

COVID-19 firms' fast innovation reaction analyzed through dynamic capabilities

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During the COVID-19 emergency, several companies have been able to rapidly reconfigure their innovation and production processes to help support health and other services to cope with the shortage of needed supplies. Using the dynamic capability perspective, this work aims to understand which capabilities enable companies to have fast innovation reactions when they are not pursuing a competitive advantage but they are responding to a societal requirement. A multiple case study approach was used and results reveal that the use of internal and external sources is fundamental. In particular, the Italian companies with a fast innovation reaction to COVID-19 are not the ones that possess all the competencies internally but are rather those able to orchestrate internal and external resources by means of 'fast' and flat management. Internal commitment and a culture of continual renewal are essential to rapidly reach a performing product.

1. Introduction

The discovery of the severe acute respiratory syndrome in late 2019 (Zhu et al., 2020) and the subsequent pandemic of COVID-19 has not only severely tested the public health systems (Chesbrough, 2020) but also severely overwhelmed businesses, posing considerable challenges for managers. The unprecedented and unexpected lockdown experience is an exogenous shock for society and economies worldwide.

This 'assault' has prompted several encouraging developments in many sectors and not only in the medical sector. Most of the journals are talking about companies that changed their production processes due to COVID-19 emergencies. Several companies immediately identified (external) needs deriving from the new ones dictated by the COVID-19 emergency and they have Fast Innovation Reactions (FIR). Large

international companies such as H&M or Zara decided to produce masks or medical gowns, whereas the famous spirits Campari decided to help in the production of sanitizing gels. Small companies or startups were also able to produce goods required as a consequence of the emergency. Innovation has and will have an important role to play during and in the recovery phase in the aftermath of the COVID-19 pandemic. These developments have in common the rapid response to these unexpected needs of supplies. Managers, therefore, concentrate on renewing their resources. The dynamic nature of the environment of the COVID-19 pandemic situation requires managers to both combine in new ways the resources already owned and to rapidly search for new ones to gain additional resources. Indeed, in fighting a pandemic, speed is crucial, and the sooner experts, researchers, and companies are able to take action, the better it will be for all humankind in curbing the acceleration of the disease.

The ability to reconfigure companies' resources has been widely studied by the dynamic capability (DC) framework (Bogers et al., 2019; Teece, 2020). Such capabilities are critical to the success of firms in dynamic markets.

So far, DCs have always been considered an enabler to gain competitive advantage and gain an economic return (Teece et al., 1997). In the COVID-19 pandemic situation, the goal has been slightly different. Companies have FIRs to cope with societal needs and not market success. Thus, the research gap investigated in this paper is to investigate the importance of DC to have fast reactions not to gain a competitive advantage but to cope with a societal need.

The paper aims to fill this gap, understanding how the existing DCs owned by a company may be an enabler to fast reaction due to the shortage of needed supplies that may differ from the economic return of a single company. Specifically, the paper seeks to understand how during the COVID-19 transformation DCs have enabled firms' FIRs, by answering the following research question: How does dynamic capability owned by companies enable 'COVID-19' fast innovations reactions?

Through the use of a qualitative methodology and the conduction of seven case studies, i.e. Campari, Isinnova, Grafica Veneta, Ellamp, HTM Sport (Mares), Distillerie Silvio Carta (DSC), and Caracol, the study shows the importance of continuously combining internal and external resources to cope quickly with new and unexpected social needs. Flat and flexible structures, where employees are easily committable to the project favor this prompt response and establish a win-win situation between society and firms.

This exploratory study makes two distinct contributions. First, managers should think about firms' role toward society and the capabilities needed to achieve FIRs. Second, policy makers should think of their role as orchestrator of assets in the supply chain.

2. Literature review: dynamic capability framework

DCs are 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments in which there is deep uncertainty' (Teece, 2020). In the DC perspective, a fundamental pillar to sustain profitable growth is the ability to recombine and reconfigure assets and organizational structures, the adaptability of internal and external capabilities to the volatile market and

the technology environment. Internal resources generally are the human or technological assets owned by the firm itself, while external resources are those obtained from external sources through alliances, collaborations, joint ventures, acquisitions or also outsourcing (Chiesa and Manzini, 2002; Bantham et al., 2003; Johnson and Sohi, 2003). This process called 'orchestration' requires shifting or moving resources such as assets, talent or money where they could deliver the highest value. Teece et al. (1997) theorized DC to explicate why some organizations are more successful than others in creating and sustaining competitive advantages in dynamic markets. DCs are undergirded by three sets of processes: sensing, seizing and transforming capabilities.

The 'Sensing' capability includes 'the identification, development, and calibration of technological opportunities, customer needs, and strategic challenges' (Teece, 2020). The key goal of sensing is to identify recombination of resources and capabilities to recognize and assess opportunities and avoid threats (Matysiak et al., 2018). Therefore, it is critical to identify or attract new or cutting-edge ideas and then to remove bad ones. A deeper technological and market understanding, open to external knowledge, enriches sensing capabilities. The sensing capability assists companies in identifying and evaluating valuable external knowledge. The top management team is responsible for merging and evaluating different and not homogeneous sources information in order to identify new opportunities coming from the environment or from internal boosts and for prioritizing problems (Day and Schoemaker, 2009). Technical dialogue with customers, suppliers, researchers and competitors makes innovation efforts more effective and increases the likelihood that top management learns from matters affecting markets, value chains, or in general the ecosystem before reaching crisis proportions (Teece et al., 2016). In this context, some studies, such as Caniels (2003), emphasize the importance of local knowledge spillovers, including the rapid spread of new information, technology and knowledge through local inter-firm interactions or personal interactions.

The 'Seizing' capability determines 'how quickly the organization can respond to significant opportunities and threats once identified' (Teece, 2020). Once a new opportunity is sensed, it must be addressed through new products, processes, or services. Multiple and often competing paths are possible (Teece, 2007). Thus, the seizing activities comprise investing, identifying, and deciding how to fill capability gaps (Chesbrough and Teece, 2008). To successfully use external knowledge and technology, companies need

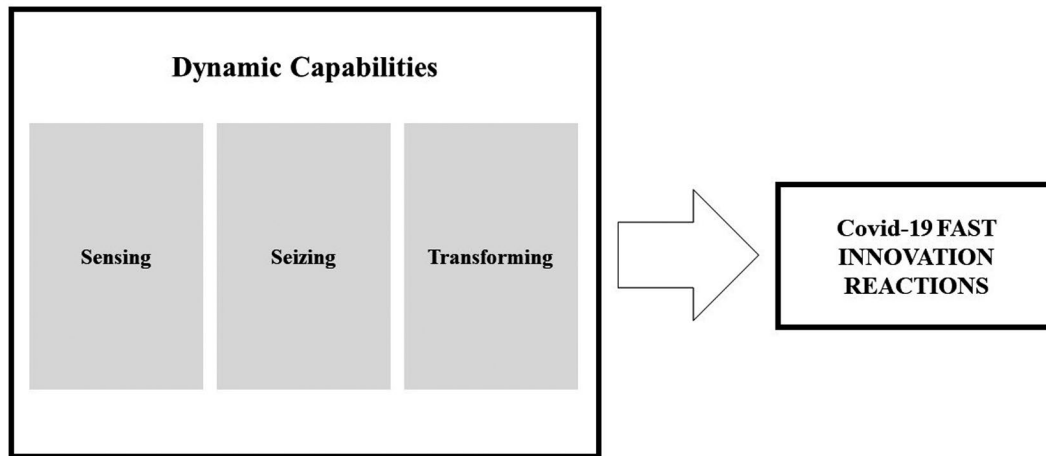


Figure 1. Schema for the analysis.

to establish various organizational practices in terms of extensive delegation, intensive lateral and vertical communication. The proximity may lower communication costs, while face-to-face contacts enhance the interaction quality. Many solutions from outside are not 'plug and play' with internal capabilities. System integration is a major challenge and usually, flexibility favors it. The ability to integrate pieces of knowledge or technology from different internal or external sources avoids developing another piece of knowledge, but rather helps in creating systems. Accordingly, loyalty and commitment within the company and a platform for complementary products and services must be built. In addition, decision-making protocols play a significant role (Teece, 2007). In hierarchically organized enterprises, decision-making involves bureaucratic processes that may hinder innovation and a 'program persistence bias' may occur. Strong leaders can overcome such propensity, but they are not always present. Moreover, the excessive risk aversion may limit the seizing of sense opportunities. The gaps can be filled through multiple sources and organizational mechanisms. For example, outsourcing can be an option, otherwise, partners should cooperate in developing the product. Other seizing capabilities, such as the ability to quickly integrate feedback and the rapid prototyping of new products help to bridge the gap existing in the ecosystem and rapidly capture the value.

The 'Transforming' capabilities 'are responsible for keeping the elements of the organizational system coherent, aligned with the strategy, and competitive in the external environment' (Teece, 2020). A key is the ability to reconfigure assets and organizational structures when company, markets and technologies change. This requires organizations in which decisions can be made rapidly. Companies should be able to combine co-specialized assets, to learn and

generate new knowledge, and to establish a proper governance model (Teece, 2007). This means that companies should be capable also to change routines, whilst it may be costly. This permits relevant information to flow quickly where it can create value. Asset smart orchestration is fundamental to realign organizations and integrate external knowledge sources and it depends mostly on developing and promoting a culture that encourages collaboration. The integration of external knowledge and resources may require a cultural change. Pushing an organizational culture that sustains openness, agility, flexibility, and experimentation may be challenging, but it can provide a solid groundwork for earlier, quicker, and easier renewal in the future. Transformation is fundamental because opening the innovation process may allow the redeployment of internal resources that are completely different from core technologies and anticipate competitors.

In this context, managerial skills are relevant to 'orchestrate assets and activities' across firms' boundaries, including the integration of various technologies. Managers who have the leadership skills to design organizational structures and culture that are open toward external technology and knowledge, can speedily apply new knowledge and respond to changing conditions (Teece et al., 2016).

3. Methodology

An exploratory multiple case study has been conducted. It allows an in-depth analysis and its multiple nature ensures the variety of the cases. Multiple-case studies enable comparisons (Yin, 2014) that elucidate whether an emergent finding is replicable (Eisenhardt and Graebner, 2007). Figure 1 reports the process of analysis.

To increase the robustness of results, data analysis and data collection have been overlapped to have the opportunity to take advantage of a flexible data collection and to maintain the freedom to enhance the quality during the data collection process itself.

3.1. Data collection

This rapid response paper seeks to interview companies that have showed a FIR. The data collection was conducted from April to August 2020. The reconverted company represents our unit of analysis. Therefore, the process was structured as follows:

- *Selection of the cases.* The cases were chosen from Italian companies that during the COVID-19 pandemic have placed on the market new products compared to the core business in order to cope with the shortages of products that limit the spread of COVID-19. The Italian business newspapers and press releases were reviewed to identify the cases. Italy was chosen because it was one of the European regions most widely affected by COVID-19, in particular at the beginning of the pandemic, when industrial support was required even more. According to a convenient sample (Siggelkow, 2008), fifteen firms were asked to participate in the research project and seven firms agreed to participate. This allows the authors to take variability into account in terms of sector, new production processes, new products (masks, valves, sanitizers, air cleaners, screens) and size of the company.
- *Definition of the interview-protocol.* The interview protocol was defined according to the literature background and with the exploratory purpose of

understanding how DCs enact the establishment of new production processes due to the COVID-19 market requirement. The guidelines for the semi-structured interviews were based on the schema in Figure 1 (Teece et al., 1997, 2016; Teece, 2020) and examples of interview questions were reported in Table 1.

- *Interview process.* In this stage, the interview, written or oral, was conducted with the employees having worked in the firms' reconversion (see Table 2) Written or oral semi-structured interviews between one and two hours long were conducted, followed by informal follow-ups via e-mails to clarify questions that arose during the data analysis.
- *Secondary data collection.* The use of secondary data, gathered from company websites, newspapers and press about companies' COVID-19 initiatives, permitted authors to control for subjective judgment of individuals and thus increased the validity of the analysis (Gibbert et al., 2008).

3.2. Data analysis

The process of analyzing data was performed following Eisenhardt (1989). A second-order code was developed according to a hybrid approach (Fereday and Muir-Cochrane, 2016) by three researchers. Then, they separately defined the first-order codes through a deductive approach, relying on the literature review (Mayring, 2000). The findings were processed according to a data-reduction process (Miles et al., 2014) and summarized into a case study. Then, a cross-case analysis was conducted in order to identify common patterns and differences between the selected cases and to compare them with the extant

Table 1. Examples of interview questions

Question area	Questions example
Initiative	<ul style="list-style-type: none"> • Could you describe the initiative of reconversion that you have put in place in your company? • How long does it take?
Sensing DC	<ul style="list-style-type: none"> • How does the company understand the external need? Is it a company that often looks outside to get new ideas? • Is it a company highly devoted to innovation and R&D?
Seizing DC	<ul style="list-style-type: none"> • Who takes the decision to start this new production? Is all the company involved? Which competencies were required? • How do you communicate internally? • Which resources were used? • Does the company collaborate with other partners? Are you used to collaborating with external actors? Does the company already know them?
Transforming DC	<ul style="list-style-type: none"> • Does the company specialize in specific competencies? • What are the thoughts of the company and the employees about the renewal? • What does the company learn from this experience? Does the company aim to stay in this business?

Table 2. Cases description

Case	COVID-19 fast innovation reaction	Sales last avail. Yr (thousands of EUR)	Number of employees	Number of patents	Number of trademarks	Source
Isinnova	Manufacturing of valves adaptable to snorkeling masks to be connected to ventilators	472	n.a.	11	0	Co-Founder/CEO
Campari	Manufacturing of sanitizing gel	1,711,700	3,625	1	95	SCM and Marketing Director
Grafica Veneta	Manufacturing of filtering screens. They were one of the first companies that became famous in Italy for the reconversion	57,475	270	0	1	Different company functions
Caracol	Manufacturing of reusable and sustainable masks	n.a.	12	1	0	Co-Founder/COO
Ellamp	Manufacturing of sanitizing devices	11,415	150	26	2	Owner
Distillerie Silvio Carta	Manufacturing of sanitizing gel usable also on food	8,620	19	0	1	Owner
HTM Sport (Mares)	Manufacturing of masks usable for medical purposes	104,369	188	5,254	14	Technical Director

analyzed literature. Content validation was made by dialoguing between researchers to agree on the data labels. Any passages where a coder had doubts were discussed to reach agreement on the appropriate label. Then, findings were triangulated with additional secondary data and the final consensus was reached (Miles and Huberman, 1994). These findings were detailed and then summarized in Table 3 and shown Figure 2.

4. Results

4.1. Isinnova

Isinnova is a small company set up in 2014 with headquarters in Brescia, an area highly affected by COVID-19. Born as a startup, the company is devoted to R&D activities. Isinnova aims to find an application for each idea and find the right business for it. They achieve these goals either alone or by collaborating with other companies. Isinnova is composed of a heterogeneous team of engineers, designers, and market experts. The organization can be defined as flat and the average age is around 30.

Isinnova was the creator and promoter of the project Easy-Covid19. When the COVID-19 emergency exploded, Mellini hospital of Chiari (close to the Isinnova headquarters) had a lack of respirator valves. Isinnova received a call from a physician and a Brescia journal asking them to print these valves in 3D.

Isinnova's founder decided to solve this problem alone in order to avoid issues for the firm, but still working with his collaborators:

We started in a Garibaldina style.

The valve CAD of the supplier company was not available. They took the valve from the hospital and drew and printed it in 3D. In three days, they produced more than 100 valves, also asking for printers from friends' companies.

After that, there was a lack of C-PAP masks for sub-intensive therapies in Brescia and Italy. Isinnova analyzed how to connect this mask with the breathing respirator ending with the design and printing of the 3D valve that can be inserted into the oxygen pipe substituting the mouthpiece. The valve was tested in Chiari hospital and in another one. This valve, called Charlotte, is also adaptable to different breathing respirators.

The Charlotte valve was patented to avoid speculation. The patent can be used by everyone and hospitals can print valves with any 3 printer. Now, they are launching an international project to help countries that could suffer COVID-19 emergencies.

The peculiar aspect of this project has been the time. They had to squeeze activities generally done in one or two months into around three days. Moreover, their propensity to risk allowed Isinnova to grasp the challenge. Most people advised them to not start this production process; however, in Isinnova employees' mind the mission to help people was more important than fear. There were several obstacles, in particular, normative ones:

We are still waiting for the different certifications.

This project has allowed Isinnova to enlarge its network and increase its visibility: several new clients have contacted them to develop new ideas.

4.2. Grafica Veneta

Grafica Veneta is a medium-large company based near Padua, Veneto, one of the first Italian regions affected by COVID-19. They are the biggest Italian printing & graphics company. They are known for the printing of some famous books, such as Harry Potter. After the 2011 crisis, they are one of the few 'surviving' printing companies. They constantly invest in young employees and in the most promising technologies or material such as clean energy, circular economy, and forest safety. The company has a dynamic structure, able to embrace novelty and entrepreneurial challenges.

In this emergency, they were contacted by the regional authority to produce safety filtering screens for citizens to avoid COVID-19 infection.

To produce these screens an entire division was dedicated to the project and the high technology of the plant was converted.

Everyone in the company was involved. After the direction set by Grafica Veneta's president, everyone contributed to this new project.

From the CEO to the last hired employee all have worked for this project.

The quality head initially tested the prototypes, also thanks to his chemical knowledge. Then, external labs certified the required standards, in terms of anti-allergic and biocompatible certifications, toxicity, and irritation tests.

The company has reached new suppliers and strengthened its relationship with political institutions and society. They have learned how to adapt what they already had as knowledge, in order to be able to fulfill a societal need.

From this project, they learnt the importance of being useful for society. The first screens were donated, but now they have also been contacted for series production. Contemporaneously, they keep their core production process.

4.3. Campari Group

Campari Group is one of the most important players around the world for the premium spirits sector and it owns a portfolio of more than 50 brands. They have a historical connection with the city of Milan, another area most highly affected by COVID-19. They always encourage innovation from its roots.

At first, Campari paid attention to its supply chain. It moved stocks to avoid shortages in normal distribution and managed COVID-19 as any other risky situation. Indeed, Campari has established a strong risk management system and managers have experience in managing similar emergencies, such as MERS and SARS.

In Italy, Campari donated alcohol to produce a sanitizing gel, one of the most important products in reducing COVID-19 infection, also to respond to the call of help coming from spirits associations. Indeed, they expressed the need and lack of denatured alcohol.

There should be the desire to do things, the organization to do it, and trust in doing it.

In Italy, Campari could not change its production process and established a partnership with Cosmint (Intercos Group) that operates in make-up cosmetics sector. This partnership was established thanks to the idea of Campari's president, who knows the president of Intercos, although they never collaborated for traditional business. The two companies exchanged their knowledge to convert Campari alcohol into denatured alcohol.

In other places where Campari has its plants, they started also the gel manufacturing. In Canada, they anticipated the need and converted their production process, treating alcohol according to the regulations of the medical market, which are different from those of the spirits sector. This was possible because they have chemical and engineering knowledge.

In most of the situations, Campari anticipated the government requests and understood the need required because:

That was the right thing to do.

4.4. Caracol

Caracol is a startup based in Lomazzo, close to Como, a province highly impacted by COVID-19. They are additive manufacturing service providers, who support large companies in different industries. This is possible thanks to the strong R&D activities it pursues, and its deep understanding of core industries like automotive and medical devices.

Table 3. Multiple case analysis data

DC	Second-level codes	First-level codes	Quotations
Sensing	Recognizing external opportunities	High propensity to look outside the company and to quickly detect the need for a supply	“Vision without execution... is just hallucination”. We work with innovative external ideas. This helped us to be ready to answer to the “call of help”. (Isinnova) The company searches for new horizons and this makes us ready for market requirements. (Grafica Veneta)
	Direct internal R&D and selection of new technologies	Strong focus on R&D to solve different problems	R&D is part of our company and it continues to work also during this pandemic. (Campari) We base our R&D on our capability in order to solve other problems and be ready for each situation as in this pandemic. (Ellamp)
Seizing	Mobilization of resources	Capacity to move external resources quickly to develop the new product Capacity to move internal resources quickly to develop the new product	We searched for other makers that could develop our product. We always work with other actors. (Isinnova) Some of our resources were dedicated to the project and we invested in this new production process. Our resources are always sharable between different projects. (Caracol)
	Building loyalty and commitment	Involvement of all human resources to better manage and develop the new product	We have a flat organization, and everyone works day and night to develop the valve. This organization makes easier to create a team to develop the new valve. (Isinnova) The human resources immediately understood that the world was changing. For example, we do not go on holidays. (Ellamp)
Initiating combinatorial activities	Fast decision-making	Capacity of fast decision by the management – top-down, quite flat to decide fast how to set up the new production and commercialization Capacity of fast decision by the management – top-down to decide fast how to set up the new production and commercialization	In three days, we already had the prototype; generally, this process takes months, but we are always fast. (Isinnova) In few days, I decided the recipe of our product. Generally, I took the decision and all the employees follow me. (DSC)
		Fast combination with other companies to quickly and better develop the needed supply (technical background) Ability of fast combination with other companies and scientific partners to quickly and better develop the needed supply (technical background) Fast combination with other companies and certification offices to quickly and better develop the needed supply (technical background)	Intercos produced the sanitizing gel and then we combined the logistic aspects We have engineers and chemists, so the two groups (Campari and Intercos) talk the same language. (Campari) Other companies built the filter and we talked with public institutions. We are used to work with different actors and this help us. (Caracol) The head of quality, thanks to a chemical background, allowed Grafica Veneta to set up the initial lab tests after completing in external labs. We are used to combine our knowledge with others. (Grafica Veneta)

(Continues)

Table 3. (Continued)

DC	Second-level codes	First-level codes	Quotations
Transforming	Culture of renewal	Continuous search of new ideas in order to be ready and competitive in turbulent environment and be able to set a fast innovation reaction	<i>We have... never renounced the use of high technology in the production processes. (Grafica Veneta)</i> <i>After the crisis of our main and unique product in the seventies, we decided to continuously test new products and differentiate them. This was important to renew ourselves also in this pandemic. (DSC)</i>
	Knowledge management	Capacity to use existing knowledge also to develop totally different new products in emergency situations	<i>We continuously manage risky situations. We already have protocols to manage risky situations, we simply use them on a higher scale. (Campari)</i> <i>We were applying our skills and we are thinking of creating a new division with this business. (Mares)</i>
	Co-specialization	Focus on the own specific competencies to better produce the needed supply	<i>The filter was produced by other companies specialized in it. We are able to produce the mask. (Caracol)</i> <i>The bottle was different from the others and I searched for new suppliers. (DSC)</i>

The team is comprised of young people with expertise in the world of design and industry 4.0. A group of people who believe in being open-minded, adaptable, creative and innovative, stating in their values that ‘We believe there is always a new way of doing things’.

During the emergency they wanted to contribute to their community and country, deciding to dedicate their full production process capacity of 25 printers to producing protective masks, printed with a polymeric material. Using their knowledge of 3D printing, they were able to quickly start producing 2-3.000 masks per week.

This project started as an internal idea, and they created a dedicated team:

We created a company in the company.

All of Caracol’s team was highly committed to the project:

We worked day and night on it.

Moreover, they collaborated with research centers and universities. Most of the difficulties were encountered with regard to the certification process, which led the company to learn how to ‘talk’ with different actors.

They are already moving back to working in the core business, but this project has helped the startup’s team to keep producing even during COVID-19.

4.5. Ellamp

Ellamp is a company based in Bodio Lomnago, close to Como that develops interiors for buses and trains. In 2011, it suffered a serious crisis. After that, Ellamp management understood that the company could not only operate in the traditional business but had to better use their competencies. The company re-evaluated its value proposition reasoning on how its competencies could be used. They started to propose several new ideas for the transport sector.

During COVID-19, the owner, who has an engineering background, decided that he did not want to close the company and that Ellamp could also help society to recover from the pandemic.

I tried to follow a vision. A positive path. The other option was to fire people, but I am an optimist, so I decided to do something useful during the lockdown.

Thanks to Ellamp’s knowledge of buses and coaches, a new system based on tungsten trioxide photocatalyst that cleans the air has been manufactured. The photocatalyst is not dangerous for humans, kills or reduces virus and bacteria, can be used also when people are on the bus; it can act continuously and the maintenance costs are quite low.

After the owner's initial decision, the employees were involved and the majority of them received the change well, also because:

It is interesting to have a new project to follow and not a crisis to treat.

The company has always relied on collaborations with other companies (for example Elmec), universities and labs. In this case they extend their original network.

The system has already been patented and offered to some municipalities. Moreover, with this system, different devices, for different uses, have been prototyped.

4.6. *Distillerie Silvio Carta*

Distillerie Silvio Carta is a small company based in Sardinia and it is recognized for its alcoholic beverages and spirits. Sardinia has not been widely affected by COVID-19. However, during the days of the pandemic outbreak, the owner of the company was in Milan, a highly affected area.

After having suffered a crisis in the '70s DSC decided to no longer rely on few products. For these reasons, they always try to discover new products and propose new tastes to clients, still understanding what the market wants. The new recipes are tested in their labs and the owner is the first one who decides if the product can be ready for the market or it is still not good enough.

During COVID-19, the owner decided to develop a hand sanitizing liquid, with a nice smell, usable also on foods. The lab and the production department were involved in this project immediately. In around four days the product, named Sterile 85, was ready. It is edible, has natural properties typical of organic alcohol, is versatile and suitable for multiple uses.

It involves also new suppliers and new clients, extending a network already quite broad:

It is not possible to run this business alone.

Also in this case, they focused on their specific competencies, i.e. raw material, recipes, quality tests and production process, relying on external sources, for example, for the new packaging.

4.7. *Mares*

Mares is a company based in Rapallo (Genoa), an area highly affected by COVID-19. Mares is a subsidiary of HTM Sport and it is one of the most highly regarded companies in the snorkeling sector. The strength of Mares is related to its high propensity to continuously innovate, particularly in terms of new

technologies. After having seen the idea developed by Isinnova and also due to the request for masks posted on social network by hospitals, a team of Mares technicians developed a system able to convert the snorkeling masks into ventilator masks that can work with ventilators C-PAP using a 3D printing adaptor:

We created a WhatsApp group where every day I wrote if there was the need to produce new masks and nobody of my colleagues complains.

Compared to other masks, this product covers face, eyes, nose and mouth completely. The result came out in four days thanks to a series of trial and error approaches.

The project was made possible thanks to the use of the network that has also been enlarged. In particular, it was possible thanks to companies such as Nuovamacut and Ferrari, who have a high level of technology, but also hospitals.

5. Cross case analysis and discussion

The results arising from the seven Italian cases show that companies' DCs can be an enabler for fast reaction to the need of supplies and not only to gain a competitive advantage. Thus, the main contribution to the theory regards the possibility to use existing DCs also when different objectives need to be met. DCs have generally been widely studied and applied to investigate how companies reconfigure their assets to gain a competitive advantage (Teece et al., 1997). This study shows how during the COVID-19 emergency, they have been the enabler to produce the need of supplies, where the main driver is the speed of response to a high degree of uncertainty (Teece et al., 2016).

In the analyzed cases, internal and external resources and their orchestration are fundamental for explaining the fast reaction (Bogers et al., 2019; Teece, 2020). The ability to manage internal and external competencies is a prerequisite to reacting in a few days to these unexpected shocks in the market. DCs have been fundamental in enacting FIRs. In the three sets of processes that underpin DCs, i.e. sensing, seizing, and transforming, this evidence is even more striking.

Regarding the sensing process, the ability to continuously look outside and be innovative in the core business also allows companies to catch unexpected market requirements faster, such as the masks, valves, sanitizing gels, or air cleaner. The vision of the analyzed cases is based on the ability to grasp new ideas and transform them into applicable knowledge; or

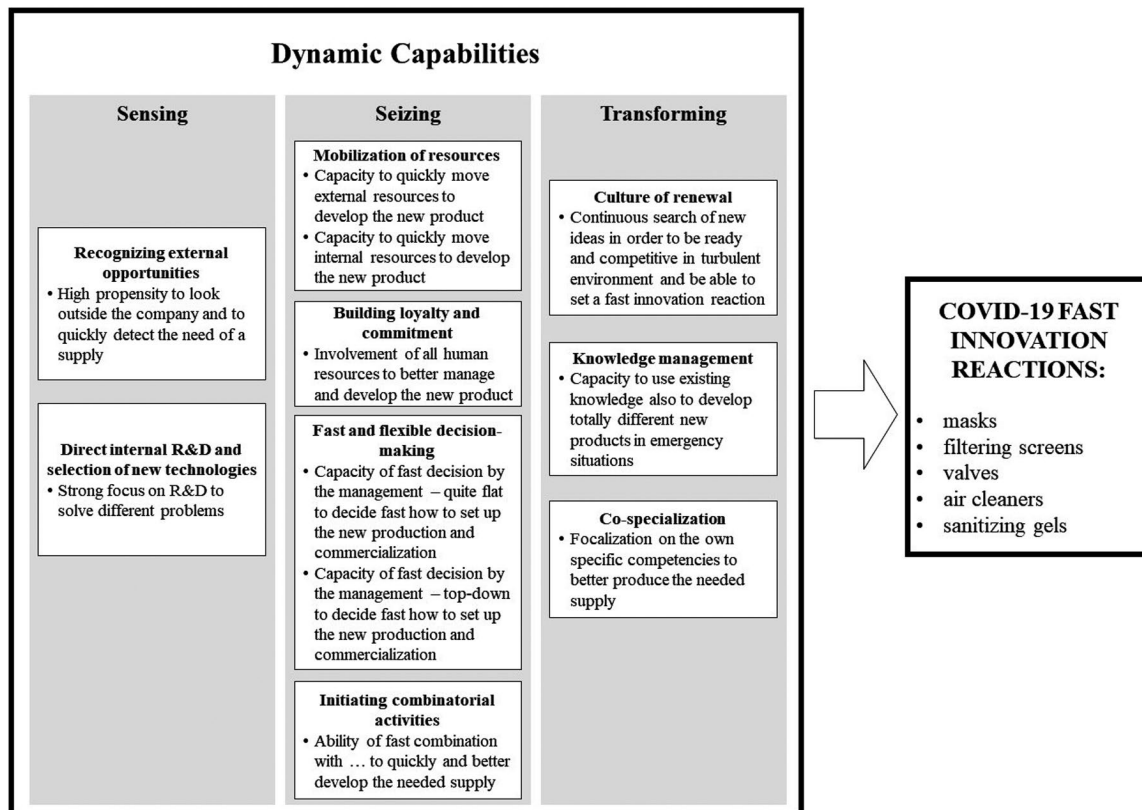


Figure 2. DC and COVID-19 FIR.

they are companies that have suffered a crisis and they have survived because they have continuously searched for new opportunities outside the company. Moreover, these companies are highly inclined to internal R&D and in most of the cases they already use 3D printing that has allowed them to rapidly prototype products that could feed the arising of new needs.

Compared to other contexts, such as multinational competition environments (Matysiak et al., 2018), the proximity to the need seems fundamental for a rapid answer (Caniels, 2003). In a context where the ability to internationalize and dislocate appears a must, these findings show that in a case of shock the companies that can react faster, are generally those closest to the need, probably also because of logistic and supply obstacles.

In terms of the seizing process, i.e., how quickly the organization responds to opportunities and which mechanisms they put in place, the cases analyzed confirm that the ability to take the risk and the capacity to integrate different competencies from outside streamlines the production process. Companies need to search for other partners, such as new suppliers or companies operating in different businesses. All these companies were already open to collaborate

with other partners, often scientific ones. Results show also that the capacity to involve large part of the organization, also in bigger companies is fundamental. Sharing the same objectives and adopting fast communication simplify the processes. This requires a flexible organization or in some cases a strong leader. To answer unexpected market needs, knowledge must be shared fast and a strong hierarchy can be the enemy of agility. A hierarchical structure can be highly efficient in performing a defined task at high volume but this rigidity stops the rapid response and information from the bottom flows slowly and could arrive distorted. This is especially problematic when the business environment is undergoing rapid changes as happening during the COVID-19 pandemic (Mintzberg, 2013; Teece et al., 2016). The technical and engineering background seems to be an important prerequisite to facilitate the integration with external resources. This finding suggests that educational background facilitates the development of new products and exchange of competencies with other partners in a few days (Protogerou et al., 2017). In addition, the existence of different backgrounds permits companies to have wider views and also facilitates the development of the products. Moreover, the professional and work experience in

similar risk conditions, such as having worked for SARS or MERS pandemics, permits companies to have a more structured approach in solving these unexpected situations.

In terms of transformation, an important aspect that emerges from the cases is the culture of continual renewal. The ability to orchestrate the assets, and still maintain the core business, is fundamental to realign organizations with different market environments. An already open culture not focused on one specific business has allowed companies to create these win-win situations. Companies were quite used to establish co-specialization processes, and also in this case it has occurred. In a short time, the companies were able to adapt their capability to produce a part of the entire product and use the competencies of other companies to fully develop it. Also in the cases where the new production process will be closed at the end of the pandemic, this fast reconversion has laid another brick for earlier, quicker, and easier transformations in the future of these firms.

Following the results emerging from these cases, managers should be aware of the role that companies could have in emergencies. Although this fast reconversion is not a means for fast value capture, it leads to an important positive brand exposition and creates a win-win situation between companies and society. A FIR is generally possible if the company follows the traditional innovation process but is also able to cope with an expected emergency, often dedicating a team and resources, as shown in the seizing phase. This may be boosted by the orchestration of a sort of ambidextrous organization (Agostini et al., 2016).

Policymakers and public institutions should be more involved in this FIR needed by companies. Their involvement would streamline the supply chain and help in orchestrating the different assets available in society and decide the right governance model (van de Vrande et al., 2006). Indeed, for a company alone it may be difficult to produce new products in a few days and cooperation may help. Public actors could behave as asset orchestrators of the resource available in different companies, favoring the interplay of the different resources and shortening the seizing phase.

6. Conclusion, limitation and further research agenda

The purpose of this study has been to investigate the FIR of different firms to the COVID-19 emergency. The firms' FIR has been one of the most important contributions to recovering sooner from the COVID-19 pandemic. Undeniably, several different

companies show their ability to rapidly reconfigure their process and their innovation capabilities in order to supply the products needed because of the COVID-19 emergency. By using the DC framework, i.e., the capacity of a company to reconfigure its assets quickly, with the lens of the OI, i.e., the use of external resources for the R&D process, the paper explores how the FIR has been possible. In doing so, the analysis is based on seven case studies regarding firms that during COVID-19 emergency developed products completely different from their core business and that were sorely needed by the market for the safety of citizens.

The present study is not without limitations. Particularly, due to the limited amount of time, the case studies have been conducted in a short period. This would lead to further research, in particular, the present study will be enriched by conducting a longitudinal-retrospective case study at the end of the pandemic. Although the study contains multi-source data, only seven case studies were analyzed, limited to Italy and with a high focus on the manufacturing sector. Further research could focus on additional types of FIR, also not successful ones, extending the geographical and the sector limit.

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