following paper has sought to provide a theoretical contribution to the literature of
family firms in the food industry, with specific reference to the sub-chains of bakery products
and pasta. Findings provide a contribution to the research about Food 4.0 sector and the two
sub-chains of bakery products and pasta, taking into account the applications of the most
impactful technologies in the sector and the value brought by entrepreneurial figures
(Nuthalapati et al., 2020). The research contributed to confirm the advantages that a
traditional family firm receives through the development of a path of digital transformation
of some supply chain processes in a context where the COVID-19 pandemic has been of great
effort. The food business is expected to go through a change as a result of the adoption of
Industry 4.0 technologies. Food 4.0 refers to the use of these Industry 4.0 technologies in the
food industry (Jagtap et al., 2020, 2021). To make the success in sales of the sector there is also
the influence of start-ups that have always been supporters of innovation processes, of which
most have developed e-commerce systems focusing on the commercial element of food
(Nuthalapati et al., 2020).

5.2 Implication for practices
Besides the theoretical contributions, the study provides also practical implications related to
the opportunity of digitalization for food firms and mainly for family firms. Findings
provided empirical evidence about the reconfiguration of the traditional business model of
family firms in the food sector into a digital one with the start-up “ArteBianca Delivery”. The
marketing, delivery, e-commerce, customer care components of the business models have
been supported and enhanced through the adoption of digital tools such as mobile
applications useful both for users and for a more rapid digitization of companies is growing
exponentially and they are an excellent marketing resource.

In order to remain competitive on the market, companies are obliged to move in this new
direction by investing in research and development, in a renewal of products and services, in
the improvement of production processes, in the implementation of useful services for
citizens, sources of value creation. And it is precisely starting from these principles that
“ArteBianca Delivery”, the case study of this paper, has been launched.

The analysis of the case study, carried out through the methodology of action research, led
to identify a low degree of digital maturity towards the “Industry 4.0”, towards digital as well
as a low degree of maturity in terms of marketing and digital marketing. These results were
obtained thanks to the use of the DMM “Test Industry 4.0”. Thanks to the results obtained,
the start-up under study has best defined its technological proposal for the transformation
and digitization of business processes in a simple and intuitive way, with low management
costs for entrepreneurs through a mobile-app. ArteBianca Delivery is the emblem of a holistic
system that finds the excuse of “delivery” to enter the homes of Italians but above all to bring
a highly traditional sector to take small steps towards digital.

The study has highlighted as the scalability of digital solutions allows to contextualize the
transformation to the single firm in reason of its organizational and market configuration.
Accordingly, the study can inspire the conception and execution of digital transformation
strategies in the larger food industry as well as also in regional areas typically characterized by structural delays and low propensity for innovation.

5.3 Future research
The paper opens new roots for future investigations. First of all, it will be interesting to monitor in the next future the development of the Artebianca Delivery for evaluating the advancement and sustainability of the digital transformation. With the aim to overcome the limitations associated to the single case study, in the future a larger sample of cases could be included into the research for observing common and specific patterns. In particular, it could be useful to replicate the study in different domains of food industry by including firms of different profiles (in terms of size, history and food specialization) and geographical locations interested by the digitalization of their business and organizational model during the years of pandemic emergence of COVID-19. In allowing to have a major comprehension of the boundaries and enablers of digital transformation occurred food industry, this replication could allow also to have more evidences of the resilience behavior manifested by the industry value chain.

References


Further reading


James, P. and Hopkinson, P. (2005), “Sustainable broadband? The economic, environmental and social impacts of Cornwall’s Actnow project”, Technical report, University of Bradford and SustainIT.


Appendix

In-depth interview (about 15 min).

(1) What is your name?
(2) How old are you?
(3) What is the name of your company and what is the sector in which it operates?
(4) What is/what are the representative products of your company?
(5) What role do you play in the company?
(6) How many years has this company existed?
(7) Do you use digital solutions in your company? If yes, which ones? If not, why?
(8) Have you ever thought about adopting digital solutions in your company especially for marketing, delivery and customer care services?
(9) Do you think they can be useful for business success?
(10) How much would you spend on a solution that can digitize marketing, customer care and delivery processes?
(11) During the COVID-19 period, what have you done to avoid huge economic losses?
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