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**Responding to Global Disruption: the Covid-19 impact on the Portuguese
Textile and Clothing Industry**

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Master's in Business Administration

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Resumo

A pandemia de Covid-19 causou disrupções sem precedentes nas cadeia de abastecimento e indústrias a nível global. Neste contexto, a Indústria Têxtil e Vestuário (ITV) portuguesa, reconhecida como um cluster industrial experiente e de alta qualidade, foi também desafiada a adaptar-se e evoluir novamente. Como as recentes observações sobre o caso português permanecem à superfície do impacto desta crise (i.e impacto macroeconómico) esta dissertação procura preencher essa lacuna com foco na capacidade de resposta das empresas dentro deste ambiente disruptivo internacional. O principal objetivo é explorar a resposta da ITV portuguesa, visando especificamente a forma como esta indústria ultrapassou os desafios iniciais e aproveitou as oportunidades encontradas. Procura-se abordar este assunto preliminar com base nos conceitos, capacidades dinâmicas e gestão de risco, apresentados como ponto de partida neste estudo. Realizaram-se entrevistas semiestruturadas com oito representantes de firmas inseridas na fileira de têxtil e vestuário nacional. Foi observado que a flexibilidade, a customização e a transparência foram aspetos determinantes para guiar estas empresas positivamente face à pandemia. Através dos desafios, algumas oportunidades para desenvolvimento futuro foram também apresentadas, nomeadamente a oportunidade para inovação e investimento em sustentabilidade, os quais tiveram impacto na performance das empresas, mesmo em circunstância de crise. Foi também concluído que a colaboração careceu de eficiência na indústria não tendo atingido todo o seu potencial. Espera-se que estas conclusões consigam contribuir para a reflexão das empresas a nível prático e operacional.

Palavras-Chave: Cadeia de Abastecimento, Têxteis, Vestuário, Disrupção, Covid-19, Gestão de Risco

Sistema de Classificação JEL:

L67 Other Consumer Nondurables: Clothing, Textiles, Shoes, and Leather Goods; Household Goods; Sports Equipment

M11 Production Management

O31 Innovation and Invention: Processes and Incentives

Q54 Climate • Natural Disasters and Their Management • Global Warming

Abstract

The Covid-19 pandemic created unprecedented disruptions to supply chains and manufacturing firms globally. In this context, the Portuguese Textile and Clothing Industry, known for its expertise and high-quality as a cluster, has also been challenged and called upon to adapt and further evolve. As recent observations within the Portuguese manufacturing are limited to the surface impact level of this crisis (i.e macroeconomic impact), this dissertation seeks to fill this gap by focusing on firms' individual ability to respond within international disruptive environment. The key objective was to explore the Portuguese Textile and Clothing Industry response, in particular aiming to understand how this industry overcame the initial challenges and grasped possible opportunities encountered with the pandemic. The concepts of dynamic capabilities and risk management presented a theoretical starting point for the study, and Semi-structured interviews were conducted with eight Portuguese firms in the TCI. The results found that flexibility, customization and transparency were determinant aspects that led to a positive response. Through the challenges, some opportunities for future development also appeared, namely the opportunity for innovation and sustainability investments, which impacted companies' performance, even within a crisis setting. Further, it was felt that the potential for collaborations had not been fully explored. It is expected that the results of this study can contribute not only to the growing body of knowledge on companies' responses to a scenario without precedent, but also to companies' own development and continued adaptation to these circumstances on a practical, operational and possibly even strategic level.

Keywords: Supply Chain, Textile, Clothing, Disruption, Covid-19, Risk Management

JEL Classification System:

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List of Abbreviations

DC – Dynamic Capabilities

RBV – Resource-Base View

SMEs – Small and medium-sized enterprises

TCI – Textile and Clothing Industry

WTO – World Trade Organization

1. Introduction

As the Covid-19 crisis continues to bruise the global economy in many sectors – and does so at unprecedented scale – particular attention is being given to organizations’ (strategic) crisis response (Finn et al., 2020). Traditional planning, business models and even meticulous status reports are now being questioned, as they are outdated, or even contain wrong information that can lead to instability in various areas (Finn et al., 2020).

The pandemic instigated experts to start underlining possible future market and international trade trends, such as the reconfiguration of the global supply chain, with possible increases in prices and (health) control in the long run (Twinn et al., 2020); or even the relocation of the components of the supply chains, in order to achieve, for example, less dependency on China (Horobin, 2020), as a form of risk diversification. Since business enterprises function with interdependencies, the exposure to risk, even with minor disruptions, can cause severe consequences (Pettit et al., 2019). Hence the growing necessity for companies to value risk management and incorporate it into management culture (Leflar & Siegel, 2013).

Even prior to the pandemic, awareness of the importance of business continuity after a disruption has been increasing through the years (Zsidisin et al., 2005). In a volatile, competitive and short life cycle (time pressure) setting, companies value skilled management, accompanied by prompter knowledge information and material flows, and a persistent mindset of opportunity to grow (Soosay & Hyland, 2004; Storey et al., 2006).

Reconsideration of suppliers’ diversification and inventory management, with an efficient trade-off strategy between agility and costs, stand as some of the focal trends recently considered within companies. (Retail Economics, 2020). Moreover, simplification of supply chains through on-shoring, near-shoring and re-shoring is a current topic of discussion (Retail Economics, 2020), however prioritizing creation of value and risk diversifying with multiple sources, either geographically close or considerable distant, might be a more solid option (Singhal & Sneader, 2020).

Nonetheless, disruption risks’ impact varies across industries, being particularly relevant in higher-tech industries that have substantial requirement of intermediates in output production, which is the case for manufacturing industries (Reiter & Stehrer, 2021). So, different industries will also have different approaches to environmental disruptions and subsequent supply chain strategy (Kleindorfer & Saad, 2005).

Particularly in the day-to-day fashion apparel industry, the product life cycle is short, the demand is highly uncertain and the supply side is relatively stable (Lee, 2002). Some countries, with prominent textile markets, for example, are looking for new suppliers in order to increase production, while relying heavily on online presence, digitalization and automatization (McKenzie, 2020).

Normally, in a crisis situation, the input prices increase amid material inflation and shipment delays, before eventually stabilizing; however, the current situation after the Covid-19 crisis is still not stabilized (Yadoo, 2021).

It has been proposed that the uncertainty following this outbreak will not end with the dissipation of Covid-19; and the restructuring of business models and operations within several sectors is being discussed as a permanent change (Hollinger, 2020). This changes and uncertainty surrounding the outbreak show the pressing needs to understand the responses, more so because the modern supply chain, having been designed to be global and lean, will remain in a vulnerable state (Ivanov, 2020) and perhaps, the crisis might carry change and improvements in logistics efficiency (Patchett, 2021).

Given the need for near continuous recalibration of strategy and operations, and continuous need of wide-ranging and trustworthy information on the matter in the clothing and textile manufacturing industry (Bontoux et al., 2017), it seems relevant to uncover how an industry with these principles, like the Portuguese TCI, is responding to the pandemic.

A study from Banco de Portugal (2020) investigated the impact of Covid-19 on the Portuguese textile and clothing industry (TCI). This sector was significantly affected, with a 13,8% drop in productivity (gross value added), throughout the first trimester of the pandemic (Banco de Portugal, 2020).

The Portuguese TCI was deliberately chosen as the focus of this thesis. In 2020, this industry lost 18% in production compared to the previous year, and roughly 5000 workers became unemployed (Larguesa, 2021). Still, even though Portugal's main customers as of 2019, France and Germany (besides primarily Spain) (ATP, 2019), were anticipated to be the most affected during 2020 (Euler Hermes, 2020) both of these contributed with better results to the Portuguese TCI, being Spain actually one of the countries that less contributed to this sector (Larguesa, 2021).

Mainly located in the north of the country, the TCI is divided into two categories: 1) the processing of natural or synthetic fibers into yarns and fabrics and 2) the preparation of a wide

variety of products, such as treatment of raw material, finishing activities (e.g dyeing) and production (e.g clothing, coverings, home textiles, technical textiles) (DGAE, 2018).

Historically characterized by family-owned businesses (Lorenz, 2018), the Portuguese TCI's model evolved after several crises and emergence of competitors like China with its entry to the WTO (Pamésa Consultores, 2019). Thus, the model went from having price at the center of competition, to a high quality, innovative and service efficient model, present in the international market, by combining modern manufacturing with know-how from past generations (Pamésa Consultores, 2019).

The industry represents 10% of the country's exports, with a total of approximately six thousand companies (ATP, 2019). Additionally, the TCI is one of the sectors (at a national level) within manufacturing industry that most contribute to the trade balance (exportations surpass importations); in fact, exportation is the predominant activity within the industry's production (around 70%) (Pamésa Consultores, 2019).

Thus, exploring the strategy behind an industry with this recognition and dependence on foreign markets, both on supply and demand side, will potentially contribute not only to recent academic literature but also to companies, in a practical, operational way. Accordingly, the objective of this thesis is to explore the response of the Portuguese TCI to this unprecedented disruption. Subsequently, the formulated research questions are:

RQ1 : *“What challenges did the disruption caused by the Covid-19 pandemic pose for Portuguese TCI companies and how did they overcome these challenges?”*

RQ2 : *“What opportunities do these companies from the Portuguese TCI encounter when responding to disruption?”*

This dissertation is composed by the following structure. First, the Literature Review (Chapter 2) explores disruption in the following contexts: dynamic capabilities, supply chain management, innovation and sustainability. Methodology is present in the Chapter 3. Result presentation (Chapter 4) includes the thematic analysis. The Results are followed by Discussion (Chapter 5) containing interpretation in detail of the themes associated with the research questions. Finally, in Chapter 6 the Results are presented.

2. Literature Review

Strategic response to disruption in organizations entail comprehensive understanding of seminal literature on the matter, which is why in this literature review there is focus on the Dynamic Capabilities (DC) concept, introduced by Teece et al. (1997) and still relevant to this day. Further, it was equally necessary to review current literature on supply chain trends and existing debates, in order to fully comprehend what this study would add to the topic.

2.1 Dynamic Capabilities: sensing, seizing and reconfiguring

Strategy takes a central role in adapting to unstable, disruptive environments (Hoon & Bovers, 2020). A potentially important element in the ability to carry out this adaptation is the presence of dynamic capabilities within the firm (Helfat & Peteraf, 2009).

Within the strategy field, Barney (1991) explores sustainable advantage through the Resource-Based View perspective, focused on firm-specific internal characteristics, such as capabilities and assets, that further advance a firm's performance. These resources and capabilities persistently exist distributed across the firm, heterogeneously, contributing to long-term competitive advantage if characterized not only as valuable and rare, but also costly to imitate and unsubstitutable (Barney, 1991). However, this perspective was later criticised for being static and lacking a dynamic approach (Priem & Butler, 2001).

Acknowledging the way external environment changes can spawn firms' capabilities, Teece, Pisano and Shuen (1997) stem their study from the RBV perspective on idiosyncratic resources and heterogeneity of organization's skills, while having in mind the need to incorporate time, flexibility, innovation and managing competences (Barney, 2001). Teece et al., (1997). Thus, the conceptualization of the terms dynamic (adaptation in critical changing environments) and capabilities (crucial strategic management skills in response) leads to Teece et al.'s (1997) pivotal framework of dynamic capabilities, defined as: "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (p.516).

This framework tackles a specific entrepreneurial perspective in which there is a requisite for constant creation of business opportunities, as well as proactive managers that accomplish that viewpoint (Teece, 2014). This means that without a leading strategic management team and view targeting these DC, their existence alone will not be enough to achieve superior organizational performance (Zahra et al., 2006).

This perspective also emphasizes the importance of continuous organizational learning and knowledge in order to allow development (Teece, 2014; Zahra et al., 2006). The learning process, the recognition of misconceptions about the external environment or even pressure to change internally are factors that can contribute to performance improvements (Zahra, Sapienza & Davidsson, 2006). “Interorganizational learning” (Teece, 1997, p.520) such as partnerships or collaborations, as well as learning mechanisms and behaviors obtained through experience, can shape DC (Zollo & Winter, 2002). Thus, a firm that invests in constant collaboration with other enterprises is not only adapting to business ecosystems, but also fully exploiting its DC in an innovative entrepreneurial way (Teece, 2007).

Therefore, according to the DCT, management should take an ecosystem point of view (Teece, 2007), shifting the logic of ownership of (difficult to redeploy) assets to orchestration of resources (Hitt et al., 2021) in a more flexible, effective way, and overall ability to adjust (Eisenhardt & Martin, 2000; Teece, 2007).

This approach thus follows an evolutionary economics perspective, as DC are deeply embedded in the organizational processes— they are built, instead of bought - and learned overtime, influenced by the evolutionary paths and positions historically adopted (Teece et al., 1997). Since these paths are singular to every firm, the idea of heterogeneous strategic resources, previously explored in the RBV perspective (Barney, 1991) remains relevant, as some firms achieve long-term competitiveness, while others do not (Teece et al., 1997).

Companies generate DC through three particular conceptualized capacities: sensing, seizing and reconfiguring (Teece, 2007). Sensing is about recognizing and dealing with opportunities and threats; seizing incorporates investment in these sensed opportunities; and lastly, reconfiguring is enhancing, combining, protecting or even modifying assets and organizational structures, maintaining evolutionary fitness and efficiency (Teece, 2007). Evolutionary fitness “refers to how well a dynamic capability enables an organization to make a living by creating, extending, or modifying its resource” (Helfat et al., 2007, p.123) in a context where there is the need to compete with other firms that withstand superior performance (Helfat et al., 2007).

Management innovation is a crucial step in enhancing DC, as well as utilization steps (such as motivation, invention, implementation, theorizing and labeling) and key change agents (internal and external) (Gebauer, 2011).

Thus, when the intention is to enhance sensing capabilities through management innovation, motivating employees to switch and experiment with routine may be the desired

step (Gebauer, 2011); whereas, if the focus is on seizing, contextualization of new routines in invention, implementation, theorizing and labeling is required (Gebauer, 2011).

Finally, in the case of reconfiguring, collective and inclusive company effort towards management innovation are necessary, as well as further effort from internal agents (with internal knowledge) to work on transparent and systematic procedures (Gebauer, 2011). Organizational-level learning (the alignment of individual and group learning with non-human aspects of the organization) combined with reconfiguring capabilities will facilitate innovation as well, incorporating it into the company's culture and strategy (Hawass, 2010).

Even though companies might achieve long-term competitive advantage through resource configurations, the thought of temporary advantage, as opposed to long-term, could be more realistic in high-velocity markets (Eisenhardt & Martin, 2000). Certainly, a logic of opportunity, adaptation to unpredictable changes and focus on growth (instead of profit) might be a better, effective approach (Eisenhardt & Martin, 2000).

2.2 Dynamic capabilities and disruption

It is recognized that DC exist in a systematic learning environment, thus, even though the process comprehends creativity and, certainly, dynamism, the application of the capabilities stays "structured and persistent" (Zollo & Winter, 2002, p.340). Essentially, if this adaptation is made in a disjointed way, proper employment of DC is at risk (Zollo & Winter, 2002).

Specifically in experimental high-velocity markets, Eisenhardt and Martin (2000) consider DC simple, experimental and iterative (non-linear); therefore, not necessarily practiced to rely on a certain (effective) pattern or existing acquired knowledge, as mentioned previously (Zollo & Winter, 2002). However, since it is a non-linear, situation-specific and newly created process, managers should not disregard structure and make sure to keep track of these routines (Eisenhardt & Martin, 2000).

Companies confronted with exogenous change might use DC to enrich or recreate other existing "ordinary (or operational) capabilities" (Winter, 2003, p.991) in the firm. The latter capabilities also ensure short-term survival, as they sustain the minimal stability necessary to then follow an exploratory and uncertain path in environmental turbulence (Dixon, Meyer & Day, 2013; Winter, 2003).

Ultimately, even if relying on DC to amplify ordinary capabilities is enough to adapt to change and outperform competitors, there are situations where innovation and development of new capabilities is necessary (Dixon et al., 2013). However, in extreme crisis situations where

business opportunities are declining, firms should avoid changes in operational capabilities, reflect on the strategy and environment, and possibly prioritize observation and evaluation focused DC in comparison with regenerative and renewing DC (Fainshmidt et al., 2019; Makkonen et al., 2014).

Moreover, specifically in an economic crisis situation, where a firm will almost inevitably be affected, openness and collaboration with other partners is a key advantage in creating DC and resilience (Ahn, Mortara & Minshall, 2018). Beyond partnerships with entities within the same value chain, the advantages of looking outside of it (such as universities or international partners) could potentially bring new knowledge, even if the unfamiliarity between entities makes the process harder (Ahn et al., 2018).

Nair et al. (2014) propose that companies dealing with crisis are more capable with risk management elaboration, being enterprise risk management a dynamic capability itself. Further, the authors suggest that companies should have several capabilities, and not just this in particular (Nair et al., 2014).

2.3 Disruption and integration

Causing an unprecedented supply and demand shock across European retailers (Alvarez & Marsal, 2020), Covid-19 pandemics forced companies to reconsider strategic decisions to ensure supply continuity and security (Retail Economics, 2020). Production based on historical data, through strategies like cost reduction in low-cost regions or just-in-time manufacturing, became fragile during the above-mentioned pandemic (Simchi-Levi & Edith, 2020).

Currently, end-to-end value optimization, although costly, surpasses the advantage of a longer, yet compromised, supply chain (Singhal & Sneader, 2020). Christopher and Lee (2004) allude to this perception focusing on the company's confidence: the end-to-end pipeline must acquire visibility, both upstream and downstream, and have control over operations. These two concepts are reflected particularly when the order is released and it is further difficult to respond to demand changes (Christopher & Lee, 2004). Overall, lack of confidence may bring longer lead times and less flexible contracts, which impacts the effectiveness of competition (Christopher & Lee, 2004).

Supply chain disruptions caused considerably indirect costs, and subsequent supply shocks (Rima, 2020). These disruptions being unintentional and exogenous to the company, should be tackled through specific measures, such as, inventory and external collaborators or partners, as well as contingency plans. (DuHadway et al., 2019). These contingency plans, once activated

according to risk sources specification and assessment, will ensure continuity and mitigation, (Finch, 2004; Kleindorfer & Saad, 2005).

Straining away from the idea of one-to-one relationships, strategies within operations evolved from individual machines to a group of internal facilities – plants – and a connected network of (internal and external) players (Olhager, 2013). Supply chain management became comprehended as an “integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders” (Lambert & Cooper, 2000, p.66).

Furthermore, besides equal distribution of benefits and value throughout the supply chain, including the end customer, integration is crucial towards firm efficiency (Lambert & Cooper, 2000). In seminal observations of supply chain, where operation functions were developed and worked on relatively independently, led Stevens (1989) to make the statement that in order to meet the market needs of market changes, integration - efficient collective support and aligned operation - is necessary.

Supply chain integration impacts cost, quality, delivery and flexibility (traditional operational performance’s features) directly (Wiengarten & Longoni, 2015). In order to ensure high performance levels, supply chain integration encompasses practices such as knowledge and demand forecast sharing, as well as accuracy and speed in inventory and transport (response) towards customers (Kalyar et al., 2020).

More recently, studies tackle these cohesive efforts in three steps: internal integration, supplier integration and customer integration (Cao et al., 2015; Flynn et al., 2010; Lee et al., 2016; Wong et al., 2011; Yeung et al., 2009). Pagell (2004) specifically selected structure functionality and culture within organization, as well as reward systems (incentives) and communication (formal and informal), as some enabling factors in internal integration’s performance.

Externally, under unstable environments and heavy customization, integration should be explored in terms of customers and suppliers: particularly if delivery, customer service, quality and flexibility are reflected as company’s order winners (Quesada et al., 2008). In external integration, firms should attempt actual initiatives such as “implement joint planning, information sharing and integrated networks” (Kalyar et al., 2020, p.378). In a relationship between supplier and manufacturer, information-sharing and willingness to open about relevant information is central in operational performance (M. Kim & Chai, 2017).

Moreover, external integration alone does not affect firm's flexibility unless it is combined with supply chain risk management: the choices regarding collaboration with external partners (suppliers and customers) must involve appropriate study of potential benefits and risks, as well as desired consensus of interests and trust (Chaudhuri et al., 2018).

Integration can also lead companies to value co-creation (Tian et al., 2021). In SMEs, rather than incentivizing extreme competition (commonly practiced in previous years), actual goals are now focused on sharing expertise and resources. These will save costs and effectively improve services and productivity (Tian et al., 2021).

Moreover, integration and supply chain evolution carry risks when firms deal with factors such as lead time, inventory and capacity - all aspects that need safety strategies during unexpected disruption (Zsidisin et al., 2005). Market uncertainty relevancy in supply chain integration, operations and strategy commences with its control over behavior variables (fluctuation in demand, price elastic and seasonal changes) (Lu et al., 2018). Nevertheless, this uncertainty encourages firms to seek for integration both internally, as well as with suppliers and customers, eventually contributing to supply chain effectiveness (Kalyar et al., 2020).

Thus, supply chain management is not an "all embracing" (Childerhouse & Towill, 2000, p.338), one size fits all strategy; instead, it needs to be tailored and responsive to the specific culture and management of the company (Childerhouse & Towill, 2000; Kleindorfer & Saad, 2005). After the pandemic shockwave it became even more visible the need for an up-to-date, resilient supply chain that can recover and thrive in a post-coronavirus domain (Cai & Luo, 2020). In moments where there is high vulnerability within the supply chain, related risk planning should be a priority in a firm's agenda (Wagner & Neshat, 2012).

2.4 Resilience, risk management and flexibility

Resilience in the supply chain is a multifaceted preemptive approach that differs from traditional risk management in the sense that it is capable of dealing with unforeseen and previously unidentified events (Pettit et al., 2010). It encompasses the operational capability to "withstand, adapt, and recover from disruptions at a minimal cost to ensure customer demand is fulfilled" (Hosseini & Ivanov, 2019, p.2). Further, resilience also encompasses eventual errors and must capitalize either from failure or success (Yao & Fabbe-Costes, 2018).

Measuring resilience efficiency based on resilience strategies is still a debatable topic in the literature (Behzadi et al., 2020). Usually, companies tend to be focused on internal operations, considering major exterior disruption a rare, improbable event; however it is crucial to assess this risk, by taking into account the company's organizational capabilities and learning

from eventual errors in the past (Rice & Caniato, 2003; Snyder et al., 2012). The risk is attached to the structure of the supply chain, therefore the interdependent parties involved can become a source of risk as well (Jüttner, 2005; Pettit et al., 2019).

A resilient tactic that explores the complex linkages between the company, its suppliers and customers' strengths and weaknesses will enhance risk management, as opposed to replacing it (Pettit et al., 2019). Identification and quantification of risk is not a priority anymore, instead, search for capabilities that oppose vulnerability shall be pursued (Pettit et al., 2010; Pettit et al., 2019).

Besides contributing to operation continuity during disruptions, supply chain resilience can strengthen the company's competitive advantage, as long as the market position remains fast, effective and superior to its competitors (Rice & Caniato, 2003; Sheffi & Rice, 2005). Sometimes, a crisis setting can potentially urge a change in a firm's activity, and act as a catalyst for future improvements and innovative endeavors (Archibugi et al., 2013; Chisholm-Burns, 2010).

Flexibility and redundancy in the supply chain network responsiveness are two approach strategies that potentially improve redesigning procedures and mitigating risks (Rice & Caniato, 2003; Sheffi & Rice, 2005). In fact, the resilience of the firm will be created, as disruption occurs, through flexibility and redundancy (Rezapour et al., 2017).

Flexibility anticipates resource shortage with investment in activities such as highly skilled workforce, adaptable (in real-time) production systems and smart sourcing strategies (Rice & Caniato, 2003). On the contrary, redundancy commences during disruption, as firms' management and investment are focused on stocking: buying inventory and having excessive capacity, even if it goes against the initial plan (Rice & Caniato, 2003). Thus, the latter strategy may lead to unused capacity, and therefore may not be considered as low cost as flexibility (Sheffi & Rice, 2005).

Companies with excess capacity in manufacturing will carry less risk if flexibility is incorporated as a pooling tool, whether this translates into moving workers or adapting plants depending on the demand (Chopra & Sodhi, 2004). Moreover, stockpiling inventory (particularly products with low holding costs and extended usage guarantee) may be useful during crises and unpredictable price fluctuations (Truong & Hara, 2017) - an actual occurrence during the pandemic, as China materials' inflation affected companies globally (Xie, 2021).

Furthermore, Tomlin (2006) states that whenever disruption is long and infrequent, sourcing mitigation strategy - exclusive trade with reliable suppliers - is preferable, rather than inventory mitigation (exclusive sourcing from an unreliable supplier while maintaining extra

inventory). Because this is when inventory will be most desirable, it is preferable to select a reliable supplier (Tomlin, 2006). Even compared to contingent tactics such as rerouting (search for alternative suppliers) or demand management (shift demand to alternative, unconstrained products), sourcing mitigation remains favorable in this type of disruption (Tomlin, 2006).

Further, transparency plays a significant role in the supply chain's open-information exchange and effectiveness (Wagner & Neshat, 2012). Nowadays, even with the advances in the supply chain operations, transparency between buyer and supplier is essential, and this was known before the pandemic (McMaster et al., 2020).

Again, if companies were to incorporate mass customization or build-to-order processes in their activities, as a way to respond to customer demand, the production must remain flexible to changes, while achieving accuracy specification of customers' requirements (Lee, 2002).

The combination of flexibility and redundancy practice in a company might be effective, whilst being cognizant of the industry and comparing the costs of each firm (Rice & Caniato, 2003). Companies should understand that while flexibility benefits endurance in daily operations, redundancy will have a limited advantage, as it is only useful when disruption occurs (Sheffi & Rice, 2005).

Furthermore, Polyviou et al (2020) explores resilience in medium-sized companies focusing on human resources instead of operations, introducing internal social capital as a complex, under-research resource, established through structure, quality and relationship patterns. This structure is based on geographical proximity within small and flat organizations; the quality alludes to effort in respectful relationships and, lastly, the prevailing tenure in the firm (Polyviou et al., 2020). The authors encourage larger companies to seek these resources focused on human relations, commonly used by smaller firms as a way to enhance resilience (Polyviou et al., 2020).

All in all, instead of focusing on predicting disruption, perhaps the supply chain operation should flow without great dependence on certainty, whilst constructing a resilient and proactive supply chain, prepared to any circumstance (Ivanov & Dolgui, 2019).

2.5 Innovation

Commonly, companies tend to focus on cost minimization during crises. However, Lee (2004) noticed that while doing so, a sustainable advantage was not achieved, since firms frequently overlook agility, adaptability and alignment. In fact, in what concerns the fashion apparel industry, a responsive supply chain strategy might be more beneficial than one focused on cost

efficiency (Lee, 2002). This strategy of response to high demand uncertainty can be achieved through customization processes (Lee, 2002).

In order to create a dynamic, innovative approach, companies should deal with disruptive events along three timeframes: first, establishing effective outcomes of operation routine while guaranteeing safety of employees and quality of product; second, exploring social and environmental responsibilities; and lastly ensuring risk management and continuity (Leflar & Siegel, 2013).

By recognizing and exploring the economic downturn effect on innovation, Filippetti and Archibugi (2011) argue that innovation is best represented in firms with cyclical behavior. However, its persistency during crises is uncertain: either the cycle works naturally with reduction of innovation efforts, or a counter-cyclical kind of innovation irrupts. The latter will persist if the company reacts to uncertainty with a view of opportunity to exploit and strengthen its operations (Leflar & Siegel, 2013).

Technology takes center stage in the innovation field, being both its source and driver (Soosay & Hyland, 2004). Communication and information technology (Soosay & Hyland, 2004) becomes imperative, especially in terms of sourcing: supplier innovativeness seems to be better maximized with domestic sources, whereas global sourcing requires investment in information sharing strategy (M. Kim & Chai, 2017).

Thus, neither innovation nor technology should be feared by organizations, as its “*maieutic* effects” (Angeloni, 2020, p.12) on the individuals and operations will encourage skill’s growth and overall effectiveness and cooperation (Angeloni, 2020). For instance, Kim et al. (2018) conclude that innovation, idea generation and product or services development, positively affect commercialization capabilities and performance of a company.

Nonetheless, persistency within innovation can perform differently depending on the company’s circumstance, its country, the current time and space, and the specific opportunities (Filippetti & Archibugi, 2011). For example, the level of cooperation amongst employees and their take on creativity during disruption are as valuable to achieve competitive advantage innovativeness as other aspects e.g. technological progress (Angeloni, 2020).

Furthermore, localization and its demand habits in terms of product or service will impact innovativeness in a company as well (Kalyar et al., 2020). It seems that minor firms within regional clusters, established around larger clients, are also capable of cultivating this ability to innovate (Soosay & Hyland, 2004). This network collaboration and integration, facilitated by geographic proximity, will advance the performance of the focal firm since it exists a common understanding of strategy and goals (Kalyar et al., 2020).

Actually, the pandemic has been associated to a wave of innovative solutions: particular attention to health issues, local buying habits, transparency within manufacturing and collaboration, along with specific concerns about the planet keep innovation evolving continually (Robles & Darke, 2020).

2.6 Sustainability

Sustainability has been incorporated into business continuity over the years as a strategic response and recovery practice to minimize disruption impacts (Miller, 2011). According to Sarkis et al (2020), after the pandemic, industries are facing a “natural experiment for sustainability” (p.2) as two crises intertwine – Covid-19 and climate crises – catalyzing change, alternative systems and collective efforts leading to a rupture in previous behaviors and routines (Perkins et al., 2021).

Sustainability encompasses a beneficial balance of economic, social and environmental performance steadily integrated across current and future generations (Geissdoerfer et al., 2017). Nowadays companies aimed achievements go beyond successful sales and value delivery to stakeholders, as progress in terms of inequality and inclusion gains ground and long-term gain is anticipated in sustainable investments (Robles & Darke, 2020).

Studies on sustainability and its principles exponentially developed over the years (Ansari & Kant, 2017; Eskandarpour et al., 2015), and this topic became a heavy concern in the fashion industry, as this remains second in industry’s water consumption and it represents approximately 10 percent of global carbon emissions (UN Environment, 2019). Furthermore, the use of harmful chemicals, extensive waste production, use of non-biodegradable package, and transportation pollution contribute to textile’s overall ecologic impact (Choudhury, 2014).

Facilities, transport and product design represent the main categories with integrated environmental criteria, in terms of supply chain network design and strategic decision (Eskandarpour et al., 2015). However, supply chain practices concerning suppliers must be predominant in the strategy field, as suppliers performance will impact most significantly the final footprint of production (Caniato et al., 2012).

Supply chain sustainability also interrelates with resilience (Fahimnia & Jabbarzadeh, 2016; Ivanov, 2017) and subsequently competitive advantage (Jensen & Remmen, 2017). In the case of disruption, strategies towards sourcing, production and distribution that incorporate sustainability measures offer better opportunities to uphold resilience in the company, even when implying a slight cost increase (Fahimnia & Jabbarzadeh, 2016).

Furthermore, and by acknowledging the underdeveloped practicality of sustainable manufacturing, Barletta et al. (2021) suggest investment in technology and organization training as future steps towards a greener company. Moreover, Sun et al. (2020) states that in what relates to manufacturing industry, the approach should be towards product quality, while guaranteeing investment in technology to tackle environmental threats.

Thus, besides the significant disruptions and delays in the workflow of both practitioners and academia, the current circumstances should spur new research around the impact of this crisis and sociopolitical measures on sustainability, equivalently to how new innovative strategy practices emerged from it (Leal Filho et al., 2021).

3. Methodology

3.1 Research Design

Based on the Literature Review, and due to the pandemic's effect on industries globally, which generated a much needed conversation to address its impact and following solutions, several questions emerged. Thus, as most studies are still at early stages, this research proposed to answer two Research Questions in order to achieve a single objective: explore the Portuguese TCI's operational response to the Covid-19 disruption. To do so, the focus started on the companies' challenges, while trying to understand how these were overcome, and what opportunities arose from the disruption.

Following this objective, a qualitative research strategy was selected. Qualitative research "is a situated activity that locates the observer in the world (...), attempting to make sense of or interpret phenomena in terms of the meanings people bring to them" (Denzin & Yvonna, 2018, p.10). The respondents construct the reality (Robson & McCartan, 2016) at which the researcher aims to understand, hence the stress in qualitative research being deeply into their point-of-view, as well as into their contextual behavior (Bryman, 2012).

Since the pandemic affected companies globally, and their workers individually and collectively, making a qualitative research approach was considered the most appropriate procedure in order to answer the research questions.

Further, in order to explore a given phenomenon with yet little knowledge, the researcher should approach the data with flexibility and open-mindedness (Stebbins, 2011). Since this is a transition period in the industry and its companies, plus a process that is currently working towards achieving routinization, an exploratory study may better assist in its fulfilment (Yin, 2018).

Exploratory research has an inherent discovery purposive basis (Stebbins, 2011) and is appropriate for clarification of a particular (unsure) scenery and its nature (Saunders et al., 2007). The exploratory nature responds well to changes due to its adaptability and flexibility facing unexpected insights (Saunders et al., 2007), just as the pandemic situation; thus, it is also useful to "generate a direction for further work" (Saunders et al., 2007, p.492).

3.2 Research Strategy

With focus on a bounded time and place (Creswell, 2007) – events from the beginning of the pandemic, around February 2020 until the middle of June 2021 – the present qualitative

research intended to explore companies' managers (as company's representatives) experience during this period. Within qualitative research methods, the interview was elected, specifically semi-structured in nature. In this type of interview a list of themes and questions are structured beforehand, even though, depending on the organization's context, the topics and questions may vary, and the order may change (Saunders et al., 2007).

Thus, semi-structured interviews (see annexe A) were preferred due to their "informal, conversational character" (Bloor & Wood, 2006, p.104), allowing freedom and adaptability (Yin, 2018) to the pre-selected interview themes. The aim was to gain insights into the interviewees' perspective of how the response occurred while facing the Covid-19 disruption. Open-ended exploratory questions, not shown to interviewees beforehand, were ideal to better grasp the companies' issues, while constantly shaping the questions to the topics cultivated by the interviewee and to the topics, in theory, most "close to the people" (Creswell, 2007, p.43).

3.3 Data Collection and Analysis

The first interview opportunity resulted from a connection made through a case study work for a course at ISCTE, which required the students to interact with the textile and clothing company's CCO (Luís Brito Têxteis). From here, selection of the (non-probability) sample was built progressively through "snowball sampling" (Bloor & Wood, 2006, p.154), by asking each respondent to suggest and provide other potential respondents. As most of the intended target is located in the coastal Northern region of Portugal (Pamésa Consultores, 2019), the snowball sampling method facilitated the access to a somehow difficult (due to geographical distance and pandemic restrictions) population of interest (Bloor & Wood, 2006).

The research sample resulted in a total of eight respondents from different companies situated in a cluster location (see annex B) and the interviews were held through Zoom Video Communications between May and June of 2021 (see annex C). Respondents carried in-depth knowledge about the changes in operations and response strategy due to their leadership positions (see table 1) and consent was given for the recording of the interview and the disclosure of its contents.

Given the importance of ensuring population's diversity in qualitative studies, especially with a small number of cases (Bloor & Wood, 2006), the sample is not uniformized in terms of size and nature, other than its industry: the Portuguese TCI.

Table 1 - List of Interviewees

Participant	Company	Company Size	Job Title	Interview Date
A	Riopele, Têxteis SA	Large	Manager of manufacturing finishing processes	18/05/21
B	Bordados Briotte, Lda	Small	General Manager	24/05/21
C	Moda 21 - Tinturaria E Acabamentos Têxteis, S.A.	Medium	Production Director	08/06/21
D	D Closet	Small	Founding member/Designer	06/05/21
E	Jadifex – Malhas e Confeções, Lda	Medium	General Manager	04/06/21
F	Têxteis Leiper, Lda	Medium	CEO, Chief Executive	17/05/21
G	Riler Indústria Têxtil, SA	Medium	Administrator	26/05/21
H	Luís Brito, Têxteis, SA	Medium	CCO	19/05/21

The interviews were derived of previous reviewed literature on supply chain strategy, and based on scripts, attached in annex A. The set of questions were mainly divided in three sections: first section was operations' contextualization: how the company functioned before and after the disruption, and were there any contingency plan or business model changes; secondly, environment's contextualization: the companies' standpoint within the Portuguese cluster and how was the dynamic between competitors and collaborators dealing with Covid-19; and third, opportunities during this crises: what changed in terms of investment priorities and prospects.

Thus, a thematic analysis carried the methodology process, following the authors Braun and Clarke (2006) developed seminal work in this subject. The authors propose a multi-step

process: 1) familiarizing with the data through reading and transcribing; 2) generate codes labeling the main concepts in the narratives; 3) search for themes and patterns within the codes; 4) reorganize the themes; 5) name the themes; and 6) review, compare and interpretate the patterns.

The thematic analysis follows a deductive approach, characterized by taking existing theory and applying it to research and data analysis (Saunders et al., 2007). Thus, the data coding remains attentive to the specific preconceived themes found in emerging theoretical framework (Braun & Clarke, 2006). Tuckett (2005) supports the latter type of engagement with preliminary literature, stating it as a way of sensitizing the researcher to potentially missed, subtle details; thus, instead of these preconceptions being considered bias, they can help to narrow the results (Tuckett, 2005).

However, because deductive logic is limited and “alone can never uncover new ideas and observations” (Stebbins, 2011, p.7) there is space to practice coding analysis inductively, as the coding frame was not held to the theoretical interest of the exploration (Braun & Clarke, 2006).

4. Findings

4.1 Thematic analysis

In order to organize and analyze the transcripts, codes were created based on the literature review. Following Braun and Clarke (2006) process of thematic analysis, after identifying the different codes, themes were selected based on repetition of concepts, indigenous categories (concepts used by participants), transitions or shifts (in content) during speech, as well as theory-related material (Ryan & Bernard, 2003).

This process was facilitated as the codes were inserted in MaxQda, a software for qualitative data analysis purpose, capable of code processing, organizing and identifying keywords in the transcript and excerpts. The coding process outputs from MaxQda are presented in annexes C and D.

Since the thematic analysis can be both deductive and inductive in nature, the selected themes were defined a priori: prior to the interviews, the themed questions were based on literature review.

As for inductive approach, keywords such as raw material, competition and customization were later emphasized within the analysis of the themes. At the end, a total of four main themes and six sub-themes were selected (see table 2):

Table 2 - Themes and Sub-themes

<i>Theme 1</i>	<i>Collaboration and Integration</i>
Sub-theme	Cluster
Sub-theme	Transparency
<i>Theme 2</i>	<i>Risk Management</i>
Sub-theme	Contingency Plan
Sub-theme	Business Model
Sub-theme	Flexibility in operations
Sub-theme	Investment priorities
<i>Theme 3</i>	<i>Sustainability</i>
<i>Theme 4</i>	<i>Innovation</i>

A parallel can be drawn between these themes and the proposed research questions: the themes reflect the TCI companies' response to the disruption caused by the Covid-19 pandemic, and can help explain the challenges and opportunities respondents saw as arising therefrom.

In particular, the cluster, transparency, contingency plan and flexibility in operations were identified as ways to overcome the challenges. Further, risk management, business model, investment priorities, sustainability and innovation were identified as both ways to overcome challenges and as opportunities. Lastly, collaboration and integration also appeared to have played a part during this time, even though being considered an unexplored opportunity.

4.1.1 Theme 1: Collaboration and Integration

According to findings in the interviews, on one hand, collaboration and integration at a supplier-manufacturer level have traditionally co-existed in the TCI cluster activity: *“we have a really close relationship with our suppliers (...)”* (Participant H, CCO). On the other hand, this collaboration is understood to have a big impact on operations, on the company’s value and its further preparation for disruptions; however, participants noted that in the current disruption caused by the pandemic, there seems to exist lack of, or insufficient, collaborative effort. Leiper’s CEO, one of the respondents, confirmed the latter statement, arguing that companies seem to be too fixed on the present, overlooking the potential collaborative future that both companies and associations could have:

“(...) companies think too much, or only, about the ‘immediate’, even with the pandemic. There is no collective thinking about the future(...). The textile industry associations themselves should also cooperate more in this respect. No consensus is reached, and so there are situations that still happen today that could potentially be avoided.” (F, CEO).

This theme was found to be related to the first research question, as the existent collaboration is effective at a production level. However, Collaboration and Integration represented an unexplored opportunity, remaining overlooked.

4.1.1.1 Sub-theme: Cluster

As this region functions within an industrial cluster, geographically, the region facilitates operations industrial activities and efficient operations since *“the people already have knowledge within textile, and there is a lot of offer in terms of services”* (Participant G, Administrator). Proximity is so relevant to operations that at times it is *“part of recruitment (...)”* when selecting collaborators, since it *“provides added value”* (Participant B, General

Manager) to the company. Furthermore, although this cluster stemmed from the close proximity between companies, it resulted from the necessity of a mutual collaboration to grow and evolve:

“The companies here exist in close proximity because they depend on, or cooperate with, one another. A clothing company does not exist without the embroiderer or the knitwear suppliers, for example, because it facilitates the development of raw materials. These synergies between companies do not result from the cluster, but it is the cluster that results from this synergy.” (Participant H, CCO).

During the pandemic some companies experienced faster responses from supply chain partners, due to privileged (cluster) location: *“we had faster responses than other companies located farther away”* (Participant C, Production Director). Moreover, big international retailers (like Inditex) seem to often times opt for the Portuguese factories because of their proximity, *“short the lead-time”* and flexibility (Participant A, Manager of Manufacturing).

In terms of subcontracting, *“sometimes it is necessary and the (close) location facilitates the process”* (Participant G, Administrator). During the first months dealing with the pandemic, the recurrent use of subcontracting firms by larger companies had a major impact on the cluster: *“when smaller subcontracted companies were reaching the red line (...) and ended up closing, we lost in terms of production”* as opposed to demand, which *“did not decrease”* (Participant F, CEO). These subcontracting companies closing impacted the region: *“we lost, as a company, and Portugal lost as a country, in terms of production capacity”* (Participant F, CEO).

The time dimension is very important. Proximity of partners is not common in all industries or supply chains. Even companies with national suppliers experienced delays or raise in price in other parts of the product: *“We have mostly national suppliers (...). Our suppliers have also suffered greatly, which has been reflected in longer delivery times for knitwear, suppliers having to close down, and the rising price of raw materials such as accessories or even packaging, all resulting in even more delays in our orders.”* (Participant H, CCO).

Another aspect related to proximity is the operation of all stakeholder under the same regulatory or financial environment. In a different matter, material accessibility, particularly for the companies with suppliers across Europe and Asia, was hindered during the pandemic, mainly due to inflation: *“European (companies), unfortunately, are very dependent on countries like China or India, and it becomes very difficult when this type of disruption occurs”* (Participant G, Administrator).

Further, despite the geographical and cultural proximity, as noticed in some interviews, it seems that since the disruption occurred, the interviewed companies felt division and more so competition than effective collaboration: *“unfortunately, it was ‘each man for himself’ and that is more noticeable, for us as a small company, as time passes.”* (Participant B, General Manager).

Nevertheless, it is worth mentioning that if one company stayed afloat during this time, that also meant on-going work for others in the location: *“our customers allowed us, as well, to keep our suppliers in activity and not closing the doors”* (Participant D, Founding Member/Designer).

Seemingly, the key aspect in the cluster environment, perhaps as important as local proximity, is communication: *“within proximity, communication is the most valuable (...) in the beginning (of the pandemic) I noticed lack of information”* (Participant D, Founding Member/Designer).

The cluster as a theme was found to be related to the first research question, in a way that although challenging due to a high competition environment, geographic proximity and know-how was helpful to the companies. Just like the main theme of collaboration and integration, the potential of being an opportunity to improve cluster’s functionality on a bigger scale (RQ2) was a prospect, but it did not occur.

4.1.1.2 Sub-theme: Transparency

Transparency appears highly valued primarily internally or *“inside the company”* (Participant G, Administrator), as well as through all parties involved, *“from supplier to distributor”* (Participant H, CCO). *“Partnerships”* are key in the industry (Participant G, Administrator), and transparency in these events seems relevant: *“the more transparent we are during the process, the better our clients will understand the value of our work”* (Participant B, General Manager).

During this period of disruption, transparency and mutual collaboration appears to be significant with collaborators and clients: On the one hand, *“We had to delay some deadlines due to shortage of labour workers (...), fortunately our clients were able to collaborate and understand”*; and on the other hand *“the client struggled with shortage of people, and we collaborated and helped during that time”* (Participant C, Production Director).

Further, transparency might stand differently depending on the companies’ size: *“there seems to be an unfair competition to SMEs”* which differs from big companies where

transparency is more normalized and considered “*essential*” all across the supply chain (Participant A, Manager of Manufacturing).

However in terms of planning, transparency took different roles:

“We tried to get the message across to our team about what was going to happen and we wanted to count on them for a quick response.” (Participant B, General Manager)

“It is relevant to mention the role of our business partners, who started talking and warned us about what was happening in Asia.” (Participant A, Manager of Manufacturing)

Besides preparation, transparency regarding mistakes and possible delays seem to persist during disruption, although it was a priority “*even before the pandemic*” (Participant G, Administrator).

Transparency was found to be related to the first research question, as it was leading the response to the disruption in terms of organization and planning.

4.1.2 Theme 2: Risk Management

Risk management seemed to be one of the features of these companies’ strategy towards disruption in two ways: Firstly, since the industry is by nature unstable, and knowingly so, companies had already confronted risk and learned from past mistakes: “*Whether it is a pandemic or an economic recession, whoever is in this industry has to deal with constant risk (...) thus, based on past investments and ‘family’ history, the company should be capable of making the best decisions*” (Participant E, General Manager).

Secondly, indirectly, risk management has a positive effect on these companies thanks to a big client – Inditex, in Corunha, Spain – that chooses the north of Portugal as a way to minimize risk: “*(...) in the last years they (Inditex) started to ‘come to us’ as the lead time is very short*” (Participant A, Manager of Manufacturing).

Within these subject, the idea of future relocation from other countries during the pandemic was seemingly noticeable:

“I see my client coming to Portugal’s production, as a way to minimize risk. (...) we have talent, but not enough offer (...) thus it would be a rather viable option not only to export (...) but also ‘feed’ ourselves in our own industry. That was my thought process during the pandemic: I cannot depend on others” (Participant D, Founding Member/Designer)

Risk Management was found to be related to both of the research questions, as this theme not only acted as a base for the entire strategic response, but also posed as a facilitator in having more orders from clients, and a possible new opportunity in new clients during their relocation.

4.1.2.1 Sub-theme: Contingency Plan

In response to an unexpected event such as the one in study, most contingency plans were altered, in some way, in these companies. In other cases the answer whether there was actually a contingency plan prior to Covid-19 was unclear.

The company's size and experience seems to have played a rather more significant role in terms of contingency planning: Riopole's contingency plan remains "*evolutive and dynamic*" as it was recently adapted months before due to a fire (Participant A, Manager of Manufacturing). Jadifex's general manager claimed its contingency plan was "*above the industry average*". Differently, Bordados Briote's general manager admitted that the company would never be fully prepared for this type of disruption, different from all the past crises.

The theme contingency plan was found to be related to the first research question, as it is in itself a way to overcome challenges. However, some companies remained reluctant to detail their contingency plan, or even disclose if it was already existent before the Covid-19 disruption.

4.1.2.2 Sub-theme: Business Model adaptation

In the context of this industry during this period, with no international fairs or showrooms, business model transformation appears to have occurred in some cases, specifically in the product development and commercial department:

"The commercial department, that is the heart of this company along with production, had to completely adapt to the new demands" (Participant A, Manager of Manufacturing)

In terms of product development, Luís Brito turned to mask production, which "*made it possible to balance invoicing, by managing to make up for the lack of orders from old customers with orders from new customers*"; while Riopole opted for not only new mask production but also hospital products.

It was also noticed that production suffered alterations: D Closet, whose operations are (habitually) very much based on subcontracting, prevented delays in suppliers' deliveries by creating "*an internal production*" as alternative.

"*New markets*", within in the clothing sector, were explored (Participant F, CEO), while focusing heavily on costumers that work online as opposed to physical stores. Further, the company's CEO mentioned an example of a new strategy with campaigns on social media networks, "*something that 3, 4 years ago would be unthinkable*" (Participant F, CEO).

Further, to compensate the feebleness of the commercial department, technologic developments were observed, particularly in Riopelle, with new services like an app and virtual showroom:

"This form of technology enables the sale, and performs, at the end of the day, the same work that was done before the pandemic" (Participant A, Manager of Manufacturing)

Other cases chose to focus on their expertise, keeping the business plan with minimal to no changes:

"In our case, there was no change in the business model. The production of masks was something we thought about, but fortunately we ended up not doing it, since in a short time we had orders again. Most of the Portuguese textile sector was dedicated to masks, however, after three or four months their production was no longer profitable." (Moda21)

"There was no change (in the business model). There was one or another production of masks requested by clients, or masks for internal consumption, but it was a minimal change." (Participant E, General Manager)

"Our focus was always our speciality. That was our trump card (...)." (Participant B, General Manager)

Business model was found to be related to both research questions. Firstly, the adaptable model that some companies chose to invest contributed to operations flow. Secondly, in response to the second research question, an opportunity for restructuring and innovative endeavors was released.

4.1.2.3 Sub-theme: Flexibility in operations

As expected, this crisis had a significant impact on the companies' operations. Overall, and based on each strategy, most of the results were positive, even if not the same (revenue) margins as a "normal" year. This adaptability was a result of the companies' operational flexibility: *"There is a lot of flexibility involved, during Covid, the planning is day-to-day, constantly changing"* (Participant A, Manager of Manufacturing).

It was visible that *"online buying and sales triplicated, therefore bringing demand in that type of service"* (Participant D, Founding Member/Designer). Thus, clients joined *"rapidly to operations via e-commerce, websites, social networks"* (Participant E, General Manager) so the company was able to restart activity gradually.

Companies changed their layout within operations, organization, and buying plans:

"The regulatory distance was implemented from the start, and this changed the layout at the level of operations in the factory. In terms of production, there was no change." (Participant E, General Manager)

"When we started talking about the pandemic in January 2020, our buying team anticipated the shortage of supply of fabrics, yarns, and even dyes. There was a large increase in the price of raw materials, and we immediately stockpiled, already anticipating this type of situation." (Participant A, Manager of Manufacturing)

Interestingly, customization incorporated in operation seemed to heighten the competitive advantage: *"(...) we did not have a negative impact from Covid in our process of work, it was actually the reverse. We grew (...) because there was a client that was forced to think outside of the box"* (Participant D, Founding Member/Designer).

Companies seem to have discovered a new side of the working force. On the one hand, flexibility within operation was highly dependent on the people's willingness to adapt to new schedules and essentially a new way environment: *"At any moment they (workers) were called and came to help in any way they could. The biggest secret of textiles is to have a skilled team, everything else is already discovered"* (Participant B, General Manager).

Further, it was noticeable, particularly in the case of Leiper, the importance of internal positive response: *"during the pandemic, our company in particular, (...) developed a strong team spirit and mutual help in order to take the company forward."* (Participant F, CEO). There was opportunity for investment *"in training collaborators, that could substitute others in case*

of absence”, which also worked as an *“incentive”* (Participant H, CCO). Nevertheless, it is relevant to mention these changes affected workers’ mental health, dealing with *“stress, uncertainty (...) and extra hours”* (Participant C, Production Manager).

This theme of flexibility in operations was found to be related to the first research question, demonstrating how exactly did the operations functioned in practice in order to compensate disruption losses.

4.1.2.4 Sub-theme: Investment Priorities

In terms of investment priorities, it was verified that most companies tried to maintain their ongoing investment plans, although some stated that a few of their plans were forced to be paused. Most of the companies had to create new investment plans in order to answer the conditions created by the COVID-19 crisis.

Based on the interviews, one of the most noticeable changes on these companies was the investment in different business targets or offer: changes such as starting to produce new products (e.g face masks), or adding completely new services to their offer, while also investing on online sales and e-commerce:

“We also renovated our facilities in order to incorporate other machines that we needed for the new orders, including the production of certain masks.” (Participant H, CCO)

“We invested in laundry machines and a printing machine. Perhaps the pandemic contributed to us considering opening up the range of services.” (Participant G, Administrator)

“The online customer strategy had already been thought out before the pandemic, however, it had to be accelerated in light of everything that was going on.” (Participant F, CEO)

One particular company, due to its (comfortable) viable financial conditions, was able to keep and increase their investment on the sales department as well as on the product development and commercial teams, as a way to keep the company competitive:

“Strategically, 2020 was already a year in which we wanted to focus on developing our sales, improving this department and growing the commercial and product development teams. Our cash flow and shareholder support allowed us to maintain this strategy of focusing on sales even during the pandemic, taking a step forward instead of backward” (Participant H, CCO)

It was also noticed that there was a significant investment in changes made to the physical space where these companies operate, either by transforming the space between workers, or creating new security measures for the building. Some of these changes were already planned before the crisis and the companies took advantage of having less affluence on their working space to put these in motion:

“The investment in enlarging the space, making it more airy and with natural light, had already been thought of. The pandemic only accelerated this project.” (Participant D, Founding Member/Designer)

“There have been changes in the physical space to adapt the company to security measures.” (Participant G, Administrator)

As expected, companies were also compelled to invest in giving their workers conditions to keep performing their job, either investing on the hardware and software available for them while they were forced to work from home - *“Besides the enlargement of the space there was an investment in a server to work from home, and laptops.”* (Participant D, Founding Member/Designer); or focus on the security measures imposed to the workers: *“(…) providing conditions for workers, both working from home or on-site, with the purchase of masks and other protective equipment.”* (Participant H, CCO).

Still on the workers' section, some of the companies had to find a way to temporarily deal with possible workers' absence due to medical reasons, while having in mind not to overload their employees with working hours. One of the solution found by those companies was investing on their workers training, in order to have them prepared to assume their colleagues functions:

“On the other hand, these constant absences, whether due to illness or family assistance, also made it possible to see how the team reacts to these moments, grows, and is able to solve these problems, even when the people missing are key people in our production, which is interesting. It also led to the possibility of training other workers to be able to replace those who are absent, which was also a stimulus on the one hand and an investment on the other.” (Participant H, CCO)

Another vastly mentioned matter on the interviews while focusing on the companies' investment plans was sustainability, how the companies' awareness and concern about this issue raised during the pandemic, and how these companies faced this emerging subject.

Investment priorities as a theme was found to be related to both research questions. These priorities not only were put in practice to overcome the challenges, but also brought to the firms urgency to invest unconventionally.

4.1.3 Theme 3: Sustainability

Sustainability and all its correlated associated issues were heavily discussed during the interviews, as they seem to be widespread in society, and amongst companies for the last few years. The present COVID-19 pandemic seems to have raised even further the companies' engagement on how to deal with this issue.

Among the eight conducted interviews, four companies spontaneously introduced this subject to the dialog, without it being mentioned or asked before. This can be seen as an indicator of how sustainability is present not only on these companies' agenda but also on their customers concerns' list: *“Another issue is sustainability, being something that is demanded by our customers. I would go as far as 90% of the customers demand it.”* (Participant D, Founding Member/Designer).

It was noticed in the interviews that the majority of the companies agreed on the fact that the pandemic increased the importance of sustainability, not only on the industry side, but also on the costumers, being stated that costumers *“are increasingly looking for those who can supply sustainably, who save more water, or who work with sustainable yarns”* (Participant F, CEO). The demand for sustainable products and manufacturing processes increased with the current crisis, and although some companies shared some of the changes implemented during this time, others stated not having changed their approach on this matter due to the pandemic:

“Sustainability is a Luis Brito's value, I don't think it is related to the pandemic. Perhaps as the pandemic led to a greater demand for sustainable products, there is also greater pressure on us, the companies, to be more sustainable. Our path or way of facing the sustainability issue was not, however, changed due to the pandemic.” (Participant H, CCO)

“I think that there was already a sensibility towards the environment, however, I think that the virus was a driver for this change,(...) even because the final client wants to know that he is contributing to something, and I think that the virus was a call for attention to the bad behaviour

of final consumers. That's why I can say that the pandemic accelerated the demand for sustainability, especially by the end customer who sees the label and knows if the product was made in a more responsible way (...)" (Participant D, Founding Member/Designer)

On one hand, it is relevant to observe how different companies faced the pandemic and the opportunities it created on this particular subject, using them to, for instance, apply new sustainability measures on their structures and facilities: *"The pandemic brought an opportunity to make changes in layout and covered areas of the factory that in "normal" situation would be more tricky and difficult. Right now, the pandemic brought the opportunity to make these changes without creating disruption, without the typical influx of customers and suppliers."* (Participant E, General Manager).

On the other hand, there were also companies that emphasized the difficulties created by the pandemic on this road for sustainability. Some regulation inspections and other processes were delayed during the worst period of the pandemic, when many were working from home: *"The pandemic delayed a lot of things. We got to a point where we didn't allow people from outside the company to come in, which made some processes difficult, including processes that fall under sustainability"* (Participant G, Administrator).

Sustainability was found to be related to both research questions. This practice supported (RQ1) the majority of the companies to have a resilient approach to clients' demands. However, it was also a challenge in itself, as the investment on sustainability for some was delayed due to the pandemic. Nevertheless, this theme represents an opportunity (RQ2) within the company's response to disruption.

4.1.4 Theme 4: Innovation

A key finding in the analysis was that the majority of the decisions made by the companies all pointed to an underlying theme: innovation. The companies had to reinvent some sort of routine, and the ones that chose innovative practices succeeded. For example some companies opted to move from production involving technical textiles (hospital products) and masks, to a whole new breadth of services: reorganization of factories' layout, inventive commercial tools to respond to clients' needs, up-to-the-minute online strategies, or even search for new customers.

Innovation was found to be related to the both research questions. Ultimately, this theme is incorporated in all the previous themes and subthemes. To overcome disruption, innovative practices were at the center of the solutions and opportunities in this time.

5. Discussion

The objective of this study is to explore the Portuguese TCI response to disruption during the pandemic. Discussion interpretate in detail the themes associated with the research questions.

Challenges and Solutions

5.1 Theme 1: Collaboration and Integration

During disruption, operations were particularly facilitated by *“the cluster that results from (the industry’s) synergy”* (Participant H, CCO) and geographic advantages that came along with it. Suppliers’ survival was very influenced by the cluster and these manufacturing firms *“not closing the doors”* (Participant D, Founding Member/Designer). After all, even if one is not directly affected, the risk is attached to the supply chain as a structure, and will most likely appear indirectly (Jüttner, 2005; Pettit et al., 2019).

However, while investment in a collaborative (inter-company) ecosystem is considered an investment worthwhile (Teece, 2007), the interviews suggest lack of collective efforts from agents in the supply chain, ranging from manufacturing companies to the industry’s associations (Participant F, CEO).

Further, contrary to what Tian et al. (2021) state – that clusters thrive on value co-creation, instead of extreme competition - during this time, individuality within the industry was felt by manufacturers, which means the Portuguese TCI might not be taking full advantage of the cluster: *“there was no visible impact in that search (for collective effectiveness)”* (Participant H, CCO).

Transparency in the interviewees’ perspectives is similar to Christopher and Lee (2004) concept of “confidence”. Confidence in orders status and capability to deliver (Christopher & Lee, 2004) are noticeable in the company’s transparency beliefs during this time: *“it is better to assert right away possible delays”* (Participant G, Administrator).

Riopele’s business partners in Asia *“started talking”* (Participant A, Manager of Manufacturing) before the pandemic really hit the markets, which made the company make strategic decisions based on this information. This scenario validates Kim and Chai (2017)’s view on information sharing: a tool within collaboration and cooperation that leads to a better performance while promoting integration.

Lastly, in light of Pagell (2004) enablers of internal integration, both reward systems and communication were reflected as key factors by the interviewees:

“(The pandemic) led to the possibility of training other workers to be able to replace those who are absent, which was also an incentive on the one hand, and an investment on the other” (Participant H, CCO).

“The idea of proximity between companies is more relevant when it comes to communication. (...) In the beginning I noticed that there was a lot of lack of information” (Participant D, Founding Member/Designer)

5.2 Theme 2: Risk Management

Risk management for these companies stems from *“family history”* (Participant E, General Manager) and past experience of generations dealing with prior crises; which meant the firms were already familiar with disruption at least to some extent. Authors Teece (2014) and Zahra et al. (2006) corroborate this idea of continuous organizational learning, and its relevancy in challenging environments.

Further, regarding customization, as is the case of D Closet’s *“differentiated product”* with less *“focus on quantity, and more (...) developing any client request”* (Participant D, Founding Member/Designer), Lee (2002) states that in order for this choice of activity to succeed, production must ensure flexibility to changes. Thus, the company did implemented the latter strategy, with a new *“internal production”* (Participant D, Founding Member/Designer), preventing possible delays from suppliers.

In terms of business models, structural changes were implemented; and, according to Hollinger (2020), these changes might prevail in the future. In this context, Leiper took advantage of the circumstances to remake the *“factory layout”*, *“which would not be possible”* (Participant F, CEO) in pre-pandemic, regular days. Further, manufacturers saw a shift in clients, from physical stores to online presence (Participant D, Founding Member/Designer; Participant F, CEO; Participant H, CCO) as previously expected: in a post-pandemic context, opportunities rely more in online retail (Baker McKenzie, 2020). Companies have a chance to make use of a market shift, within the textile sector, and *“engage in new business models, providing more services and establishing a more*

collaborative relationship between customers and suppliers” (Bontoux et al., 2017, p.29).

These opportunity was sensed during the pandemic.

Inventory wise, stockpiling inventory before price fluctuations (Truong & Hara, 2017) is arguably a safe bet, perhaps in large companies such as Riopelle, turning to this strategy very early on, with successful results.

Lastly, following Polyviou et al (2020) perspective about the human aspect within operations, Leiper experienced its significance when operation-flow was facilitated by a *“strong team spirit and mutual help in order to take the company forward.”* (Participant F, CEO). Bordados Briote saw as well its employees’ willingness *“at any time being called to help in anything they could.”* (Participant B, General Manager). These statements confirm Polyviou et al (2020)’s notion that larger firms should acknowledge how minor firms develop resilience through the human aspect.

Opportunities

5.3 Theme 3: Sustainability

In the chapter of sustainability, the results were fairly consistent with what can be found in the previously presented literature. The fact that many interviewed companies brought up this theme shows a relation with Sarkis et al (2020) and Robles & Darke (2020) observations: there is an increased concern and awareness about this issue, and companies are no longer searching only for profit but looking to have sustainable alternatives available for their customers.

Furthermore, it was also concluded that the results from the interviews were in line with Jensen & Remmen, (2017), who emphasized the possible competitive advantage for the companies that are able to deliver sustainable products, since customers nowadays search for companies that *“can supply sustainably, who save more water, or who work with sustainable yarns”* (Participant F, CEO).

Another relevant conclusion was the proven concern about negative impact of the textile industry on environmental aspects like climate change, due to the high water consumption and toxic waste generated by this industry, as explored by UN Environment (2019) and Choudhury (2014), pointed out by some of the interviewed companies:

“Right now it is the sustainability part, although in the last years there is already a concern with the environmental impact, the reduction of water, the use of natural dyes,

attention to the production of fibers and the whole part of chemicals... And then the production has to follow these priorities.” (Participant A, Manager of Manufacturing)

Lastly, results also show that, as Barletta et al. (2021) and Sun et al. (2020) suggest, some of the companies decided to focus on improving their structures and technology as a way to strengthen their sustainability projects:

“(...) photovoltaic panels were installed here a few years ago. Our natural gas boiler at this moment is chip, that is, biomass made of harvested wood scraps. We are trying to reuse the water because it is possible that it comes out of the dyeing process and can be reused and reintroduced into the process. We also have the environmental certificate, which is not easy to get, and we finally managed to have waste separation.” (Participant G, Administrator)

5.4 Theme 4: Innovation

As expected and presented in the literature, despite companies usually tending to cut their costs during periods of uncertainty (Lee, 2002), several of the interviewed companies were able to deal with this pandemic by innovating their offer, either through new services or by creating new products. This conclusion also shows that, as Archibugi et al. (2013) and Chisholm-Burns (2010) suggested, companies have the necessity to reinvent themselves, in order to keep up with competitive advantage in relation with their competitors:

“The business model itself has remained virtually the same, but there has been a great deal of product innovation, as well as an increased presence in the French market, particularly with the masks.” (Participant H, CCO)

Additionally, in consonance with Lee (2002), sometimes the companies may choose to implement some functionality onto their new products in order to deal with the uncertainty of their customers' demands. During the current pandemic, some of the interviewed companies decided to produce masks and medical clothing:

“In terms of products, we have also reinvented ourselves. We started, for example, the production of masks. We made masks for the Portuguese army. We also produced hospital products, like gowns. However, we were not the first company to do so.”
(Participant A, Manager of Manufacturing)

On another subject, it was also mentioned the importance of innovation and investment on new technologies, especially those concerned to communication and information: in line with Soosay & Hyland (2004) studies, who emphasized how important these technologies can be, specially in sourcing, Leiper, for instance, changed entirely the *“computer system of the whole group of companies”*, upgrading to *“one system that has one computer program for all the companies”* (Participant F, CEO).

A different example representative of this technological innovation was the case of Riopete, who was faced with the problem of not knowing how they would expose their new products due to the new pandemic restrictions:

“The big international fairs are no longer happening and therefore our commercial part has developed a very interesting app, with a virtual showroom, where we can show our collection, pieces, fabrics (...).” (Participant A, Manager of Manufacturing)

Although it was suggested by Soosay & Hyland (2004) that having a number of companies working on a cluster, as the ones subject to this study, would have a positive impact on these companies' ability to innovate, this was not a conclusion we could take from our results, since it was not mentioned by any of the interviewed companies.

6. Conclusions

The objective for this thesis was to explore the Portuguese TCI's supply chain response during the Covid-19 disruption. This study attempted to focus on the impact of this emerging topic, by examining real-life perspectives from professionals with leadership roles in the targeted industry. These perspectives were obtained via interviews with different managers from different firms in the TCI.

Reflections around this topic seem relevant, not only at an academic level but also for practitioners. In the current supply chain scenario risk tends to be increasingly common, hence the relevance of companies having insightful knowledge of risk management, and readiness for any event. Thus, studying this crisis' impact adds value in preparing for future disruptions.

Further, intersecting the two main subjects in the literature review – supply chain management and dynamic capabilities – to tackle certain themes within the thesis' objective, makes the thematic analysis, conducted to interpretate the participants' discourse, richer.

Regarding the first research question (*“What challenges did the disruption caused by the Covid-19 pandemic pose for Portuguese TCI companies and how did they overcome these challenges?”*) it is first observed which challenges raised amid the disruption. Firstly, the majority of the companies had either a significant drop in demand, or, if demand stayed afloat, difficulties in production would appear, either internally (employees' absence) or through subcontracting (factories closing). Also, raw material inflation and high transportation costs were challenging during this time. Lastly, the companies' commercial department, which implied and guaranteed partnerships and client's orders (through fairs), was highly affected.

The adaptations required flexibility within operations, a characteristic that the industry was already known for prior to the pandemic. Moreover, flexibility should not only be implemented within suppliers and customers, but internally as well, especially being the production a central factor in this industry. After all, employees had to be capable to adapt to constraints, different scheduling hours and new layouts, guarantying continuity and productivity.

It was also found that even though the size, experience and financial capability of a large firm in part balanced the impact of the disruption, smaller companies that shown openness to customization and higher flexibility offer were able to gain solid competitive advantage during this time. Therefore, the results indicate that companies see value in responding to the customer's needs in a more flexible way. Investment in these capabilities and adaptability should remain present in the strategy towards crisis.

It seems also relevant to point out the perspective of the companies on the cluster environment and the wasted potential. Even though the basis of the cluster and its functionality on a geographic, small level and flexible response remains effective, before, during and most likely post-COVID-19, collaboration is not reaching its full potential. It seems although managers recognize its importance (as visible in the interviews), competition outweighs collaboration. This logic of cooperation and resource sharing seemed to drawback the TCI cluster's performance. In the long run, alliances within this highly competitive market should be reflected in the strategy from now on.

The same logic described above should be applied to transparency. In the interviews it was noticeable real-time information exchange was crucial in the response to disruption, between both external (suppliers and customers) and internal supply chain partners. Externally, international and national suppliers and partners' transparency regarding difficulties in transportation and raw-material accessibility was significant in inventory management (stockpiling). Client-manufacturer transparency regarding orders, cancelations, lead times or even deferred payments was also key during the pandemic. Internally, the interviewees prioritized transparency with the firm's coworkers in terms of scheduling, extra hours, security and new adaptable ways of working. Thus, transparency should remain a priority in future operations.

For the second research question (*"What opportunities do these companies from the Portuguese TCI encounter when responding to disruption?"*), its conclusions highlight the shift in the companies' investment facing the pandemic. Some companies changed the business model, offering new products and services, or even search for new clients, while others remained focused on their specialty and waited until for stabilization. Both approaches seemed to fulfill the companies' objectives, as noticed during the interviews.

Further, investment in the human capital aspect within companies will sustain the response to disruption. Although not consistently, the investment in training during the disruption was a priority for some companies. Firms should not disregard the importance of qualifications and training of employers, at various levels, especially dealing with the variety of services offered nowadays.

Sustainability was also faced as an opportunity, since it is part of the national TCI's core and it was visibly a concern during the pandemic. Investments in this matter, towards "greener" manufacturing, were, for the most part, put in practice, which is in part justified due to clients' growing expectations on this matter, nowadays. So, even when dealing with market uncertainty and limited financial freedom, the vast majority of the companies in this study did not stop

investment in this area. It is certain at this point that these investments will compensate in the long run.

Additionally, acceleration in innovation was a clear strategic phenomenon in which the pandemic had a catalytic role. Investment in not only new forms of production, such as introduction of functionality into product (with medical equipment and technical textile), but also innovative services, allowed these companies to survive and increase resilience.

Regardless of the nature and size of the company or production area, the industry works as a cluster, which means that even if the disruption does not affect one directly, it will eventually do so, indirectly: cases where companies demand was not significantly affected, production suffered anyway due to struggle of others in the cluster. The interviews confirmed this logic, which is why collective efficiency should be a priority, especially during disruption.

As these crises occur, the Portuguese TCI has the opportunity to stand out as a very capable manufacturer to national and other countries' clients that which to diversify risk with relocation of production and guarantee high quality in production. Having sustainability measures and innovative practices will also support this opportunity.

As limitations for this study, the technical complexity of supply chain subjects was reduced to facilitate managerial insights depiction. This explorative study is about one specific industry, with a small sample, in a particular crisis situation, which makes it limited regarding generalizability.

Currently there are important details and data not yet studied or disclosed, due to the unpredictability and newness of these crisis, which limits the results as well.

Nevertheless, even though it is a small sample, it encompasses a diverse collective of companies in terms of size, which allowed the access to different perspectives and environments during the interviews.

6.1 Suggestions for Further Studies

As mentioned before, with more studies and data on this matter, it would be interesting to analyse in depth the phenomenon of relocation of production and its potential impact for the Portuguese TCI. Exportation is very substantial within the industry, as well as the "Made in Portugal" status in the international markets, so, this transformation of the "typical" low cost production could be worthwhile to comprehend.

Further, observing the future generations' impact on consumer habits and how the latter will influence the functioning of the supply chain might be beneficial. In other words, explore

the consumer's perspectives on this crisis, and how that affects the manufacturer and the production. There is certainly a drive for innovation practices, but the desire from consumers to see transparency and sustainability in the "label" of a product is an important factor to acknowledge, especially after Covid-19.

Lastly, since it was visible the adaptability and innovation regarding services (i.e for commercial purposes), studying the influence of the pandemic on servitization investment would be noteworthy to the industry as well.

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Annex

Annex A – Research questions table

Table 3 - Research Questions And Interview Questions

Research Question	Interview Question	Why?	Literature
“What challenges did the disruption caused by the covid-19 pandemic pose for Portuguese TCI companies and how did they overcome these challenges?”	Em termos gerais, poderia descrever a sua empresa, o funcionamento da produção e colaboradores na cadeia?	Introduction/Contextualization	
	Como descreveria, sucintamente, a evolução do impacto da pandemia na empresa, desde o início de 2020 até agora (2o trimestre de 2021)?	Introduction/Contextualization	
	Antes da pandemia existia algum tipo de plano de contingência para resposta a crises na vossa empresa? (Se sim, em que consistia?) E neste momento, existe algum? (Se sim, em que consiste?)	Was the company prepared with a contingency plan? Did it change since?	(Finch, 2004; Kleindorfer & Saad, 2005)
	A empresa teve de alterar, de alguma forma, o seu modelo de negócio face à pandemia? Em que aspetos?	Are business models changing in response to the pandemic. How? Will these decisions remain in the firm’s long-term strategy?	Restructure of Business Models (Hollinger, 2020; Finn, Mysore & Usher, 2020; Bontoux et al., 2017) Operational Capabilities ((Fainshmidt et al., 2019; Makkonen et al., 2014)
	Pensando agora especificamente ao nível das operações, quais foram os principais impactos da pandemia que a empresa sentiu a este nível? Que ajustes ou adaptações tiveram de fazer em resposta a estes impactos?	How was the supply chain agents’ response? What were the main challenges on both demand and supply?	Impact on the structure (Jüttner, 2005; Pettit et al., 2019)
	Esta região é conhecida por ter muitas empresas deste setor. Sente	Better comprehend the functionality of the cluster.	Cluster’s ability to innovate

	que fazer parte deste cluster de alguma forma alterou o impacto da pandemia na vossa empresa e/ou vossa resposta à mesma? Pensa que a pandemia desencadeou ou acelerou uma procura de eficiência coletiva?		(Soosay & Hyland, 2004)
	Hoje em dia fala-se bastante da importância da transparência entre os vários intervenientes na cadeia de produção em momentos de crise. Qual tem sido o papel desta transparência na vossa resposta à pandemia?	Understand the importance of a key concept within strategy and logistic - transparency - and its importance during the pandemic.	Open-information exchange (Wagner & Neshat, 2012) Buyer-Supplier (McMaster et al., 2020)
"What opportunities do these companies from the Portuguese TCI encounter when responding to disruption?"	Diria que devido à pandemia a vossa empresa repensou as prioridades de investimento da empresa?	Understand the priorities when the disruption begins. Even though the firm is dealing with a crisis, it is important to understand why (or if) the investment does not stop, why/what is most valued and worth to maintain or improve.	Risk management as a priority (Wagner & Neshat, 2012)
	Um tema muito falado hoje em dia é o da sustentabilidade. Isto tem sido uma preocupação importante na vossa empresa?	Contextualização	(Ansari & Kant, 2017) (Eskandarpour et al., 2015)
	Sente que este foco na sustentabilidade impactou a forma como lidaram com a pandemia?	Understand if there were any changes during the disruption motivated by sustainability concerns.	(Eskandarpour et al., 2015)
	Pensa que a pandemia de alguma forma alterou as prioridades no que toca à sustentabilidade?	What were the changes?	(Fahimnia & Jabbarzadeh, 2016) (Leal Filho et al., 2021)

Annex B - Companies' Cluster Location

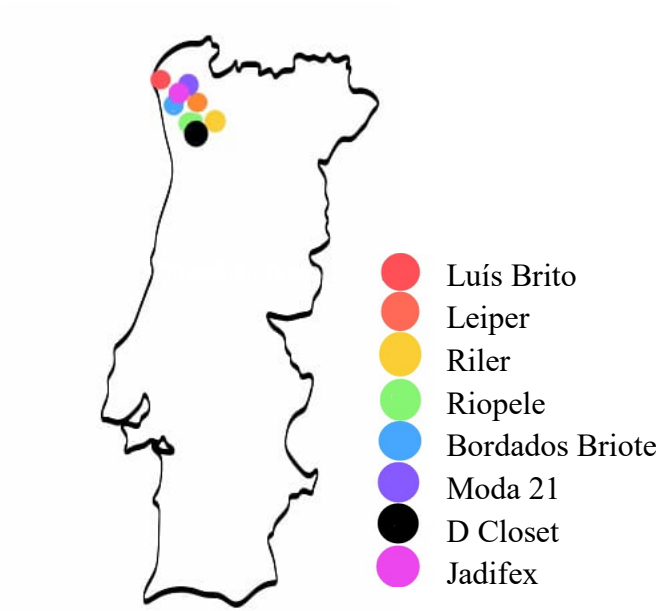


Figure 1 - Companies' Cluster Location

Annex C - Interview files used for coding with MaxQda

Folder/File	Count
Documentos	168
Entrevistas	168
Luís Brito	28
Riler	18
Bordados Briote	20
Dcloset	26
Riopele	18
Jadifex	20
Leiper	26
Moda21	12

Figure 2 - Coding MaxQda

Annex D - Categories created with MaxQDA

Code	Count
Interview Topics	0
Opportunity	7
Sustainability	13
Sustainability 1st mentioned by i...	5
Investment Priorities	15
Transparency	9
Cluster	16
Competition	4
Operations	7
Customization	2
Flexibility	9
Business Model	9
Innovation	8
Evolution	9
Contingency Plan	4
Company	11
Suppliers	14
Clients	13

Figure 3 - Categories MaxQda