

# Ambidextrous strategies in turbulent times: the experience of manufacturing SMEs during the COVID-19 pandemic

SMEs  
ambidextrous  
strategies  
during COVID-19

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## Abstract

**Purpose** – The paper refers to the framework of ambidexterity to explain the strategic paths of manufacturing SMEs in turbulent times, by investigating SMEs' strategic reaction to the COVID-19 pandemic.

**Design/methodology/approach** – The authors adopted an inductive approach methodology. Using a qualitative research method, Italian manufacturing SMEs in different industries were interviewed to outline how they have faced the negative effects of the COVID-19 by considering the strategies implemented during the pandemic.

**Findings** – The study identifies three ambidextrous strategies for manufacturing SMEs to positively overcome the COVID-19 crisis: (1) playing different roles within the same market (business-to-business and business-to-consumer) simultaneously, (2) simultaneous entrance and management of multiple markets and (3) exploiting manufacturing knowledge for exploring product and business model innovation (simultaneous learning processes).

**Research limitations/implications** – Results enrich the theoretical discussion on ambidexterity and SMEs, by stressing the strategic dimension of ambidexterity and including a more fine-grained analysis of the different firm' strategic paths in times of crisis.

**Practical implications** – The paper provides practical suggestions for manufacturing SMEs on how they can react during turbulent times and crises by implementing ambidextrous strategies also thanks to the use of digital technologies.

**Originality/value** – This paper contributes to outlining the conditions for SMEs' resilience in the international competitive context by highlighting the perspective of ambidexterity based on the analysis of multiple case studies from manufacturing industries.

**Keywords** Ambidexterity, SMEs, Manufacturing, COVID-19, Crisis, Strategy, Multiple case study

**Paper type** Case study

## 1. Introduction

The pandemic has put under pressure the organization of economic activities, opening questions on how firms may react to overcome a global crisis such the COVID-19 one (Verma and Gustafsson, 2020) and bringing attention to the concepts of ambidexterity as a possible successful strategy (Nofiani *et al.*, 2021). Ambidexterity considers the balance between

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exploitation (utilizing what firms already know) and exploration (discovering what is yet to be known) strategies within the organization (March, 1991; Tushman and O'Reilly, 1996) in the management of business for growth (Auh and Menguc, 2005; O'Reilly and Tushman, 2011). Tushman and O'Reilly (1996) describe an ambidextrous organization as the firm that can compete both in "mature" markets (where cost, efficiency and incremental innovation are critical) and develop new products and services for "new" markets (where experimentation, speed and flexibility are critical).

Studies on simultaneous ambidexterity captures the concurrent firm ability to manage contrasting or divergent goals and processes at the same time (Gibson and Birkinshaw, 2004; Simsek, 2009). Nonetheless, scholars also stress the challenges in the definition of strategic goals in uncertain competitive contexts, which may push firms towards opposing conflicting strategies (Greve, 2020; Gaba and Greve, 2019). In this perspective, it becomes relevant to know more how firms define their strategies during COVID-19 taking into account the potential trade-offs in terms of competitive positioning that arise (i.e. between innovation and efficiency or between different positions in the value chains). Moreover, studies on ambidexterity suggest the need to further consider the time dimension: "ambidexterity research called for more research on boundary conditions, crossing levels of analysis and taking time into account" (O'Reilly and Tushman, 2013, p. 332). In this perspective, analysing strategic behaviours firms had before and during the pandemic may offer new insights on how ambidexterity links to COVID-19 pandemic and how SMEs may define and implement ambidextrous strategies during turbulent times.

The ambidextrous view of strategies has been proposed in international business studies (Choi *et al.*, 2020; Huang and Cantwell, 2017; Luo and Rui, 2009; Su *et al.*, 2022). International business scholars suggest that firms may positively adopt ambidextrous strategies to internationalize and expand their market, being the organization able to overcome the different trade-offs in going global (i.e. location conditions or forms of governance) (Avioutskaa and Tensaout, 2022). From this point of view, ambidexterity can be approached also as a strategic dimension that could help firms in facing the challenges of turbulent environments.

The COVID-19 has affected negatively the survival of firms in all industries and especially of small- and medium-sized enterprises (SMEs) operating in the manufacturing sectors for two main reasons: on the one side, because of the increased risk linked to the market contraction connected to the reorganization of global supply chains (Dohale *et al.*, 2021; Kano and Oh, 2020; Mouzas and Bauer, 2022) as well as to the new challenges related to the rise of new market opportunities (Campbell *et al.*, 2020); on the other side, because of the lack of organizational resources that characterize SMEs and push them to rely on the stock of resources available (Nofiani *et al.*, 2021). The pandemic has posed unprecedented pressures for SMEs questioning on their ability to eventually modify or adapt their strategies giving their size and individual-level components of such behavior (Bressan *et al.*, 2021), their role within global value chains and markets' reconfiguration (Barbieri *et al.*, 2020), also depending on the different types of SMEs (Juergensen *et al.*, 2020). In this scenario it becomes relevant to explore how manufacturing SMEs react to overcome the crisis successfully and rapidly, specifically considering potential business failures (Amankwah-Amoah *et al.*, 2021).

Past research has highlighted that even if it can be difficult for SMEs to pursue both exploration and exploitation simultaneously because of their limited resources (He and Wong, 2004), they could rely on ambidexterity (Partanen *et al.*, 2021; Turner *et al.*, 2013) to overcome economic crises (Alcalde-Heras *et al.*, 2019), with a focus on innovation processes. During previous crisis periods, ambidextrous firms were able to improve their resilience, resistance and recovery through the increasing of a balance between exploration and exploitation (Altay *et al.*, 2018; Aslam *et al.*, 2020). Also with regard to the case of COVID-19

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pandemic, as suggested by recent literature (Papadopoulos *et al.*, 2022), it would be fruitful to consider the concept of ambidexterity for SMEs' responses.

While theoretical contributions on ambidexterity identify potential organizational paths of developments for manufacturing SMEs, what has to be further enriched is developing research on ambidexterity from the strategic viewpoint and as response of SMEs to the challenges emerging during turbulent times, such as COVID-19 pandemic. In this research, applying the theory on ambidexterity, we studied how manufacturing SMEs may face the business challenges emerged from the pandemic and linked to the following rapid market changes occurred, by focusing on the strategic side (and relevance) of ambidexterity and developing "new" ambidextrous strategies, in terms of simultaneous exploitation and exploration activities, that SMEs can implement during turbulent and crisis times. The objective is to provide new knowledge on strategic evolution of manufacturing SMEs to positively react to the crisis, by advancing studies on ambidexterity in the context of evolutions of firms' relationships with their markets (Bhattacharjya, 2018; Winterhalter *et al.*, 2016). In doing so, the paper aims at addressing the following main research question:

*RQ1.* How did ambidexterity allow manufacturing SMEs to strategically respond to the pandemic-related crisis?

To reach our research purpose, we carried out an exploratory study following an inductive approach (Gioia *et al.*, 2013), mainly based on a multiple case study analysis of 10 Italian manufacturing SMEs. Italy is an interesting context for analysis for several reasons. It is the second largest manufacturer in Europe (second only to Germany) (European Commission, 2019), with a manufacturing structure based mainly on SMEs (99%, according to the Italian National Institute of Statistics [ISTAT]). Italian SMEs compete in multiple industries (machinery, electrical equipment, transportation, textiles and apparel, among the most important ones), thus experiencing negative impacts of the COVID-19 pandemic differently (OECD, 2020). Moreover, Italy was one of the first countries to suffer the spread of pandemic and one of the most affected by Covid-19, thus it is a key country in which to explore the effects of the COVID-19.

We further advance research on ambidexterity in turbulent times by identifying three specific ambidextrous strategies that manufacturing SMEs may apply to overcome crisis, namely, playing different roles in the same markets (operating simultaneously as supplier in business-to-business market and as a brand in the business-to-customer market), simultaneously entering and managing multiple markets and exploiting manufacturing knowledge to explore product and business model innovation. Our findings can assist SME in developing strategies to overcome the challenges of turbulent times linked to global crises.

## 2. Theoretical background

### 2.1 *Ambidexterity in uncertain competitive times*

The concept of ambidexterity relates to the firm ability to simultaneously explore new opportunities while exploiting existing businesses (Cao *et al.*, 2009). Specifically, simultaneous ambidexterity refers to the pursuing of both exploitation and exploration activities at the same time (Gupta *et al.*, 2006). Ambidextrous firms are able to use and apply existing knowledge (exploitation) while simultaneously creating new knowledge (exploration) to overcome knowledge gaps in their activities (Tsai, 2016; Turner *et al.*, 2013). Exploration includes firm activities "such as search, variation, risk-taking, experimentation, play, flexibility, discovery and innovation", instead exploitation is represented by activities such as "refinement, choice, production, efficiency, selection, implementation and execution" (March, 1991, p. 71). Exploration focuses on "the experimentation with new alternatives", while exploitation focuses on "the refinement of the existing knowledge" (March, 1991, p. 71). Focusing on SMEs, Lubatkin *et al.* (2006) asserted that exploitation mainly considers the activities focused on the

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(creative) development of new ideas to satisfy (new) customer needs or market demands. Instead, exploitation mainly considers the refinement and improvement of the existing products/services.

The unexpected rise and spread of COVID-19 have pushed the reorganization of strategic options (de Goeij *et al.*, 2021) for firms in developed countries in terms of geography, their partners' sourcing and production options and the firms' ability to access established or new markets. Firms could have multiple responses in reaction to the COVID-19 pandemic (Wenzel *et al.*, 2021)—retrenching, persevering, innovating and exiting. Nevertheless, the COVID-19 scenario opens new challenges in the definition of the strategies to be implemented (Muzio and Doh, 2020), taking into account the speed of such process and the need to balance existing resources with new needs. Firms are asked to identify new markets as well as their location choices for production across countries (Pisani, 2021; Strange, 2020), posing questions on how firms can exploit existing offering and knowledge related with products and markets with the (rapid) exploration of new market opportunities. Similarly, other scholars have suggested the need for business model innovations (Kronblad and Envall Pregmark, 2021), stressing how established value generation processes must be updated to consider for new strategies rooted on digitalization (Rapaccini *et al.*, 2020) and new approach to markets between physical and online levels (Donthu and Gustaffson, 2020).

Scholars have posed specific attention to organizational ambidexterity (O'Reilly and Tushman, 2013), highlighting the positive relationships with firm's performance (Cui *et al.*, 2014; Hsu *et al.*, 2013; Raisch *et al.*, 2009), but also specifically disentangling how ambidexterity can be achieved. Contrary to structural ambidexterity (Jansen *et al.*, 2012; O'Reilly and Tushman, 2004), studies on behavioral ambidexterity (Gibson and Birkinshaw, 2004) emphasize the capacity to simultaneously demonstrate adaptability (the capacity to rapidly reconfigure activities in the business unit to face the demand) and alignment (coherence among the patterns of activities within the same business unit). In line with this approach, other studies on simultaneous ambidexterity (Achrol, 1991; Li and Lin, 2008) specifically highlight the advantages of concurrently managing the tensions emerging from the competitive scenario with respect to sequential ambidexterity (Chou *et al.*, 2018), in which case the firm shifts from exploration to exploitation at different times.

The concept of ambidexterity is particularly suitable for understanding how companies may behave positively during a crisis. This is particularly important in competitive contexts, as well as in turbulent and risky environments, where transforming knowledge into action and the speed of the process are important success factors (Simsek, 2009; Turner *et al.*, 2013). Ambidexterity is important in cases in which there are deep and unpredictable contextual changes in competitive environments. As scholars suggest (Birkishaw and Gupta, 2013; Raisch *et al.*, 2009), the temporal dimension has also to be considered in approaching ambidexterity and the time view is crucial pandemic-wise: a scenario that has progressed from a health crisis to an economic and financial one with which firms must face before the situation becomes the "new normal".

During crisis times firms have not only to react and adapt to the new competitive scenario from an organizational point of view, but most important, also from a strategic one. In this respect, studies rooted into the international business stream of research have applied ambidexterity in terms of variety of simultaneous strategies adopted to overcome the tensions related to firm's internationalization (Choi *et al.*, 2020; Huang and Cantwell, 2017; Luo and Rui, 2009). According to scholars, multinationals "show a significant tendency towards 'international ambidexterity' in their strategic decisions" (Hsu *et al.*, 2013, p. 58), considering for the typologies of strategies adopted enabling to overcome the conflicts related to internationalization (as a stage and as a process). Similarly, other researchers have highlighted the strength of the ambidextrous perspective in developing and managing dual business models for firms engaged with international markets (Winterhalter *et al.*, 2016).

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We rely on this perspective of ambidexterity and apply it to SMEs to explore the strategic responses to the COVID-19 pandemic and its conflictual competitive scenario, where limited research has occurred so far. The rapid changes firms had to cope due to the pandemic pressures in the short run (Kang *et al.*, 2021) pose also particular attention on the simultaneity of such strategic ambidextrous potential directions, expanding the organizational view of simultaneous ambidexterity (Gibson and Birkinshaw, 2004). Whenever a firm experiences tensions between market requirements and related value-creation processes (i.e. low-cost vs premium), simultaneous ambidexterity occurs in approaching different business domains and different value chain configurations at the same time. In this context, integration mechanisms favor superior performances and the sustainability of the strategies applied (Markides, 2013).

### *2.2 SMEs and ambidexterity in times of crisis*

SMEs may suffer from crises more than large firms due to resource constraints—also conceptualized as the liability of smallness (Bruderl and Schussler, 1990)—and an uneven stock of resources available internally (i.e. financial, organizational, or knowledge-related resources) (Jurgensen *et al.*, 2020). Nevertheless, the literature has also suggested that due to more flexible decision-making processes and the ability to innovate rapidly (based on specific learning mechanisms), SMEs may overcome such dimensional constraints (Zhang *et al.*, 2006) by adopting simultaneously ambidextrous strategies, exploring new contexts and exploiting well-known ones at the same time (Lubatkin *et al.*, 2006). In this sense, ambidextrous SMEs could be able to balance organizational learning through exploration of new knowledge (e.g. experimentation, flexibility) and the exploitation of their current knowledge (e.g. refinement, efficiency) to face the Covid-19 challenges (Lee and Trimi, 2021).

When considering the potentialities of ambidexterity in the context of SMEs, the research results are multifaced (Wenke *et al.*, 2021). On the one hand, the specificity of the liability of smallness may put under scrutiny the adoption of ambidextrous strategies in SMEs compared to the adoption of either exploration or exploitation paths. On the other hand, due to the less formalized organizational and decision-making dynamics of SMEs, simultaneous ambidexterity can provide positive support for a firm's performance (He and Wong, 2004) and strategic consistency support for SMEs' resilience (Iborra *et al.*, 2020). As far as crises are concerned, research has shown that although SMEs are more vulnerable due to their lack of resources, they could also be more prone than large firms of becoming ambidextrous organizations because of their higher capability to anticipate scenarios and their ability to acquire key resources from external cooperation for the activation of innovation paths (Alcalde-Herras *et al.*, 2019).

In the COVID-19 scenario, it becomes relevant to explore how ambidexterity can be used to explain the strategic responses implemented by manufacturing SMEs in their industries and to provide a perspective that can support manufacturer SMEs' actions towards the market in the pandemic and post-pandemic times (Kano and Oh, 2020; Raisch and Birkinshaw, 2008). Manufacturers – specifically SMEs – are asked to evolve and find new opportunities specifically in relation to the competitive behaviors adopted by business customers, who may implement switching strategies (Gereffi *et al.*, 2021) and modify market prospects specifically in international distant markets (Côté *et al.*, 2020). In this scenario, digital technologies have a role in favoring the achievement of ambidexterity (Papadopoulos *et al.*, 2022) taking into account the pressures of managing brand between industrial (B2B) and consumer (B2C) markets (Li *et al.*, 2018), in approaching new markets (Klein and Todesco, 2021), in case of supply chain resilience (Modgil *et al.*, 2022; Zouari *et al.*, 2021) and ambidextrous strategies by developing new paradigms and models (Ivanov *et al.*, 2021).

The challenges in the reconfiguration of the SME's relationships with their markets during the pandemic asks for a better comprehension of the strategies manufacturing SMEs adopt,



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taking into consideration the broad evolutionary dynamics in the global organization of economic activities (Panwar *et al.*, 2022) The structure of both buyer–supplier and firm–customer relationships are put under pressure in the COVID-19 pandemic, in which the possibility of reaching the markets—established but also geographically distant ones—becomes difficult and ambidexterity may emerge (Blome *et al.*, 2013; Wang *et al.*, 2021). From this perspective, the transformation of value chains and the possibility of firms to reach new markets in times of crisis through new forms of productions and value creations (Lee and Trimi, 2021; Phillips *et al.*, 2022) requires a deep knowledge of the potential reactions of manufacturing SMEs during such a reconfiguration (Gereffi *et al.*, 2021; Panwar *et al.*, 2022), specifically in terms of simultaneous ambidexterity. Such a process has to be further investigated by taking into account the implications in terms of strategies adopted and linkages developed with established and new markets and innovation for SMEs (Voss and Voss, 2013).

Winterhalter *et al.* (2016) suggested that firms can benefit from ambidexterity in terms of dual business models, combining simultaneously two different strategies for value creation for two different business domains – namely Western and emerging markets. Nevertheless, the possibility to simultaneously explore and exploit by SMEs, with positive consequences on their performance, has been put under discussion recently (Wenke *et al.*, 2021). With this non-conclusive theoretical debate, specifically taking into account the pressures on SMEs’ actions driven by the COVID-19 external environment, it becomes relevant to further discover which strategies manufacturing SMEs have put in place *vis-à-vis* the tensions emerging in the pandemic scenario and the internal resource constraints.

### 3. Methodology

Because of the exploratory nature of our research, we adopted a bottom-up inductive approach (e.g. Gioia *et al.*, 2013; Thomas, 2006) “wherein theories are formulated by drawing general inferences from particulars or cases of empirical data” (McAbee *et al.*, 2017, p. 278). The purpose was to identify new theoretical patterns (Sabherwal and King, 1991). We attempt to answer the study’s research question by selecting “information-rich” cases (Patton, 2015), summarizing varied or extensive raw data, establishing relationships between findings and research objectives and developing a theoretical framework based upon “the underlying structure of experiences or processes that are evident in the text data” (Thomas, 2006, p. 238).

#### 3.1 Data collection

To ensure rigor, we performed an exploratory multiple case qualitative study (Yin, 2014) using multiple material sources from the context of the COVID-19. First and foremost, due to the exceptionality and unpredictability of the event, we used in-depth interviews to better understand the phenomenon. In addition, we considered also secondary data in terms of news about the impacts of COVID-19 pandemic on industries and businesses and the reaction of firms, collected online and offline.

As main data source, we interviewed entrepreneurs and managers of 10 Italian manufacturing SMEs specializing in different industries. The interviews were conducted during the first phase of COVID-19 spreading in Italy, that is between May and June 2020, to explore the firms’ strategies adopted to face the emerging challenges linked to changes occurring in their markets and competitive environment due to the pandemic. The case studies have been selected targeting the same SMEs we had the opportunity to interview just before the COVID-19 pandemic occurred. The ten SMEs have been previously involved (between April 2019 and January 2020) in a larger study coupling quantitative and qualitative analyses (stratified sample of Italian SMEs operating in manufacturing industries) aimed at assessing the technological (Information and Communication Technologies and Industry 4.0

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technologies) investment of Italian SMEs (Bettiol *et al.*, 2021). After having contacted all the firms interviewed before the pandemic, only the ten SMEs included in this work accepted an interview during the first phase of the pandemic crisis. To identify and assess the strategic decisions that SMEs have taken during the pandemic we asked entrepreneurs, CEOs and/or managers of SMEs a set of open-ended questions that followed an interview format to keep the conversation structured and on point. Each interview lasted from 60 to 90 min and benefited from the documentation from the previous study.

Through this two-step process – before and during the pandemic – we were able to analyze the evolution of the firms' strategies due to the pandemic challenges. Table 1 shows the main characteristics of the SMEs considered in this study and the details of interviews done in 2020 (interviewed role and duration of interview in minutes).

### 3.2 Data analysis

We performed data analysis by following the inductive method recommended by Gioia *et al.* (2013) using three levels of coding. The primary and secondary data were coded into categories. Fundamentally, first-order concepts or codes are organized into second-order themes and these are distilled into aggregate theoretical dimensions. This methodology explains the analytical process of identifying concepts in data, grouping them as themes and then finding the aggregate dimensions at a wider level (Corley and Gioia, 2011; Gioia *et al.*, 2013).

Although there is no a widely accepted measure of an ambidextrous orientation, to assess the strategies implemented during the pandemic from the viewpoint of ambidexterity, we considered the simultaneous firm's behaviors in terms of both exploration and exploitation, to compete in their mature markets and in new ones (He and Wong, 2004). Specifically, following the work of Lubatkin *et al.* (2006), on the one hand, we considered as explorative behaviors the implementation of strategies aimed to look for novel technological ideas and/or creative ways to satisfy customers' needs by thinking "outside the box", to explore the use of (new) digital technologies, to develop or create products or services that are innovative to the firm, enter into new market segments and/or targets new customers. On the other hand, we considered as exploitative behaviors the strategies aimed at improving quality and reliability of products and services at lower cost, increasing the levels of automation in operations, fine-tunes the offer to improve the customers satisfaction and penetrates more deeply into its existing markets. In this sense, ambidexterity is meant as the propensity and the intentions of firms to do something (see Birkinshaw and Gupta, 2013 for a review) also through market experimentation that refers to the firms' expertise "to invest in small experiments that can generate new insights" (Day, 2011, p. 189) that allows to respond to heterogeneous markets and boost its performance (Moorman and Day, 2016).

To minimize biased interpretations, we investigated the SMEs' responses to COVID-19 challenges mainly relying on the interviews collected by describing our interpretative process in three steps. Firstly, all interviews were taped and transcribed. Specifically, the interview questions aimed to assess (1) the impacts of the COVID-19 pandemic on business processes and performance, on the relationships with customers and suppliers and the firms' utmost concerns about the pandemic; (2) how the firms were coping with COVID-19 also assessing the role of digital technologies; and, thus, (3) the strategies implemented in terms of process and product innovation activities, as well as of market innovation and whether the firms focused on exploiting and exploring new strategies due to their own resources and knowledge.

The interviews were processed using MAXQDA (released by VERBI GmbH). Following Gioia *et al.* (2013), we employed open coding focused on the respondents' perceived challenges related to the pandemic to build the first-order categories. Coding was carried out autonomously by the authors, followed by a comparison with the results obtained from the first-order analysis. In this first step, the information gathered through interviews was

**Table 1.**  
Firms' characteristics  
and interviews details

Case study	Activity	Employees (2019)	Competitive factors	Digital technologies	Interviewed role	Date of interview	Mins
Case 1	Production of wood - wood/ aluminum windows and doors	15	<ul style="list-style-type: none"> <li>Flexibility, customizable products</li> <li>Product uniqueness</li> <li>Servitization</li> </ul>	Computer numerical controlled (CNC) automatic machines in the production facilities	Entrepreneur	May 12 2020	63
Case 2	Two main production lines 1. Washing machines for trains, buses and trucks (main business) 2. Industrial electric vehicles (emergent business)	36	<ul style="list-style-type: none"> <li>Flexibility, customizable products</li> <li>Product uniqueness</li> </ul>	Enterprise Resource Planning (ERP), Customer Relationship Management (CRM)	CEO	May 13 2020	71
Case 3	Production of customized premium fine "Made in Italy" shoes	12	<ul style="list-style-type: none"> <li>Flexibility, customizable products</li> <li>Servitization</li> </ul>	E-commerce; ERP	Vice-president	May 08 2020	68
Case 4	Material analysis and technical tests on products (lab), electronic product design, training	30	<ul style="list-style-type: none"> <li>Flexibility, customizable products</li> <li>Product uniqueness</li> <li>Servitization</li> </ul>	ERP, CRM	CEO	June 15 2020	78
Case 5	Production of flours, yeast and other semi-finished products for bakeries	32	<ul style="list-style-type: none"> <li>Short time to delivery</li> <li>Flexibility, customizable products</li> <li>Product uniqueness</li> </ul>	E-commerce site dedicated to yeast and flours (B2C); ERP, CRM; autonomous robots and value chain integration systems	CFO	May 14 2020	83

(continued)



Case study	Activity	Employees (2019)	Competitive factors	Digital technologies	Interviewed role	Date of interview	Mins
Case 6	Specializes in the production of hyaluronic acid and other cosmetic products	26	<ul style="list-style-type: none"> <li>• Short time to delivery</li> <li>• Flexibility, customizable products</li> <li>• Product uniqueness</li> </ul>	ERP	President	June 11 2020	75
Case 7	Design and production of machines for wastewater purification and filtration plants	125	<ul style="list-style-type: none"> <li>• Flexibility, customizable products</li> <li>• Product variety</li> <li>• Environmental sustainability</li> </ul>	ERP, CRM, SCM; cloud system; cybersecurity; 3D printing and rendering	CEO	May 28 2020	86
Case 8	Production of furniture	60	<ul style="list-style-type: none"> <li>• Flexibility, customizable products</li> <li>• Time-to-market</li> <li>• Servitization</li> </ul>	E-commerce; new (automatic) production machine	CMO	June 09 2020	80
Case 9	Production of wine for own brand and third parties	17	<ul style="list-style-type: none"> <li>• Short time to delivery</li> <li>• Flexibility, customizable products</li> <li>• Environmental sustainability</li> </ul>	E-commerce; ERP and CRM	Entrepreneur	June 03 2020	78
Case 10	Design and construction of robots and automated systems for packaging (pharma, food and automotive)	20	<ul style="list-style-type: none"> <li>• Servitization</li> <li>• Innovative solutions</li> </ul>	ERP; autonomous robots; 3D printing; artificial intelligence and Internet of Things (IoT)	Entrepreneur	May 04 2020	76

**Source(s):** Authors' elaboration

Table 1.

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complemented by secondary data (company websites, news by local and national media, etc.). We specifically considered the activities and processes SMEs implemented during the first phase of COVID-19 pandemic as responses to the new economic scenario. During this first step, we selected quotes from the respondents related to the crisis and different exploitation and exploration strategies. Furthermore, the emerging relationships between the first-order concepts led to the creation of higher-order themes. We open coded our data to identify concepts and mechanisms (Gioia *et al.*, 2013) that helped us to understand how manufacturing SMEs adopted and adapted activities and processes into new strategies. The next step was to perform a second round of coding—axial coding—in which we searched for similarities in the first round. We generated the second-order themes based on the firms' relationships with suppliers and customers, the technologies used, the organization of business processes and innovation paths, approached in terms of exploration and exploitation. The last step in the coding process was to find aggregate dimensions explaining the first- and second-order codes and the relationships between them. We identified three higher-level aggregate dimensions (Gioia *et al.*, 2013), which represent the main strategies through which manufacturing SMEs responded successfully to the COVID-19 pandemic through ambidexterity. The overall coding structure is reported in Figure 1.

#### 4. Findings

Based on the second-order themes, we built theoretical dimensions that resulted in the emergence of the following key constructs: (1) playing different roles within in the same market simultaneously, (2) simultaneous entrance and management of multiple markets and (3) exploiting manufacturing knowledge to explore product and business model innovation (simultaneous learning processes) and for each, we offer a sequential narrative organized around the second-order themes.

##### 4.1 *Playing different roles within the same market simultaneously*

With respect to the strategies implemented before the pandemic, case studies have shown that firms started to play multiple roles in the market – addressing both industrial (B2B) and final customers (B2C) – due to the challenges connected with the international crisis and distribution constraints. This result is possible through the combination of second-order themes, that is digital business operations and quick adaption to demand that allowed serving simultaneously the B2B and B2C markets.

*4.1.1 Digital business operations.* Investments in technology carried out before the pandemic but not fully exploited paid off during the pandemic. As the marketing manager in *Case 8*, a mid-sized firm specializing in furniture, said:

We bought Industry 4.0 machinery for production and last year, we created an app that takes advantage of augmented reality because we don't have stores, we don't have showrooms and you can't see our products live before you buy them. So, we thought of developing an app that takes advantage of augmented reality—a free app.

Other companies reported that the pandemic forced them to take advantage of more advanced but underused innovative machines. These slack resources were helpful in managing important changes in demand to adjust production.

*4.1.2 Quick adaptation to demand.* The behavior of the firm in *Case 5* (which produces products for bakeries—flour and yeast) during the Italian lockdown emphasizes the firm's capability to deal with market turbulence. An e-commerce site was initially developed to reach customers in areas usually not covered by the geographic distribution of large retailers.

First-order concepts	Second-order themes	Aggregate dimensions
<p>(1) <i>Industry 4.0</i>: from orders to production and logistics is managed through digital technologies</p> <p>(2) <i>Virtualization of product configuration</i>: customers can view the product in 3D and personalize it through digital app.</p> <p>(3) <i>Ecommerce and communication</i>: online sales matched with the opportunity to talk directly to customers</p> <p>(4) <i>Increased (and improved) use of underutilized machines</i>: firms learnt to use slack resources (technology) to react to new requests</p> <p>(5) <i>Demand postponement</i>: compensations for customers for production delays</p> <p>(6) <i>Repurposing of production</i>: quick change in production for focusing on emerging requests</p> <p>(7) <i>Brand development</i>: beyond their B2B firms are starting new brands target to the final consumer</p> <p>(8) <i>Marketing cooperation with distributors/independent shops</i>: instead of jumping the intermediary firms involved them into a coordinated marketing campaign.</p> <p>(9) <i>Product differentiation</i>: producing different lines of products for B2B and B2C</p> <p>(10) <i>Old wine in new bottles</i>: developed new products with the same production facility</p> <p>(11) <i>Modularity</i>: recombination of in use technology to develop new product lines</p> <p>(12) <i>Adaptation to new rules</i>: different supply chains require different certifications and standards (product/process)</p> <p>(13) <i>Remote Maintenance</i>: virtual reality helps firms to deliver maintenance services to remote clients and to offer new services, independently from the product</p> <p>(14) <i>Remote Consultancy</i>: using existing expertise to consult clients of different values chains via new technologies</p> <p>(15) <i>Remote Training</i>: acquiring new clients of different values chains with ad hoc online courses.</p> <p>(16) <i>A foot in two stirrups</i>: serving more than a supply chain at once to diversify the risk</p> <p>(17) <i>Supply Chain Refocusing</i>: once a supply chain slowdown, firms could concentrate on another one</p> <p>(18) <i>Videoconferencing</i>: pandemics legitimized the use of digital communication to interact with clients saving time and money for finding new clients.</p>	<p>i. Digital business operations</p> <p>ii. Quick adaptation to demand</p> <p>iii. Serving B2B and B2C markets simultaneously</p> <p>iv. Exploring new business opportunities</p> <p>v. Improved digital services</p> <p>vi. Switch to more promising markets</p>	<p>1. Playing different roles within the same market simultaneously</p>
<p>(19) <i>Product repackaging</i> modified packaging for adopting to new targets</p> <p>(20) <i>Greener components</i>: improve the product by replacing the most polluting components</p> <p>(21) <i>Servitization</i>: adding high value services to existing products</p> <p>(22) <i>High quality production</i>: dedicated to specific markets with higher standards</p> <p>(23) <i>Partial production conversion</i>: to produce to mask or sanitized gel</p> <p>(24) <i>Customization</i>: improved capacity of managing small batches</p> <p>(25) <i>Incorporate advanced technology into existing products</i>: AI and machine learning can define new product categories.</p> <p>(26) <i>Discovering latent needs</i> emerged during the pandemic</p> <p>(27) <i>Designing solutions for B2B2C</i>: digital app for managing the supply chain helping the clients of firms' client</p>	<p>vii. Exploiting product innovation</p> <p>viii. Exploiting process innovation</p> <p>ix. Exploring new business models</p>	<p>2. Simultaneous entrance and management of multiple markets</p> <p>3. Exploiting manufacturing knowledge for exploring product and business model innovation</p>

Source(s): Authors' elaboration

Figure 1.  
Final data structures  
and codes

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Through this direct connection to customers, the company enhanced its brand visibility and customer relationship management. The entrepreneur in *Case 5* stated:

The online shop really took off in the lockdown and we had to cap the orders. We went from 50 weekly orders to 150–170 daily. We had to put a limit on orders accepted daily because we couldn't keep up with them because we had the same or even higher increase in demand from large retailers.

To deal with the increasing demand, the company increased production to 24/7 and employed new workers who had been laid off by other companies because of the lockdown. In addition, the company learned to use a new piece of machinery that had been acquired before the pandemic and had been underused.

*4.1.3 Serving the B2B and B2C markets simultaneously.* The example in *Case 8* shows that the dependency of large retailers for sales in situations where stores have been closed may be a detriment for turnover, especially in difficult times. Hence, they decided to further push their own brand towards their e-commerce and app-related services to overcome the reduction of turnover coming from B2B activities. In fact, a company having its own brand with direct control over the retail chain via an e-commerce store can become a safety valve for production. Being a supplier and a brand manufacturer was particularly useful during the pandemic. As the *Case 8* marketing manager stated:

It was a positive move for us because even before the production came back, we already had a lot of orders from the e-commerce store [ . . . ]. Instead, on the third-party side, it was all canceled [ . . . ], so if we could only rely on the way of doing contract work in the past, I do not know if we would still be here talking about it.

Regardless of the success of the direct-to-consumer strategy of the firm in *Case 8*, the company did not cut its links with large retailers in preparation for its future reopening. The company still managed the two production lines at the same time within the same factory. Other companies invested in product differentiation to reach new market segments (B2C) via their brand, hence exploring such market opportunity in addition of exploitation of existing B2B markets (*Case 9*).

#### *4.2 Simultaneous entrance and management of multiple markets*

SMEs can find new markets that may allow them balancing alternative trajectories (local and global) (Arlbjørn and Mikkelsen, 2014) in the context of the COVID-19 pandemic. Being present in multiple markets simultaneously has offered a positive path to resilience.

*4.2.1 Exploring new business opportunities.* The possibility of exploiting the experience garnered in one country in another one is a key aspect in this respect (Silva *et al.*, 2021; Vahlne and Johanson, 2013). The machinery producer in *Case 7* benefited from multiple locations and reacted to the pandemic by using company sites to be closer to its customers at its specific location. The entrepreneur in *Case 7* stated:

Fortunately, we were already structured with offices on various continents, so we have America, Brazil, Turkey and Pacific in Australia and this gave us a big push in the sense that the work is going on because our offices and factories continue to work for our clients abroad.

In the same vein, the firm in *Case 1*, which operates in the home furniture industry by offering windows and doors, mastering wood and aluminum production processes, invested in creating new market relationships with buyers in the US maintaining at same time its mainly domestic and European customers. The firm's ability to adapt its products and processes to the standards of the US market allowed it to be more reactive to the pressures of the pandemic. Owing to this experience of entering *new* markets, the company was able to switch and perceived this process as relevant and fostering potential growth. The manager stated:

We are moving in that type of market [US] [ . . . ]. We had already started to move by making investments because they need certification on the product [that is] different from the Italian legislation. They have hurricanes and have certain problems that are different from ours.

*4.2.2 Improved digital services.* For the company in *Case 4* operates, the digitalization of specific services was leveraged to expand its market. For example, the training courses (provided by a large US buyer) that the firm in *Case 4* used to offer face-to-face domestically have moved online due to the COVID-19 pandemic. This enabled the company to overcome physical boundaries and expand into the international market overnight. Moreover, due to its investments in digital technologies for customer relationship management (CRM) developed for its design-related business, the company was able to communicate and manage interactions with customers (and suppliers) more easily online and with a faster approach during the pandemic. The *Case 4* founder said:

We have 7,000 database contacts and basically, the fact of having them in the database has given us a considerable advantage. Digitalization is also becoming the key to process innovation related to the laboratory service, which was enhanced by the COVID-19 pandemic but rooted in the experience of the design activity. As far as laboratory activities are concerned, we are certainly doing something that we would have done in two years anyway, which is to create a portal for our customers.

*4.2.3 Switch to more promising markets.* The firm in *Case 6*, which specializes in cosmetics, is an example of a company that was able to switch to different products due to the challenges of the pandemic, which represented an opportunity for firms in specific industries. The firm exploited manufacturing and product synergies with pharmaceutical products to enter in a new market, thus overcoming the drop in the beauty market (temporarily decreased due to the lockdown). Because of manufacturing competences and proactive, innovative behavior, *Case 6* reacted immediately to requests from the new market and the Italian government to convert the firm's production to more urgent and relevant products. The *Case 6* founder stated:

We have suspended all projects that are on cosmetics and products that, for now, I do not consider necessary and we have focused our attention [ . . . ] on reconverting some production units in the production of medical surgical aids [disinfectants].

The firm in *Case 2* followed a similar strategic path by reconverting its products—machines for ozone-based sanitization—to the medical industry.

The problem is [that] [ . . . ] in that sector [tourism], we have stopped completely because the supply chain has broken down. [ . . . ] All the oxygenation generators have been engaged in the construction of respirators for patients, so the production has not stopped but has been diverted to another product.

#### *4.3 Exploiting manufacturing knowledge to explore product and business model innovation*

The pandemic has generated pressure on firms to find new business opportunities to overcome sales drops in established markets. This pressure has driven firms to rethink their strategies and include innovative paths that had not been previously explored or considered viable before the COVID-19 pandemic, specifically considering the time constraints and resources and knowledge available.

*4.3.1 Exploiting product innovation.* The learning experience in market requirements (Alcácer and Oxley, 2014), combined with manufacturing competences developed autonomously, may generate innovative ideas for products (such as changes in packaging to attract different customers) and the business model, which could represent an opportunity but also a threat to the existing business if not balanced properly.

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In the food industry, this trend was observed for the company in *Case 9*. The firm is an export-oriented winemaker (more than 60% of sales are in the US, Russia and Singapore) and operates as a manufacturer with design and R&D competences and a brand manufacturer. The company decided to push product innovation to overcome a decrease in demand from the firm's established markets. Specifically, the firm made investments to reach a different target in the market. During the pandemic, it worked on two innovative projects: developing cardboard packaging for a low-cost wine directed at an entry-level market and designing a new product for millennials and people who are not accustomed to drinking wine—a reduced-alcohol wine in an aluminum bottle. Control over the production process, their experience in product design and the exploration of a new market sustained this investment:

You've got to reach the youth market. Young people today drink beer, drink alcohol, drink products they do not know. They do not know what the pleasure of drinking wine can be.

*4.3.2 Exploiting process innovation.* Some companies used their machines and skills to reconvert part of production process to produce, in addition to their main products, other ones more useful during the pandemic. The firm in *Case 7* partially dedicated its production lines specialized in textiles for water filters to the production of masks that were donated to employees and local authorities. Although the company did not sell those masks, its reputation and credibility grew in the eyes of its employees and clients.

*4.3.3 Exploring new business models.* Firms used digital technology to explore the market by upgrading their products and expanding their offerings from products to servitization. The automation producer for the packaging industry in *Case 10* decided to increase its investments during the pandemic by expanding the features of its products and offering new services to its customers, relying on new investments in digital technologies:

We have, let's say, relaunched. One of our goals is to transfer some of the technology developed using a high level of artificial intelligence. Then, we can apply machine learning and deep learning to very industrial applications in which we are already involved with one of our customers.

Other case studies have similarly invested during the pandemic in identifying new sources of value creations for customers by enhancing their product range (electric vehicles) (*Case 2*) rooted on the elaboration of customers' latent needs. *Case 5* expanded its content delivery digital systems to let their business customers (bakeries) to reach their final customers online with rich and updated information.

**Table 2** illustrates the strategies of SMEs before and during the pandemic. It is important to specify that strategies activated during the pandemic have been added to the strategies characterizing companies before the pandemic. Specifically, during the pandemic the companies interviewed have activated new strategies (exploring) and improved the previous ones (exploiting) to sustain business.

## 5. Discussion

The evidence presented in our findings supports the theorization of a generalizable process which details are presented in **Figure 2** describing the simultaneous ambidextrous strategies a SME may develop to overcome crisis and turbulent times. SMEs can positively combine exploitation and exploration to outline new strategies in three specific strategic directions that have been adopted concurrently during the pandemic.

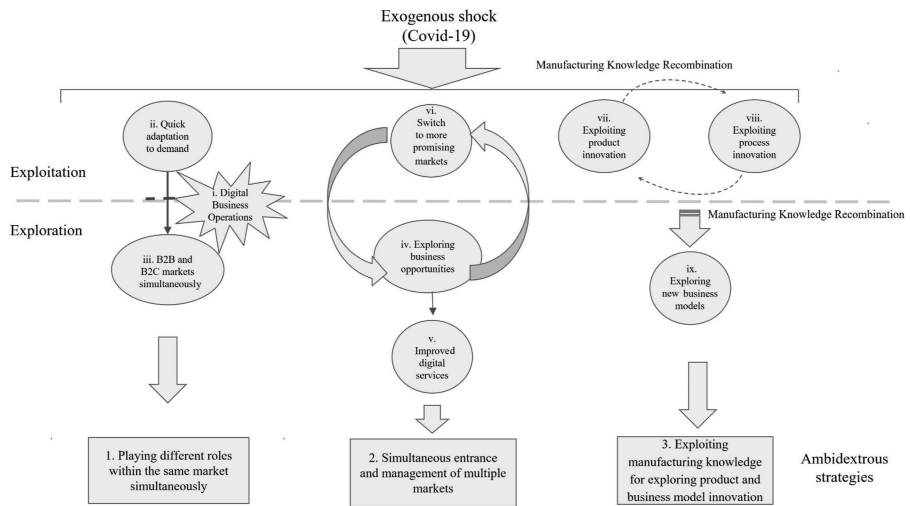
The first strategic direction refers to playing different roles (as supplier for other firms and as a brand for customer) within the same market simultaneously. This strategy is achieved by combining exploitation and exploration via the mediation of digital business operations.



Case study	Strategic directions before pandemic	New additional strategies implemented during the pandemic
Case 1	Design and production based on the input and request of their clients focusing on domestic market	Implemented digital marketing activities and innovated products Started to explore new markets adapting products and processes to the new market (US) request and standards
Case 2	Sell directly to national railway carriers around the world and to local bus transportation companies	Investments in product range adaptation to include machines for ozone-based sanitization as well as to expand their product (electric vehicles) based on new customers' mobility needs
Case 3	Subcontractor for global shoe luxury brands	Pushed e-commerce developing consumer segment and becoming subcontractor for local private labels
Case 4	Specialized supplier operating in different industries for testing products and design of electronic components	Through the digitalization of specific services, such as training courses, moved from face-to-face domestic relationships to online services expanding its market and reaching distant client (i.e. a large US buyer)
Case 5	Producer of flours for private labels and large retailers and brand manufacturer with a fast-growing market for the flours and yeast for bakery	Launch of an e-commerce site to reach customers in areas usually not covered by the geographic distribution of large retailers, enhancing the brand awareness. Development of new integrated digital services to the physical products to support customers
Case 6	Specialized in the production and direct selling of (customized) cosmetics for the pharmaceutical sector	Started the production of disinfectants and sanitizer, investing in digitalization to support business
Case 7	Designer and producer of wastewater purification and filtration plants in many sectors	Firstly, exploited multiple location sites to be closer to its customers. Moreover, used the knowledge about the production of water filters to produce masks
Case 8	Second-tier supplier of two main global and Italian brand retailers (IKEA and Mondo Convenienza) and also manufacturer with its own brand and products	Continued to serve both B2B and B2C increasing in the latter case the e-commerce channel. Launch of an augmented reality app to overcome the limit of the lack of store/showroom and offer the opportunity to "live" the product in a virtual environment
Case 9	Producer for private labels (they design the package and produce the wine) and brand manufacturer with several own brands that the company developed overtime	Invested in product differentiation to reach new market segments (B2C) focusing on two innovative projects: developing cardboard packaging for a low-cost wine directed at an entry-level market and designing a new product for millennials and people who are not accustomed to drinking wine—a reduced-alcohol wine in an aluminium bottle
Case 10	Design and manufacturing of robotic machines and systems mainly for domestic clients	Innovating products by offering new services relying on new investments in digital technologies transferring digital knowledge to satisfy the new customer needs and reach new segments

Source(s): Authors' elaboration

**Table 2.**  
Strategies before and during the pandemic



**Figure 2.**  
SMEs ambidextrous  
responses to COVID-19  
pandemic

**Source(s):** Authors' elaboration

When exposed to the exogenous shock of pandemic, SMEs' first reaction was to quickly adapt to the new scenario using resources at hand. For example, manufacturing SMEs resorted underused machines or changed the output of existing old machines (i.e. mask production out of machine for industrial filters). In this process, digital technologies were instrumental. SMEs relied on the flexibility of digital technologies to repurpose machines (i.e. reprogramming) and to interact with (distant) customers (i.e. via underused video conferencing or ecommerce). Changing production output and dialoguing with customers helped SMEs to find new business opportunities and to explore them. Latent and unsuspected potentiality emerged: SEMs learnt to interact with the final customers (B2C), without cutting their ties with B2B clients.

The second strategy considers the simultaneous entrance and management of multiple markets. This strategy is the result of an iterative process. Forced by pandemic, SMEs tried to increase the selling of their products approaching "new" markets which were more promising due to less restrictions and/or to lower COVID-19 infection rate in the population. The necessity to find and satisfy new customers led to the discovery of specific request coming from different markets. Without losing their relationship with already served markets, SMEs adjusted their products and services to cope with this new demand. The exploration resulted in the definition of new services and products. In this exploration process, digital technologies helped SMEs in improving the quality of the services offered with their products (i.e. the possibility to online customization or improved customer support).

The third ambidextrous strategy is related to the exploitation of manufacturing knowledge to explore product and business model innovation. Past experience in manufacturing process helped the definition of new products to adapt to pandemic shock (i.e. using the competence in electric engines for moving from washing machines to small electric vehicles or exploiting knowledge for producing masks). At the same time the definition of new products pushed firms to revise existing manufacturing process (i.e. a new production line dedicated to small electric vehicles). This knowledge recombination was the occasion for exploring new business models (i.e. from selling finished products to selling the design and development of the product).

## 6. Conclusions

The purpose of this paper was to explore SME suppliers' behaviors in times of crisis and how SMEs may rely on ambidexterity as a response strategy to overcome the challenges posed by the COVID-19 pandemic. The study highlights the relevance of ambidextrous strategies for SMEs to overcome the challenges emerged with the pandemic and to sustain business. Ambidexterity during crisis times could be a successful strategy for SMEs because they have the possibility to quickly adapt and improve existing products/services and develop, through experiments, new solutions (products/services/markets). In this regard, Table 3 presents a summary of the strategy rooted in the empirical analysis, which allowed us to depict both the theoretical and managerial implications, as well as to define actions and tools for becoming more resilient and competitive within the global supply chains in a post-pandemic scenario. The results highlight the key role of activating multiple positions/markets to mitigate risk (Dohale *et al.*, 2021) and of existing manufacturing knowledge to exploit and explore new market opportunities (Saide and Sheng, 2021). Moreover, as highlighted by recent literature (Doetzer and Pflaum, 2021; Paul and Chowdhury, 2021), digital technologies also play an important role in implementing the ambidexterity strategies and recovering the negative effects of the pandemic. The use of technology (social media, mobile apps, market place) allowed adaptive market experimentation, which concerns the firms' expertise "to invest in small experiments that can generate new insights for existing beliefs" (Day, 2011, p. 189).

	SME supplier' simultaneous ambidexterity strategies		
	Playing different roles within the same market	Simultaneous entrance and management of multiple markets	Exploiting manufacturing knowledge for exploring product and business model innovation
<b>Managerial implications</b>	Global markets are opportunities to learn. Cultivate those opportunities by starting your own product and brand or the possibility to work in several industries	In turbulent times, risk sharing is essential to surviving. Being present in several international markets helps. Not having all the eggs in one basket	Exploit existing knowledge base to update and adapt products while explore new market opportunities by investing in R&D and innovation
<b>Actions</b> <i>During the crisis</i>	Start small. In the event of a significant change in the environment, you are ready to scale up	Establish new sales channels and build international networks. Physical presence in the market is still important to exploit opportunities	Knowledge management practice and innovation policies matter. Never stop inventing. Manufacturing is a source of innovation
<i>After the crisis</i>	Invest in building new sales channels. Start-up culture to reorganize the internal activity. Financial resources are required	Difficult to manage in the short run. Try to explore new markets, especially using digital marketplaces where customers are already present	Put a lot of effort into developing a new product. It may be difficult and exhausting and could be hampered by bureaucratic issues (specific rules and laws)
<b>Tools</b>	Digital technologies are crucial because they help the company deploy complex processes (i.e. e-commerce) at low cost	Start with a network of qualified local partners and scale up if necessary, with a stronger presence in the local market	Cultivate open innovation and offer incentives for innovation coming from employees

Source(s): Authors' elaboration

**Table 3.**  
Strategy in the post-pandemic scenario

### 6.1 Theoretical contributions

This study contributes to the literature on the strategic dimension of ambidexterity, by defining new strategic paths manufacturing SMEs could follow in times of crises. Our research outlines that firms may pursue simultaneously different and potentially contradictory or opposing strategies, expanding research on ambidexterity that was proposed by international business studies. We identified three new aggregate theoretical dimensions meant as strategic paths that could be used to survive in rapidly changing environments and sustain competitiveness after the COVID-19 pandemic. These strategies are all characterized by the SMEs' ability to manage different tensions, mixing the exploitation of resources and the exploration of new business opportunities. Simultaneous ambidextrous strategies give SMEs the possibility of making use of their position in the market and exploring different positions in new ones, thus reducing the risks associated with the pandemic (Aslam *et al.*, 2020; Dohale *et al.*, 2021). Activating multiple positions/markets and leveraging manufacturing knowledge, supported by the use of digital technologies (Modgil *et al.*, 2022; Zouari *et al.*, 2021), may allow SMEs to be resilient and react positively to the crisis and compete in the post-crisis period, thus favoring firms' resilience in different industries.

Our study enriches the existing literature on the relevance of ambidexterity during turbulent and crisis times (Alcalde-Heras *et al.*, 2019; Butt, 2021; Iborra *et al.*, 2020; Paul and Chowdhury, 2021), since it shows that thanks to the adoption of simultaneous ambidextrous strategies, supported by digital technologies, manufacturing SMEs can pursue the strategy of persevering in their businesses by exploiting and exploring different roles (supplier and own brand), different markets, as well as innovating and developing new products (Wenzel *et al.*, 2021). In this way, they can limit the negative consequences of retrenching (narrowing their business) or exiting the market (i.e. failing), thus achieving resilience.

### 6.2 Managerial contributions

As highlighted in Table 3, this study has different implications for firms. Our results suggest that firms can achieve resilience in the market during a global crisis by focusing on two relevant elements: control over manufacturing and investments in digitalization. In fact, the pandemic has pointed out that manufacturing matters and manufacturing knowledge is relevant. On the one hand, this is related to the potential problems of distance related to production processes scattered internationally and their stoppage during lockdown (Panwar *et al.*, 2022). On the other hand, more importantly, manufacturing is linked with opportunities to exploit product and production process knowledge to improve existing products and at same time develop new businesses to reach new customers and connect with new markets. Controlling operations directly sustains innovation due to the strong interactions among the different activities along value chain. SMEs should increase (i.e. through small experiments) their ability to manage different positions/markets also by using digital technologies to be ready to face turbulent and crisis times.

Digitalization has helped firms reach their customers more proactively (via dedicated e-commerce solutions and digital customer relationship management), a solution that has been mission critical in the pandemic. The possibility of communicating with existing clients or prospects has been strategic in readapting to the new competitive scenario (Bettiol *et al.*, 2021). In addition, digital technologies related to advanced manufacturing further sustain SMEs' resilience engaged in global value chains by providing integrated data on products, processes and markets and by helping firms manage value chain connections and distributed activities (Björkdahl, 2020; Zouari *et al.*, 2021). The use of digital technologies assumes a key role in the development of ambidextrous strategies during a crisis period. Therefore, we suggest that SMEs should use digital technologies to ensure the successful implementation of the ambidextrous strategies during crisis period. For both exploiting manufacturing knowledge and exploring new opportunities (through digital technologies included), firms' internal

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competencies are necessary to move smoothly from one advantage to another at any given point in time (Kristal *et al.*, 2010).

### 6.3 Limitations and future research

This study has some limitations. As we interviewed only SMEs based in Italy, future studies should analyze firms from other countries to check whether the results can be applied in relation to different crisis pressures. Because COVID-19 affected countries in different ways in terms of both intensity of contagion and government regulations (lockdowns, isolation policies, the access of foreigners, etc.), it would be useful to compare SMEs from different countries. Related to this point, it would be helpful to understand the role played by the mindsets of entrepreneurs and managers. In this sense, as already shown for SMEs (Iborra *et al.*, 2020), mindset can have an important role in favoring ambidexterity during crises and turbulent times. This aspect could also represent an area for future research. Further research should also specifically address how ambidextrous strategies impact on the organizational dimensions of firms by enriching the theoretical debated through qualitative and quantitative analyses.

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