Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

MANAGEMENT AND INDUSTRIAL STRATEGY (MIS)

MASTER FINAL WORK

DISSERTATION

SUPPLY CHAIN RESILIENCE AND COVID-19 PANDEMIC: A CASE STUDY IN THE RETAIL SECTOR

SARA BEATRIZ FERREIRA HENRIQUES

OCTOBER - 2024

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ABSTRACT

The pandemic exposed the fragility of global supply chains and highlighted the need for businesses to build resilience to cope with unexpected disruptions. Supply Chain Resilience is crucial to companies, enabling recovery and adaptation to environmental changes and operational challenges. This study investigates how the Covid-19 pandemic contributed to the improvement of SC resilience of a retailer specialized in the distribution of entertainment and electronic products supply chain (SC). Using a case study approach and data collected through semi-structured interviews, this study explores the strategies implemented to cope with supply chain disruptions and how these strategies contributed to the improvement of supply chain resilience capabilities. Findings reveal that although no significant process changes occurred, the pandemic accelerated digital transformation, enhanced omnichannel strategy, and led to increased collaboration and negotiation with larger suppliers. Additionally, the company developed important capabilities such as flexibility and adaptability. The study concludes that while capacity and budget constraints remain, the retailer is now better prepared to manage future disruptions.

KEYWORDS: Covid-19, Supply Chain Disruption, Supply Chain Resilience, Retail.

RESUMO

A pandemia expôs a fragilidade das cadeias de abastecimento globais e destacou a necessidade das empresas desenvolverem resiliência para lidar com interrupções inesperadas. A resiliência da cadeia de abastecimento é crucial para as empresas, permitindo a recuperação e adaptação às mudanças no ambiente envolvente e aos desafios operacionais. Este estudo investiga de que forma a pandemia de Covid-19 contribuiu para a melhoria da resiliência da cadeia de abastecimentos de um retalhista especializado na distribuição de produtos tecnológicos e de entretenimento. Usando uma abordagem de estudo de caso e dados recolhidos através de entrevistas semiestruturadas, este estudo explora as estratégias implementadas para lidar com interrupções na cadeia de abastecimentos e como é que essas estratégias contribuíram para o desenvolvimento de competências no âmbito da resiliência das cadeias de abastecimento. Os resultados revelam que, embora não tenham ocorrido mudanças significativas nos processos, a pandemia acelerou a transformação digital, reforçou as estratégias omnicanal e aumentou a colaboração e capacidade de negociação com grandes fornecedores. Além disso, a empresa desenvolveu capacidades essenciais como flexibilidade e adaptabilidade. O estudo conclui que, embora as restrições de capacidade e de orçamento se mantenham, o retalhista está agora mais bem preparado para gerir futuras perturbações.

PALAVRAS-CHAVE: Covid-19, Disrupção da Cadeia de Abastecimento, Resiliência da Cadeia de Abastecimento, Retalho.

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GLOSSARY

SC(s): Supply Chain(s)

SCD: Supply Chain Disruption(s)

SCM: Supply Chain Management

SCRES: Supply Chain Resilience

SCRM: Supply Chain Risk Management

SCV: Supply Chain Vulnerability(ies)

1. INTRODUCTION

In the last few years, the world has almost been forced to recognize the critical importance of Supply Chain Management (SCM) to business success, majorly due to unexpected situations such as the Covid-19 pandemic and subsequent policies, geopolitical problems, and economic conditions that have underscored the fragility and vulnerability of global Supply Chains (SCs) (Christopher & Peck, 2004; Ivanov & Dolgui, 2020; Shih, 2020; Harapko, 2023). These circumstances have highlighted how imperative it is for businesses to enhance their resilience and flexibility in the face of unforeseen events.

Following the unprecedented difficulties caused by the Covid-19 pandemic, SCM experienced a significant global shift, and thus, the need for a strong Supply Chain Resilience (SCRES) became even more important. According to research conducted by McKinsey Global Institute in 2020, the Covid-19 pandemic has caused the most significant and far-reaching disruption to value chains in recent history (McKinsey Global Institute, 2020). Hohenstein et al. (2015; p. 107) stated that "The turbulent, fast-changing nature of the global business economy will continue to affect supply chains in terms of vulnerability, uncertainty and complexity", which is why having resilient SCs becomes so important nowadays.

During this shift, the emerging management strategies and practices are critical not only in recovering from the pandemic's impact, but also in preparing SCs for the dynamic demand fluctuations (e.g.: Ghafour & Aljanabi, 2022; O'Keeffe, 2020). It's imperative that businesses critically assess the reliability of demand signals from immediate customers, considering uncertainties in forecasts (Alicke et al., 2020).

The retail sector contributes significantly to communities (Alikhani et al., 2019). Acting as leaders in distribution channels, retailers establish the direction for the entire distribution network (Fernie & Sparks, 2014), therefore, retailers gain control over their SCs, which means they must embrace the responsibility for the entire SC's response to disruptions (Alikhani et al., 2021). The ability to construct resilient retail supply chains has emerged as a significant concern for policymakers and stakeholders (Alikhani et al., 2021).

As stated by Ivanov et al. (2021; p.97), "resilience in supply chains is as vital for firms as immune systems are for human beings". Resilience capabilities enhance the recovery and adaptation of the SC when it is exposed to and impacted by environmental changes and modifications on operational factors. Thus, when a company fails to understand its SCs' potential weaknesses while failing to develop a mitigation strategy, its survival is

compromised. Therefore, firms must improve their SCRES to deal with disruptions and remain competitive because "whatever the nature of the disturbance and its consequences (e.g., supply disruption, demand spikes or loss of capacity), the ultimate result of all disturbances is unfulfilled orders" (Carvalho et al., 2012; p. 357).

Despite the significant body of current research on SCRES, further studies are still needed to focus on how companies handle and react to the Covid-19 pandemic, thus on resilience capabilities and management practices. The literature focuses on risk mitigation strategies from the perspectives of buyers, suppliers, and distributors, while the role of retailers in dealing with Supply Chain Disruption (SCD) during the pandemic is understudied (Hobbs, 2020). Ivanov (2021c) also emphasizes that although Covid-19 has affected SCs, there is still a scarcity of research on resilience, adaptation and recovery mechanisms (Kähkönen et al., 2023). In light with the considerations, emerges this case study applied to a retail company in Portugal, whose business focus is the distribution of entertainment and electronic products**.**

This study aims to answer the following research question**:** How has the Covid-19 pandemic affected a retailer's management practices to enhance the resilience of its Supply Chain? More specifically, to achieve the following objectives: i) Understand the strategy the retailer put in place to deal with supply chain disruptions caused by Covid-19; ii) Understand how the Covid-19 pandemic has contributed to develop the retailer's new SCRES capabilities; iii) understand the changes implemented in inventory management practices as a result of Covid-19 pandemic; iv) Explore the challenges retailer faced in implementing the resilience strategies; v) Explore the long-term implications of these adapted practices on SCRES and performance. To achieve these objectives, this study uses a case study approach and collected data through semi-structured interviews.

This dissertation is structured into six chapters. This first chapter provides an introduction to the work, presenting the motivation, the research questions and specific objectives. The following chapter presents the literature review. The third chapter regards the methodology, giving an explanation of the selected research and data collection methods. Finally, the fourth and fifth chapters present the data analysis and the discussion of the results, respectively. To conclude, the last chapter summarises the main findings, theoretical and practical implications, as well as the main limitations and suggestions for future research.

2. LITERATURE REVIEW

2.1. Supply Chain Management

Today's supply chains are complex global networks designed to deliver products in the right quantity, place, and time, but in unpredictable markets (Kochan & Nowicki, 2018). As noted by Pettit et al. (2010), this inherent instability in global markets makes SCs susceptible to disruptions. In other words, SCs are intricate systems that face ongoing instability and turbulence, leading to the possibility of unexpected disruptions and inevitable risks. In fact, according to FM Global, in 2007, corporate leaders already recognized supply chain risk as the most significant challenge to their companies (Pettit et al., 2010). Therefore, as SCs networks face an uncertain period, it is critical to adopt new methods and approaches for the creation and management of SCs in order to protect them from disruptions (Ali et al., 2017; Christopher & Holweg, 2011).

A Supply Chain comprises all entities, directly or indirectly, involved in meeting a customer's requirements, along with all the essential functions that help fulfill the customer's needs (Chopra & Meindl, 2016). This entails not only the manufacturer and suppliers but also transportation, warehousing, retailing entities, and even the final customers. A SC is characterized by its dynamism, involving continuous exchanges of information, products, and financial transactions through all stages. Although several interpretations of what constitutes a SC exist, studies into SCRES needed to adopt a broad perspective to encompass the complex and unstable dynamics involved. An example is the definition provided by Pettit et al. (2010, p.1), who define the supply chain as "the network of companies involved in the flow of products, services, finances, and information both upstream and downstream, from the first supplier to the end costumer".

Supply chain management is a "well-established basis for retail business growth" (Butt, 2022; p.3). According to Stadtler (2015), SCM refers to the collection of strategies employed to effectively integrate suppliers, manufacturers, warehouses, and retailers. The goal is to optimize SCs by producing and delivering the right quantities of products to the correct locations at the right times, minimizing costs while meeting service level demands. This reflects firms' efforts to build and manage SCs as effectively and efficiently as possible. SCM can also be defined as the process of integrating organizational units throughout a SC and coordinating the flow of materials, information, and finances, with the aim of meeting the final customer demand, ultimately enhancing the competitiveness of the entire SC (Stadtler, 2015).

According to Sinoimeri and Teta (2024; p. 17), "Supply Chain Management involves the fundamental company activities that establish a connection between final consumers and original suppliers". The goal of SCM is the company development and competition, which can be achieved in many ways, being the customer service a mean.

Supply chain management literature shows that SCRES became an important part of studies in the field of SCM, which is driven by the growing complexity and globalization of SCs (Christopher & Peck, 2004), the increased frequency of disruptions (Ivanov & Dolgui, 2020), and a strategic shift from pure efficiency to balancing efficiency with robustness (ensuring that SCs are not only cost-effective but also robust against unforeseen challenges) (Ponomarov & Holcomb, 2009). Resilience is seen as crucial for ensuring business continuity and meeting customer expectations for reliable service (Wieland & Wallenburg, 2013). Moreover, the literature review conducted by Sinoimeri and Teta (2024) reflects that there was an increase in SCM publications (between 2012 and 2022), being the fields of Environmental Science in the first place, Medicine and Public Health, and Business and Management in the second and third place, respectively – something that is related with the outbreak of Covid-19 pandemic and the natural increase of studies in the area (Cordeiro et al., 2022).

2.1.1. Supply Chain Risks and Disruptions

The concept of supply chain risk management (SCRM) appears in literature as a managerial counterpart to the concept of Supply Chain Vulnerability (SCV) as it seeks to identify potential sources of risk and take appropriate steps to avoid or mitigate SCV. SCRM can be defined as "the identification and management of risks for the supply chain, through a coordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole" (Jüttner et al., 2003, p. 201).

SCRM research focuses on two types of risk: operational and disruption risks. Operational risks include demand and/or supply-side uncertainties that have a minor impact but are likely to occur regularly. Disruption risks arise from either man-made or natural disruptive events, having low probability but high impact (Alikhani et al., 2021). Supply Chain volatility and uncertainty are intrinsic to SCM and can happen in any company. These are typically induced by disruptions stemming from catastrophic events, including natural disasters, man-made crises, legal disputes, or labour strikes (Ivanov & Dolgui, 2019; Kähkönen et al., 2023).

Disruptions are defined as "events that interrupt the regular flow of goods or services within a system" (Blackhurst et al., 2011, p. 374; Münch & Hartmann, 2023, p. 2544); Hence, Supply

Chain Disruptions (SCD) can present substantial risks to business operations and have a significant impact on the business' success. Based on the existing literature, there are two types of SCD - internal and external. Internal disruptions refer to any disturbance associated with resources, including technology, systems, and equipment, resulting in disruptions within the organization, which the firm must deal with to sustain day-to-day operations; on the other hand, external disruptions come from events beyond the boundaries of the SC, such as terrorist attacks, global market slowdowns, natural disasters, and political instabilities (Agrawal & Jain, 2021). Certain external disruptions may transcend the control of supply chain managers, stimulating firms to implement proactive strategies for mitigation.

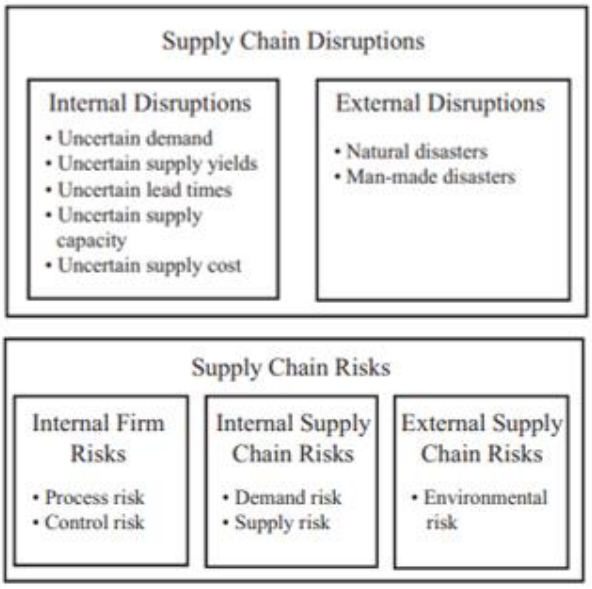
The pandemic represents a matchless type of disruptive risk that has a significant impact on SCs; that is why it is also known as a "super disruption" in the literature (Ivanov, 2021a; p.1630). The literature distinguishes between a super disruption and an instantaneous disruption, such as earthquakes, based on four factors: long-term effect with unpredictable scaling; simultaneous disruptions in supply, demand, and logistics; recovery already occurs in the presence of the unpredictable disruption; and simultaneous or successive openings and closures of suppliers, facilities, and markets (Ivanov, 2021a; Münch & Hartmann, 2023). Additionally, pandemics like Covid-19 are not confined to specific regions or time frames (Ivanov & Das, 2020), affecting both local and global supply chains at various levels.

The worldwide impact of the pandemic triggered a significant global health crisis, disrupting numerous supply chains and causing a shift in supply lines. According to Choi et al. (2020), Covid-19 caused significant problems and disruptions for companies that were not fully prepared, that is the majority of the companies, which can be justified by the fact that usually companies become aware of their supply chain's vulnerability only after a disruption has already taken place (Kähkönen et al., 2023). The general understanding is that Covid-19 had a significant impact on how SCs are managed, challenging companies to swiftly adapt to the dynamic changes in the business environment. "The Covid-19 pandemic is an extreme example of force majeure, creating SCV, disruptions, and risks that the modern business environment has never faced before. Companies were unprepared for the rapid disruptive effect that Covid-19 had and still has on global supply chains" (Kähkönen et al., 2023, p. 2705). There was a massive impact on SCM, marked by a sudden decrease in demand for non-essential products. The pandemic meant widespread chaos that led to disruptions across multiple industries simultaneously (Pimenta et al., 2022).

Following the pandemic, it became regular to classify disruptions as voluntary or involuntary (Pimenta et al., 2022). Arabi et al. (2020) define involuntary disruptions as the result of societal apprehension, insufficient medical resources, and a lack of established legal protocols. Likewise, these disruptions are often linked to reduced consumption or issues within supply chain infrastructure or management. On the other hand, voluntary disruptions, as noted by Djalante et al. (2020), tend to result from deliberate actions, such as government-imposed regulations like social distancing measures and closures of manufacturing facilities aimed at preventing the virus's spread. Thus, voluntary disruptions in the Covid-19 framework manifest a decreased demand for non-essential goods due to lockdowns – typically due to regulatory interventions.

Supply Chain disruptions constitute both external and internal risks. By failing to address these risks, companies might fall into a decline in both operational and financial performance (Hendricks and Singhal, 2003 and 2005, as cited in Hohenstein et al., 2015).

SC risks can be internal to the firm, such as process ones; and internal or external to the SC, such as demand or supply risks, and environmental risks, respectively (Kochan & Nowicki, 2018). **Figure 1** presents these classifications. Traditional risk management methods, originally developed to handle crises like floods or managerial emergencies, often proved insufficient when confronted with unforeseen disruptions. These strategies fail when it comes to fully assess the SCs' complexities, to measure the intricate interdependencies of threats, and to prepare an organisation for future uncertainties (Pettit et al., 2010).



Source: Kochan & Nowicki (2018)

Figure 1: Types of SCD and SCR

Research conducted by the Council for Competitiveness in 2007 revealed that, while effectively addressing operational risks directly impacts financial performance, many corporate board members are not sufficiently aware of these risks. More recently, in 2020, the Council for Competitiveness updated that same report, stating that it is all about Resilience (*Transform2020: Resilience in the Age of COVID-19—An Update to the 2007 Report - Council on Competitiveness*, 2020). The Council emphasized that companies should invest in resilient strategies for low probability (frequency) but high impact events.

Low frequency high impact (LFHI) occurrences represent significant risks to SCs (Ivanov et al., 2017; Ivanov & Das, 2020; Ivanov & Dolgui, 2019b; Kinra et al., 2019). These events trigger what is called a ripple effect throughout the SC. Ripple effect occurs due to extreme changes both in demand and supply dynamics, leading to shortages and delays in the upstream SC (something that impacts SCs, especially at first stages of the pandemic), which in turn manifest downstream as delivery delays, reduced service levels, and diminished quality (Ivanov & Das, 2020; Dolgui & Ivanov, 2021; Kähkönen et al., 2023).

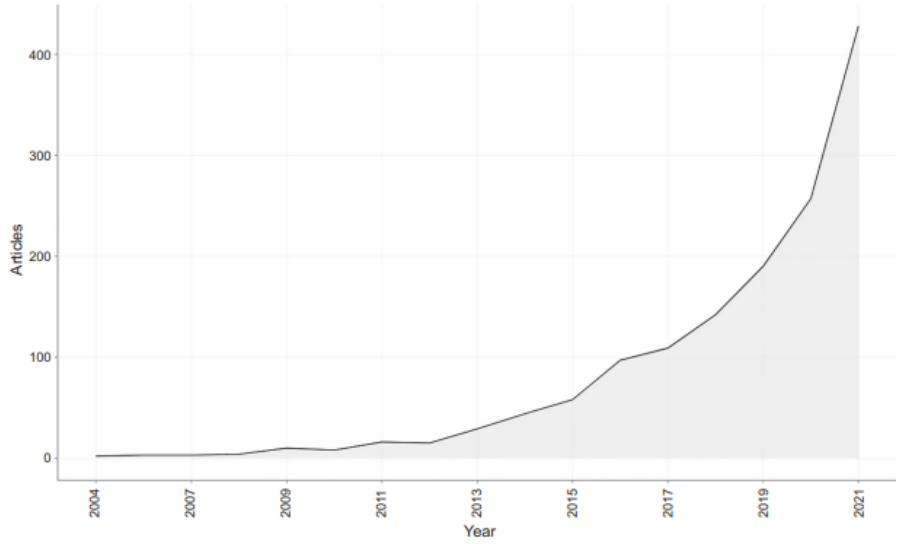
An effective risk management is crucial to improve Supply Chain Resilience (SCRES), and it is a way to minimize vulnerability by decreasing the chances of additional disruptions, ultimately leading to an improvement of SCRES (Sheffi & Rice, 2005; Kochan & Nowicki, 2018). “In practice, Supply Chain Risk Management is only possible when the probabilities and the effects of the SC disruptions on SC performance are known” (Kochan & Nowicki, 2018, p.847). Kochan & Nowicki (2018) suggested that if a SCRM initiative effectively handles the risks, the SCRES increases, otherwise if SCRM only reduce the probability of risks or increase its knowledge, SCV decrease but SCRES is not directly affected (Jüttner & Maklan, 2011). Hence, SCRM identifies and manages supply chain risks to reduce vulnerability (Jüttner et al., 2003), while SCRES develops adaptive capabilities to prepare for, and respond to, unexpected events or disruptions, recovering from them (Ponomarov & Holcomb, 2009).

In the absence of an appropriate strategy, the company's performance can be affected, and if precautionary measures are not taken, the company can lose market share and face value. Therefore, the goal is to understand what drives companies to make SCRES a priority in order to mitigate SCD. This is why several studies have emerged to gain a deeper understanding of how supply chains can enhance their adaptability to change (Pettit et al., 2013; Sheffi, 2005).

2.2. Supply Chain Resilience

Resilience is a broad concept that spans multiple fields. Holling (1973), as cited in Chowdhury and Quaddus (2017), a pioneering researcher of resilience, defines resilience as a system's ability to cope with change. This idea has been echoed by different authors who describe resilience, as it will be further discussed, as the ability of a system to bounce back and restore its initial condition. When it comes to the organizational environment, resilience can be defined as the ability to endure and thrive during unstable conditions.

Improving resilience is considered the most effective strategic capability to minimise supply chain disruptions. Indeed, despite it costs money to achieve resilience, authors conclude that it saves money after a disruption – "it has been shown that every dollar spent on mitigation saves about four dollars in response" (Alikhani et al., 2021, p. 4). Hence, it is possible to find an explanation for the fact that the number of studies in the field of SCRES has increased so much in the past years (Agrawal & Jain, 2021; Castillo, 2022) (**Figure 2**). There are several definitions for the concept of Resilience. In their literature, Tukamuhabwa et al. (2015) summarized some of those definitions.



Source: Castillo (2022)

Figure 2: Scientific publications on SCRES, per year, included in Web of Science

Moreover, Hohenstein et al. (2015) state that the lack of empirical studies on important elements presented in the definitions (readiness, response, recovery and growth) may have compromised the development of an universal SCRES definition. In fact, resilience, contrary to traditional risk analysis, employs tactics that do not rely on precise quantification, exhaustive listing of possibilities, or assumptions about a representative future (Pettit et al., 2010). For

instance, "the phases of response and recovery seem to be a fundamental and reactive part of resilience regarding risk events. Thus, both dimensions are generally included and frequently stressed in SCRES definitions. In contrast, for strong readiness and growth phases, organizations need a proactive approach to ensure resiliency; […] not all authors incorporated the readiness and growth phases in their SCRES definitions since it depends on the individual company to apply and invest in certain resilience elements" (Hohenstein et al., 2015, p. 101) – as it depends on each company, there might be different points of view and different results in practice.

Hohenstein et al. (2015) emphasize that the specific aim of SCRM is to establish and sustain resilient SCs, and "thus to reduce the SCV" (Jüttner & Maklan, 2011, p. 249), while SCRES is built on the assumption that not all risk events can be avoided.

Along, Christopher and Peck (2004b) and, more recently, Pettit et al. (2010), established an initial structure to develop a resilient SC. The authors argued that there are four fundamental principles underlying resilience: i) resilience can be created within a system in disruption; ii) the necessity for extensive collaboration to recognize and address risks; iii) the importance of agility to promptly respond to unexpected occurrences; iv) the need of fostering a risk management culture. Furthermore, based on the acknowledgement that it's not feasible to eliminate all potential risks, SCRES involves the capacity to anticipate unforeseen disruptions and quickly react to them, restoring its function while maintaining a competitive advantage (e.g.: Ali et al., 2017; Hohenstein et al., 2015; Rice & Caniato, 2003), which is in accordance with several definitions presented in **Table I**.

In general, SCRES can be divided into three stages: i) pre-disruptions - prepare, resist, avoid, and aware; ii) during-disruptions - respond, adjust, and adapt; iii) post-disruptions - recover, survive and reestablish. Most definitions imply its need to respond, adapt, and endure unexpected events within a volatile business environment. As a result, they must be able to respond to uncertainty (e.g.: Hohenstein et al., 2015; Pettit et al., 2010; Rice & Caniato, 2003). Additionally, different studies emphasize the significance of recovery, which involves returning to the original state post-disruption, as a central aspect of SCRES (e.g., Pettit et al., 2010; Rice & Caniato, 2003; Steven A Melnyk et al., 2014; Hohenstein et al., 2015). Whereas, only few studies touch upon readiness, which pertains the preparation and the mitigation of potential threats (e.g., Hohenstein et al., 2015; Pettit et al., 2013; Ponomarov & Holcomb, 2009). Similarly, few studies delve into the potential for growth following disturbances,

indicating the developing aspect of SCRES in terms of transitioning to a new situation while enhancing its position of strength (e.g., Christopher and Peck, 2004; Hohenstein et al., 2015; Pettit et al., 2013; Fiksel, 2006). For instance, the definition provided by Fiksel (2006) was adopted by the Council of Competitiveness later in 2007, describing Resilience as "the capacity for an enterprise to survive, adapt and grow in the face of turbulent change" (Fiksel (2006), p. 16; Pettit et al., 2013, p. 47).

2.2.1. SCRES Capabilities and Drivers of Resilience

Supply chain disruptions are either internal or external, impacting products, services, or resources, but they all derive from some type of change. Christopher & Peck (2004) state that 'forces of change' create vulnerabilities within the SC, which are defined as "fundamental factors that makes an enterprise susceptible to disruptions" (Pettit et al., 2010, p. 6). To address these vulnerabilities, research suggests that SCs can develop essential capabilities for surviving in the long-term.

Capabilities are described in different dictionaries as attributes necessary to accomplish something - in corporate's case, for achieving performance. The SCM literature highlights a wide range of SC capabilities (Chowdhury & Quaddus, 2017; Hohenstein et al., 2015; Pettit et al., 2010, 2013; Sheffi, 2013), being flexibility, agility, adaptability, and visibility commonly discussed as managerial SC capabilities; those, plus redundancy and collaboration, can be found in the literature as the most outstanding ones. As per Pettit et al. (2010), SC capabilities are attributes that allow an organisation to anticipate, overcome, or adapt to disruptions. These capabilities play a crucial role in preventing disruptions, mitigating their impact, or facilitating recovery and adaptation post-disruption. Thus, acquiring capabilities that are optimally aligned with addressing the SC vulnerabilities establishes an equilibrium between investment and risk. Studies characterize this condition as "balanced resilience", a 'zone' where companies should pursue and aim to be (Pettit et al., 2010, 2013).

Chowdhury and Quaddus (2017) describe SCRES as a multidimensional construct. The authors suggest that building resilience requires firms to adopt a focus on SCD, establish appropriate resource configurations, and develop robust risk management structures. Additionally, supply chain design emerges as a critical aspect of SCRES. The authors conceptualize SCRES as a third order construct that includes three second order constructs namely proactive capability, supply chain design and reactive capability. Supply chain proactive capability is a second order factor that involves flexibility, reserve capacity integration, efficiency, market strength,

financial strength, and supply chain readiness while SC reactive capability involve responsiveness, and recovery. These dimensions are also used in other studies. Supply chain design includes three dimensions: node density, node complexity, and node criticality. These same authors also suggest that SCs need proactive, reactive, and well-designed attributes to effectively sense, reconfigure, and transform resources in response to environmental shifts. The literature also states that lead times provide valuable insights into the dynamics of a supply chain, influencing its resilience. It helps identify vulnerabilities, assess response capabilities, and implement strategies to enhance overall SCRES (e.g.: Chang & Lin, 2019; DeTreville et al., 2004).

In a pandemic scenario, SCRES capabilities allow to recover and prevent crises, becoming crucial for company's competitiveness (Zhang et al., 2021, as cited in Pimenta et al., 2022). For instance, Münch and Hartmann (2023) consider two types of resilience capabilities based on different previous theoretical theories: intra and inter-firm capabilities. Intra-firm capabilities suggest that companies must develop particular capabilities to address challenges and attain a competitive edge, which indicates that companies must cultivate dynamic capabilities to address vulnerabilities in an unpredictable environment and ensure long-term survival. Inter-firm capabilities, on the other hand, suggest that firms within networks can build relationships that result in a competitive advantage by leveraging synergies and engaging in collaborative activities to access relational benefits – it is about exploiting complementary capabilities and knowledge-sharing. The conclusion is that companies require specific capabilities to build resilient SCs. These capabilities may arise from both internal and external sources to the company and can be categorized as relational if they are in part or fully linked to investment in relational assets and/or inter-firm knowledge sharing (such as the increase in communication with suppliers, etc), or, as dynamic in case of being partially or fully associated with a single company (such as increasing inventory levels or training employees, etc).

An example presented in the study of Pettit et al. (2010) regarding dynamic consumer electronics market shows that companies might decide for a single or limited sourcing to foster close collaboration and achieve a shorter time-to-market. In contrast, embracing open-sourcing to engage with multiple innovative suppliers could enhance competitiveness in this changing industry. Thus, developing capabilities, such as flexibility in sourcing, is the best way to overcome vulnerabilities and increase SCRES – being able to survive, to adapt and to grow.

The far-reaching repercussions of the Covid-19 pandemic highlighted the need for customized strategies in different contexts (Kähkönen et al., 2023). Thus, one solution is to enhance SCRES (Ivanov & Das, 2020; Pettit et al., 2013), which involves redirecting material flows within the supply chain and establishing adaptable structures to ensure uninterrupted operations. Pimenta et al., (2022) identified five major categories that represent the factors required for the existence of resilience, and are linked to resilience capabilities: i) Technology and workforce – importance of digitalization and processes integration, linked with visibility; ii) Sourcing – rethinking supply and distributions sources based on new strategies and considering local suppliers, linked with operational activities' capabilities as collaboration, agility and adaptability; iii) Customer aspects – consumers have access to more information and were forced to consume at home, which means e-commerce and home deliveries were increasingly important,, and is linked with transparency; iv) Ecosystem – it's related to everything else beyond the chain that is crucial to its functioning, linked with sustainability and market concentration aspects; v) Financial assets – about the impact of costs and margins when demands shift abruptly, that's why negotiations and inventory level control are so important to maintain operations flowing.

Resilience capabilities (also mentioned in literature as drivers) encompass the capacity to foresee, monitor, react/respond, and learn. In their literature review, Ali et al. (2017) found three key capabilities – anticipation, response, and learning – that were prominently highlighted across various definitions, while monitoring was only specifically mentioned once, even though it's crucial for businesses to vigilantly monitor supply chain performance throughout the disruption time. The authors also stated that the approach taken to address, react to, and rebound from SCD can be categorized into three key groups: proactive (about planning/recognizing, anticipation, and preparation), concurrent (dealing with changes, adapting, and responding to unforeseen events), and reactive (recovering from disruptions and restoring to the original or desired condition); while the majority of the literature only considers two main groups of capabilities: proactive and reactive (e.g.: Agrawal & Jain, 2021; Alikhani et al., 2021; Christopher & Peck, 2004; Jüttner & Maklan, 2011; Pettit et al., 2013). Companies must come up with both proactive and reactive resilience capabilities to achieve an appropriate level of readiness, response, and recovery before and after crises.

Some studies highlight that SCs require both proactive and reactive capabilities to adapt, integrate, and restructure in all the phases of disruptive events (Christopher & Peck, 2004; Pettit et al., 2013; Sheffi & Rice, 2005). In other words, while some authors define SCRES as a

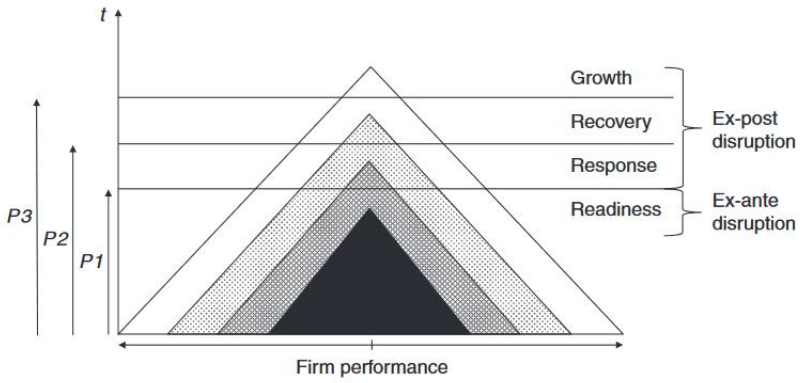
reactive capability, reflecting the capacity of a company to respond to disruptions and restore everyday operations, others define SCRES as a proactive capability, indicating a firm's ability to survive and overcome potential disruptions, which by itself indicates resistance, or both. (Münch & Hartmann, 2023). Ivanov and Das (2020) present an explanation for the organizational challenges in implementing these proactive capabilities. As proactive strategies might involve greater adoption of robotics and automated production/ distribution systems, because robots are not susceptible to viral infections, companies face several cost constraints and organization inertia.

According to the study of Hohenstein et al. (2015), the majority of research focuses on flexibility as a crucial factor in ensuring SCRES. Additionally, the authors noticed that relevant literature discusses redundancy, collaboration, visibility, agility, and multiple sourcing also as fundamental components for resilience. On the other hand, velocity is not mentioned so frequently, possibly because some authors consider it together with visibility as early versions of agility (Christopher & Peck, 2004; Jüttner & Maklan, 2011). Although some studies address redundancy and others emphasize (over-) capacity, safety stocks, or inventories, these aspects may essentially describe the same concept. Hohenstein et al. (2015) findings suggest that flexibility and redundancy are essential elements required across the various stages of SCRES. According to Alikhani et al. (2021), while flexibility includes monitoring the various suppliers, transportation, as well as facilities and workforce, redundancy is basically about capacity, such as all the inventory planning to avoid stockouts – thus, some authors believe that "In comparison to flexibility strategies, redundancy strategies are more costly, which can adversely affect supply chain costs" (Alikhani et al. (2021), p. 3). However, other studies state that redundancy can improve the lead times ratio (i.e. actual LT divided by promised LT), thereby enhancing customer satisfaction (Carvalho et al., 2012; Ivanov et al., 2017; Pavlov et al., 2019).

Some studies recognize agility as a separate idea from flexibility due to the fact that agile SCs are flexible, but the other way around is not true (Braunscheidel & Suresh, 2009; Hohenstein et al., 2015; Swafford et al., 2006). Agility includes concepts as communication, information sharing, and velocity to help responsiveness and a quick redesign of the SC to mitigate disruptions impact and enhance recovery, while flexibility is more related with having backup suppliers, flexible productions system and/or flexible distribution channels (Pettit et al., 2013). To this extent, Ivanov and Das (2020) stated that SCRES has been strengthened by investments in risk mitigation inventories, alternative supply and transport networks, subcontracting capacities, alongside data-driven monitoring and visibility systems.

A systematic literature review developed by Agrawal and Jain (2021) identifies fourteen drivers for a resilient SC: flexibility/adaptability, efficiency, reserve capacity, collaboration, responsiveness, information sharing, velocity, data analytics skills, agility, recovery, redundancy, integration, SC readiness, and ambidexterity. As previously presented, most of these drivers are grouped in the literature as reactive and proactive supply chain capabilities (Alikhani et al., 2021; Chowdhury & Quaddus, 2017; Pettit et al., 2010, 2013). The definitions of the drivers described by Agrawal and Jain (2021), as well as others identified in literature, are presented in **APPENDIX 2.**

Hohenstein et al. (2015) studied the Sand Cone Model, originally from Ferdows and De Meyer (1990), whose analysis revealed that SCRES comprises four sequential stages with similar elements throughout, as well as their importance to the companies' performance (**Figure 3**).



Source: Adapted from Ferdows and De Meyer (1990)

Source: Hohenstein et al. (2015)

Figure 3: The Sand Cone Model of SCRES

The model represents a cumulative process, where an established capability serves as a foundation for developing the next one. Consequently, companies must follow a specific order of key priorities to achieve a sustainable competitive advantage. Hohenstein et al. (2015), suggest that the readiness phase is fundamental to supply chain resilience (SCRES), focusing on reducing the likelihood of disruptions and mitigating effects. Readiness supports subsequent resilience phases, with responsiveness becoming crucial when disruptions occur, allowing for quick recovery. The recovery phase builds on responsiveness to restore normal operations. At the top of the SCRES model is growth, where firms that recover quickly can surpass competitors. Research indicates that the effect of disruptions can be moderated through the implementation of proactive or reactive mitigation strategies, which is aligned with the Sand Cone Model presented.

As part of the SCRES assessment frameworks, and in addition to capacity factors, some authors, such as Pettit et al. (2010, 2013), address vulnerabilities (fundamental elements that make an organisation susceptible to disruptions) and their link to capabilities (aspects that allow an organisation to anticipate and overcome disruptions) to assess resilience. In the aforementioned research, the authors list seven vulnerability factors: turbulence, deliberate threats, external pressures, resource constraints, sensitivity, connectivity and supplier or customer disruptions.

Amongst the challenges posed by Covid-19, achieving SCRES demands not only organizational-level practices but also advanced tools for tracking and reconfiguring resources within the SC (Ivanov & Dolgui, 2021; Kähkönen et al., 2023). Ivanov (2021), while trying to make the discussion surrounding SCRES more dynamic, introduced a framework named AURA (Active Usage of Resilience Assets), which is based on a design-for-resilience way of view (the assumption is that resilient supply chains and operations can withstand and recover from unexpected disruptions), and structure its model into five dimensions: plan, source, make, deliver, and return. In that study was considered that resilience should be viewed as "an inherent, active and value-creating component of the operations management decisions rather than as a passive shield to protect against rare, severe events" (Ivanov, 2021, p. 1211). For instance, to handle crises and mitigate the pandemic's impact, businesses must establish solid and positive relationships with key suppliers and invest in supply chain planning systems, allowing visibility throughout the entire supply network while ensuring that their suppliers have enough capacity to enable the continuity of the business. Thus, inventory management is crucial because the pandemic showed that global crises can result in sudden inventory shortages that can possibly be mitigated with constant communication with suppliers (Kähkönen et al., 2023).

Moreover, as previously said, the worldwide consequences of the Covid-19 pandemic create simultaneous shocks at different points and levels throughout the SC. These impacts have multiple dimensions and companies use their capabilities for creating a resilient response, revealing multiple aspects of resilience during pandemics.

3. METHODOLOGY

The present chapter describes the methodological procedures, which first include an explanation of the selection of a case study as the research methodology and then explain the sample selection followed by the design of the interview guides.

This study aims to answer the following research question: How has the COVID-19 pandemic affected a retailer's management practices to enhance the resilience of its Supply Chain? Considering the explanatory nature of this work, case research is appropriate as a research methodology (Voss et al., 2002; Yin, 2018). According to Yin (2018, p.45), "you would want to do a case study because you want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case". The author states that case studies mix theoretical knowledge with empirical/practical insights that build on the existing theories.

This study examines how a retail company responded to the Covid-19 pandemic, with a particular focus on developing and enhancing supply chain resilience capabilities. The research is conducted from the perspective of managers from different departments. This approach allows to explore managers' experiences in a real-world context, thereby enhancing the practical relevance and applicability of the findings (Yin, 2009).

3.1. Sample and data collection method

The data to support this research was obtained through semi-structured interviews, as well as secondary data. Respondents are from four different company divisions: commercial and product, supply chain, logistics and sales. This study also uses secondary data provided by the Company, such as the average processing time for items, since when they arrive at the warehouse until they enter the stores, between 2019 and 2024 (hereafter referred to as internal processing time). Utilizing multiple data sources can significantly enhance the validity and reliability of a case study (Voss et al., 2002).

Saunders et al. (2007) stated that an explanatory study is likely to involve interviews to enable the researcher to deduce relations between variables; moreover, when understanding the rationale behind the decisions made by research participants or understanding the basis for their attitudes and opinions is crucial, qualitative interviews become necessary. Hence, semi-structured interviews, also known as qualitative research interviews, are non-standardized, which means that the researcher maintains a list of themes and questions to address, that may differ between interviews, depending on conversation flow, since it is a more informal

interview style with room for conversation outside the pre-determined questions (Yin, 2018; Saunders et al., 2019).

This approach has enabled to gather information from elements that work in different teams along the supply chain, which ultimately helps to understand the company's reaction to the disruption of Covid-19 and evaluate its resilience. For instance, "qualitative interviewing helps reconstruct events the researchers have never experienced" (Pettit et al., 2013, p. 50). The interview guides used during the semi-structured interviews, in English and Portuguese respectively, are presented in **APPENDIX 3** and **APPENDIX 4.**

As the retailer under analysis is confidential, from now on it is mentioned as Company XX. The target population was employees from four different company departments: commercial and product, supply chain, logistics and sales, who worked in the company during the Covid-19 pandemic and are still employed. The sample includes six employees from the four company departments mentioned above to reduce bias and obtain more accurate results. The characterisation of the interviews is presented in **Table II**. All interviews were carried out through an online platform and recorded to enable future analysis of the responses provided. On average, the time frame per interview was 60 to 75 minutes each.

Table II: Semi-structured interviews characterization

		METHOD	TIME INTERVAL	POSITION
Supply Chain Department	**E1**	Microsoft Teams - online meeting	4:45 pm - 6:00 pm	Head of Supply Chain Department
	E2	Microsoft Teams - online meeting	4:06 pm - 5:07 pm	Stock Manager
Commercial and Product Department	**E3**	Microsoft Teams - online meeting	3:47 pm - 5:00 pm	Entertainment Division Manager
	E4	Microsoft Teams - online meeting	10:02 am - 11:16 am	Informatics and Gaming Division Manager
Sales	**E5**	Microsoft Teams - online meeting	3:02 pm - 4:15 pm	Store Manager
Logistics	**E6**	Microsoft Teams - online meeting	4:47 pm - 5:40 pm	Head of Logistics and Warehouse

Source: Own Elaboration

Based on the SCRES literature (Chowdhury & Quaddus, 2017; Münch & Hartmann, 2023; Pettit et al., 2013) it was developed an interview guide (see **APPENDIX 3)**, which was divided into four sections considering the knowledge needed to answer each question. A pre-test interview was conducted with one employee prior to the interviews with all other participants to ensure that all questions were clear. The interview guide was then revised based on the feedback received during the pre-test interview. All interviews were carried out in Portuguese, as it is the interviewees' native language, thus there was the need to translate the scripts (**APPENDIX 4**). The interviews were conducted according to the availability of the participants, with no particular order.

4. DATA ANALYSIS AND RESULTS

This chapter presents the results obtained through the six semi-structured interviews conducted as part of a study that aims to answer the following research question: How has the Covid-19 pandemic affected a retailer's management practices to enhance the resilience of its Supply Chain?

4.1. Company Characterization

For this case study, a single representative retail company specializing in technologic and entertainment products in the Portuguese market was selected. The Company faced significant SC challenges during the Covid-19 pandemic, as it is dependent on global suppliers that were also affected by the pandemic restrictions. Regarding data accessibility, more than the interviews with key employees, the Company also provided access to relevant information, allowing for an in-depth analysis of the strategies implemented and the resulting outcomes. The selection of this Company for the case study was based on its relevant market position in Portugal, as it is third-largest consumer electronics retailer in Europe, and considered the number two in Portugal when it comes to in-person market, with a workforce of around 1,100 employees. This Company is part of a multinational Group, with reported revenues for the first 9 months of 2024 of about 5 billion euros, being Iberian Peninsula accounting for close to 5.4M€. In this period, digital activity accounted for 21% of total Group sales. Omnichannel sales represented more than 50% of total online sales – this Omnichannel model is indeed a central element in the Group's strategy. When it comes to the online presence, the Company under analysis currently ranks 5th in e-commerce and marketplace shopping in Portugal, with around 5M monthly visits.

Moreover, the fact that it represents a sector of non-essential goods and the interest in this matter, as well as its outstanding performance during and after the Covid-19, providing a valuable example of SC adaptation in the retail sector during a period of uncertainty, are reasons for perform a study with this Company. The selection of the sample was based on the need to have a clear vision of the Company's SC, which is why people from the different stages of the chain were approached to share different perspectives on the effects of the disruption.

4.2. Semi-structured interviews' data analysis

4.2.1. Perceived severity of Covid-19 Pandemic

Like many other retailers, Company XX faced a new type of disruption - a "super disruption" - that impacted every sector of the global economic market, including the entertainment and electronics consuming market. However, each company characterises the severity of the Covid-19 disruption differently. To understand how this retailer perceived it, the interviewees were asked about the immediate effect of the pandemic on the company and the moment when the customer might have felt it. In a general mode, three situations were highlighted: as soon as the news arrived in Portugal, the concern was to be prepared to send people to telework, followed by the decision to close stores and the need to have lay-offs. E5 mentioned that "the decision of closing stores was based on the staff and customers safety"; E3 added that this decision "brought extra difficulties in managing the situations with suppliers because was not possible to honour all the contractual conditions". Besides, based on the answer of E4, it can be understood how chaotic it was to handle it from the informatics division – "the pressure increase because everyone was going to telework or teleschool so we had huge need to negotiate/purchase as much laptops as we could, which started to be a problem when the costs should be reduced to absorb the losses" (Interview E4). All interviewees agreed that customers felt the impact when felt restrictions to fulfill their demand, which was not only due to the decision of the company to close stores but also due to the government regulations (lockdowns and circulation regulations). Four of the six interviewees (E1, E3, E4 and E6) mentioned that neither the stores nor the e-commerce channel were ready for this sudden change in consuming habits.

4.2.2. During Disruption – Responsiveness and Redundancy

However, when the question regarded the concern with the length of time that the Covid-19 disruption would last, participants felt that it was impossible to predict, and that all measures the company took were for the short-run, ready for constant changes and adjustments. The main

concern was to act quickly, as the scenario was already bad. As mentioned by E4, "everyone was trying to minimize the impacts". It was said by interviewed E5 that regardless the severity of the disruption, the impact would always exist – "The disruption will always exist, and the main hope was for it to take short time" (E5). It can be assumed that the big concern was about the severity of the disruption, and despite the strategies and plans were for the short-term, they continued to make plans for long-run. As stated by E6 "projects already planned for the long-term did not stop" (E6).

When asked about the initial response of Company XX to the pandemic, in agreement, all interviewees assured that the critical investment was the online channel. For instance, E1 said "the investment in the E-commerce was huge". The point was to readapt the channel and readjust the teams. E5 stated, "one big concern was how to keep up with the business and cope with the consumer needs, taking into account the change in their habits". Not only the Company saw the need to improve its website, as it started a "tele-buying" channel based on the users' online searches and on customers' calls (which still works nowadays with some adaptations). The importance of transport partners was also mentioned. As E6 noticed, "straightening the relations and ensure the conditions with the transporters that were responsible for the deliver to the final customer because all retailers were in the hands of those transport companies to end up with a good service level".

The "big deal" for Company XX was the investment in a multichannel presence. Omnichannel enabled the Company to remain competitive in the market – which is also highlighted in annual reports. Despite this, participants noted that the company suffer from losses, which are nowadays completely assessed and reported (in 2020, revenues were down close to -10%, even with an e-commerce sales growth of almost 65%). Ultimately, in the customers' point of view, the six respondents believe that the Company remained reliable due to the high service level achieved – "Service level of about 90% during the pandemic", stated E1. On the supplier's side, E1 said "Company's reputation actually increased in the retail sector because it ended up closer to the customer". In general, participants believe that the Company is more ready now, even though, realising that no company will ever be 100% prepared for a disruption like this. Three of the six respondents (E2, E3 and E5) noticed that the company learned and is more agile, flexible, able to quickly adapt, and above of all, there are no limitations in terms of resources to work from home – E5 believe that "now the company could act more quickly and in a more accurate way", and E2 mentioned, "the Company is more ready in terms of work flexibility".

4.2.3. Covid-19 upstream and downstream impact

Moving forward to the upstream and downstream impact of Covid-19, when asked about the possible impact on purchasing prices, both participants (E3 and E4) said that the increase in the production costs naturally affects the price of the products, but customers do not perceive it - "the final client probably don't felt it because the margin management is internal and if the company wants to remain somehow competitive, has to support more costs with internal adjustments" mentioned E4. Nowadays, in the informatics division, price tables became more volatile (changing every 2-3 weeks), making it very difficult to get back to pre-disruption prices.

When it comes to the delivery reliability of suppliers, participants admit that it got worse during disruption times, but they do not blame suppliers. It was a global pandemic, and everyone was being affected, which means that suppliers also needed to manage their stock and, due to scarcity of raw materials/production constraints, felt inventory shortages – less availability – together with other logistical constraints. E2 mentioned that "even now suppliers are more cautious in their stock management and releases". Some measures taken by the company were related to increasing the level of transparency with suppliers, as well as starting to deal more with big brands instead of small distributors due to the higher volatility that small companies may feel. On the Company's XX side, regarding the responsiveness to customer demand, every interviewee agrees that during Covid-19 it might have been some difficulties due to the inventory shortages (e.g.: informatic products), but in a general mode, the level of service was good, and even increased with the online channel. It was highlighted that suppliers have begun to manage their own stock more effectively, which has positively impacted the market and optimized the availability of units. Moreover, E4 noticed that the Company has gained greater adaptability, because to respond to shifts in customer habits, it was necessary to change the way inventory was managed - "to serve demands there was a need to change the way the company managed it stocks" (E4). Another measure related to the E-commerce channel was a change in the website rules for online shopping. There was an increase in the cut-off time, which means that orders could be placed later than before and still be served and delivered by the Company the day after. E6 explained that "during that Covid-19 times, the cut-off increased by about 3h because the most important thing was to serve the demand and keep up with the performance".

4.3. Supply Chain Resilience Capabilities

As for assessing developed or improved SCRES capabilities beyond responsiveness, questions about flexibility, redundancy/ reserve capacity, collaboration, integration and information sharing, market and financial strength, diversity, efficiency, and adaptability were asked.

Flexibility

In terms of flexibility and starting with the people, participants think that, on average, the work teams were made up of a multiskilled workforce which was fundamental during the pandemic. E6 stated that "the fact that the employees were open to keep up with the business process by working in different areas was super important during Covid-19". However, more specialized jobs are not so easily replaced, and since Covid-19 the Company is experiencing a growth which requires more teams with specific knowledge. So, despite not being directly related to the pandemic disruption, since the end of it, the Company has been growing and working teams have become more specialized – E4 mentioned that "bigger the company, more specialized the people and now there are more teams with specialized knowledge which means that is really difficult to exchange tasks, but it's always possible to learn".

During pandemic several teams were relocated to help in the warehouse and logistical processes due to the sudden increase in the digital channel. Not only operational staff from stores, but also office ones, to avoid the lay-offs and help in keeping up with the business. Nowadays, E6 noticed that the logistics area learned something and is leverage on outsourcing teams to increase productivity.

Moreover, distribution sources are also critical for a retail company. Participants believe that, since the Covid-19 period, the Company become more flexible and efficient in distribution as it has optimized routes between warehouse and stores with a regular distributor contracted and another for urgent situations. For online shopping there are four transporter partners to ensure efficiency. It is also said that it's possible to adjust the routes and increase the number of trucks per week. Quite the opposite, in fact, is the difficulty in increasing the available capacity of the warehouse. Most interviewees believe that geographically it is not worth it to have another distribution centre, but in terms of capacity the current one was not ready for the natural increase in flow caused by the Company's growth (even though not directly related to the pandemic, the good level of service during those times helped). E5 assumed that "the capacity is not increasing at the same velocity that the company is". E4 said that "for this type of goods is not worth it to invest in another distribution centre", but, on the other side, E5 believes that

"it could be worth it to have another warehouse in a different location to make it agile and quicker". Ultimately, E1 and E6 believe that natural disasters or other disruptive occurrences are not a big problem, but capacity is – "capacity constraints are critical; working at more than full capacity is a current risk for the SC" (E6).

Regarding the dependency on suppliers, the company is clearly dependent on specific brands, considering the type of products. Accordingly, the company deals with big suppliers that clearly know their bargaining power, as they represent the only option to have some specific product available and to fulfil the demand. E1 mentioned, "There are powerful brands, that basically lead the business", and E2 stated, "when the supplier is the brand itself there is no other way to get the product available". Sometimes it is not possible to work with the brand, and the option is to negotiate with small distributors instead, which can give flexibility to the company in looking for available stock and, when there are only distributors in the market, it is possible to negotiate and to select the best price, however working directly with big suppliers brings less risk – E3 stated "is better to work with the brand due to prices and conditions". The opposite point of view was also explained - E2 mentioned "when working with distributors, it's possible to have more than one and find the best deal". E4 noticed, "when working with brand itself it's not possible the goal is to have several supply options".

One more generalist question was made regarding the capability to integrate new products in the sale process before and after Covid-19, and it was said by all elements that since the online channel was improved (something that was triggered by the Covid-19 disruption), it is easier to do so, because it brought a way to test the market and customer preferences – "the marketplace helped to understand the costumer's tendencies and is a good channel to test products" (E1). When the products belong to an existent category, the decision to integrate only depends on the commercial team, otherwise it's mandatory to have some studies and approval to invest in a new category or family of products. In terms of contracts and possible changes in negotiations, the interview data showed that during Covid-19 there was a huge need to renegotiate payment terms and timing, as all companies suffered from this shock, the financial effort was considerable. The problem highlighted by E3 and E4, was that big suppliers (big brands) were not willing to help in this regard – "in general almost every supplier or distributor was understandable and helped, but some big suppliers were not so understandable" (E3). The Company was able to maintain practically all renegotiated payment terms, due to its growth, good performance during Covid-19 pandemic and market position.

Finally, related to the existence of an inventory management system that regularly computes both safety and cycle stock, the SC team stated that systems have several features and editable parameters that enables to understand all stocks available. E2 stated, "the system has several features and advantages and it's possible to change all the parameters such as the minimum stock available in each point of sale". Also, respondents E1 and E2 noticed that the system has automation to relocate stocks according to sales and needs. However, nothing really changed in this matter.

Diversity

Considering this dependency issue comes the diversity capability. As noticed, in this business, most of the time, it's not possible to have more than one supplier for the same product, which means that they are unable to diversify on the supply side, in this sense. The only option, as mentioned, is to negotiate with different distributors that represent some brand and select the best deal. However, commercial teams prefer to work with the big brands as the prices and conditions are usually better. It follows that neither the geographic region of suppliers is possible to overcome by the retailer, as most technological and entertainment products are produced in the same countries.

Redundancy / Reserve Capacity

Following to reserve capacity, the respondents from the supply chain and from the commercial department (E1, E2, E3 and E4) were asked in this regard. On the issue of investments in buffer stocks, due to constraints in the capacity of the warehouse, even if not related to the disruption of Covid-19, the buffer is now smaller. "Unfortunately, not because the strategy changed but because we need to manage space and budget at the same time.", noticed E3. Participants state that nowadays, after pandemic, investments are more cautious because of the uncertainties that disruptions brought, but even more because of budget and capacity constraints (which is linked to the Company's growth and not to the Covid-19 disruption). E2 said that products with higher delivery times from important suppliers are a concern, thus they consider important to have buffer stock from those "Top products" in the warehouse. E1 mentioned – "during pandemic there was a much more cautious way of purchasing and managed stocks, which means more stock in the central warehouse". E3 referred that the Company purchased partially instead of a large quantity at once – "x units per week/month and not all at once, to better manage the flow" (E3). Regarding the demand forecasts of Company XX, respondents answer that demand forecasts are usually accurate, although sometimes unstable situations happen. Usually, the

forecasts are done according to the market trends or based on last year's sales, but interviewees explained that big brands and distributors have their own forecasts, and retailers have no power. E1 states that - "big brands have fixed forecasts and stock distributions so even if this company sells more, they won't allocate more". Yet, E3 also mentioned that commercial teams are more cautious about demand forecasts, something that pandemic made them more aware of – "probably people do less optimistic forecasts because of this market unpredictability that brought more fear" (E3).

The problem is the same with backup capacity and backup logistical support. The Company is always trying to optimize space and capacity because it works close to the limit. E4 noticed that "the big problem is that there is expansion and increase in everything but capacities, so it seems that we're always chasing the problem". In logistical terms, as said before, there is only one central warehouse, and operational tasks are already leveraged on outsourcing teams, being that the only solutions when the workflow is at peak. In this sense, E1 mentioned that the operational staff of the company is made of its own internal employees plus two outsourcing companies (to avoid dependency), although if both fail, there are no other solutions. E4 and E5 stated that there is scarcity of workforce, which is getting worse since the pandemic, and that the warehouse is always working close to, or over its capacity. The diversity capability is again related, but in terms of workforce variety/availability. In this sense, respondents (E1, E2, E5 and E6) were asked about the solution in case of workforce failure. Participants agreed that outsourcing is not only an option, it is already part of the solution. E6 mentioned that "during Covid-19 was very important to have some employees from outsourcing because the company does not have enough resources to deal with seasonality/peak workloads nor disruptions". Indeed, the four respondents believe that outsourcing brings flexibility even with high rotativity and possible lack of commitment.

Collaboration, integration and information sharing

Participants (E1, E2, E3 and E4) were asked on both inter (Company-supplier) and intra-firm relations, on the matter of changes in information sharing and/or collaborative strategies. Answers showed that nothing changed since the disruption in terms of info sharing with partners (suppliers) because there always was a certain level of transparency and collaboration - E1 stated that "the Company XX were already collaborative". E2 refers that the Company is open to partnerships, but sometimes there is a lack of proactivity and transparency on the supplier side, something that was the same before the disruption. Two respondents recognize

that during the pandemic, suppliers were very understandable and helpful, but after 2020, the only thing that changed in terms of collaboration was related with the renegotiation of contracts – "during Covid-19 suppliers could be understandable and helpful, but now is the same as before. The only thing that changed is the terms of contracts to share a bit the risk" (E4). When questioned about collaboration within the Company, the answers showed some divergence. In general, all six respondents agreed that during pandemic there was more collaboration among teams, and that planning/strategic meetings were made up of multiskilled and diversified teams. However, E3 and E4 mentioned that the fact that most work divisions are becoming more specialized into teams, makes integration and collaboration between work teams more difficult. E2 noticed that during disruption everyone became more understandable but E1 believes that everything is equal as before pandemic. All respondents agreed that digitalization helped in the existence of more collaborative teams. However, E5 mentioned that sometimes communication between teams is not effective – "there is more communications since the pandemic, but the problem is the way we communicate among teams… it's not always effective" (E5).

Market and Financial Strength

Inter-firm relations can also be related with the market and financial position. Four participants were asked, and it was said by all (E1, E2, E3, and E4) that there is a good relationship with suppliers, despite their bargaining power, as it is based on "a win-win strategy" without any kind of formalised/contractual penalties. E3 noted that suppliers may recognize that this Company achieves more with fewer resources, which ultimately leads to increased trust. The Company always tries to favour long-term relationships with its suppliers. E1 stated – "we work with a trust basis - we have value long-term partnerships with suppliers". Moreover, E4 believes that from the suppliers' side, the Company is seen as reliable and secure - "safety business that can be trusted" (E4).

In today's reality, the same four interviewees consider that the Company is better positioned in the market than before the Covid-19, which can be justified due to the better Level of Service, related with the Company's good performance, in multiple channels – something that was improved during the Covid-19. For instance, E2 mentioned that "The customer trust and the service level is higher every year; the e-commerce also improved and was highly tested during pandemic". E3 highlighted that the commitment that workers showed during the disruption of Covid-19 and the work that has been done for the Company, also sustain the Company's XX good position in the market.

Efficiency

In terms of efficiency, answers were not particularly positive. All respondents agreed that the work productivity is not very high and blame either the tools that make processes slow or complicated, or the focus of employees. However, they admitted that productivity is different among different areas - E4 mentioned that "it depends on the people and on the teams". E3 and E4 also noticed that Covid-19 ended up bringing something good: the possibility to work from home. Both respondents mentioned that "hybrid work can increase some peoples' productivity". In terms of equipment's reliability, four interviewees were asked (E1, E2, E5 and E6). It was said that lots of audits to the tools/system are required due to the lack of trust in the equipment reliability. E2 stated, "there is not 100% trust in equipment or tools" and E1 said "there is a need to audit several times due to several possible mistakes". On the other hand, E6 believes that logistics equipment is reliable, and E5 assured that the investments in IT are helping in this field. Commercial team was not asked in this regard because during the test interview it was noticed that they mostly work with own developed tools, although E3 and E4 spontaneously mentioned that there is a lack of trust in some processes and tools, which take their teams to changes their approach. Four interviewees agreed that quality control processes exist through 'audits', explaining that these take place in the logistics department every time products arrive at the warehouse to ensure delivery conditions and product conformity.

In terms of knowledge and cross-training, all interviewees agreed that employees might be cross-trained within their team/work area, but not between different work areas - "the knowledge inside a team is similar and common to all members but between teams no" (E1). Moreover, the office teams are trained inside each team to enhance expertise, but they don't necessarily have contact with all the tasks performed within their team. E3 stated "people inside a team already know how things work and are much more able to help". Inside a team, employees are confident to collaborate with each other and to share their knowledge. Two interviewees noticed that as Company XX is growing and teams are becoming more specialized, it will be harder for people to be cross trained, but it is dependent on each hierarchy availability to have clear knowledge, and info sharing among all. Respondents believe it's always possible to learn, and staff proved to be adaptable during Covid-19 times.

Adaptability

In terms of adaptability, three interviewees (E1, E2 and E6) agreed that teams always try to adapt to quickly reduce internal processing times, something that they learned from Covid-19

pandemic - "always try to adjust to fulfill the demand" (E2). However, when it comes to quickly relocate products, two respondents noticed that it is possible because teams are flexible, but the process relies heavily on manual effort and the human workforce. However, it's not always possible due to capacity constraints or a lack of operational staff. When the company is operating at full capacity, it becomes challenging to handle restrictions and last-minute changes – E6 stated "The more exceptions there are, the less efficient the process is". Logistics team fell that there's a need for a better organization within the process and among teams, as well as improvements in the tools used.

Other Vulnerabilities

Besides the previous presented questions on SCRES drivers, extra questions were conducted to understand if there were other vulnerabilities affecting the Company XX that ended up related to its performance and strategy, as well as its SCRES.

Firstly, and focusing on the products, five interviewees asked assured that there is a strong price competition, and it was said that this type of competition is worse since pandemic. E4

mentioned "price competition is worst since Covid-19, due to the increase of e-commerce and online competitors". On the demand side, one respondent highlighted for the existence of unpredictable demand shifts, but other respondents assumed that, usually, it's possible to predict these shifts based on market tendencies or seasonality. E2 mentioned that "since the pandemic, the Company XX learned to react faster and to work better with short-term plans". Associated with this is the ability to serve the demand in a trending or dynamic market, a topic to which participants referred that external environment really affects the sales and the distribution of material, and so E1 noticed the importance of knowing the client to better manage the stocks. In agreement, E2 and E5 mentioned the importance of knowing the market to optimize the stocks.

Not only retailers, but suppliers are also liable to capacity constraints, as well as other disruptions. Respondents (E1, E2, E3 and E4) noted that as part of a SC, also suppliers need to manage their stocks, and sometimes might be affected by sudden changes in the demand that were not predicted in their supply forecasts. E2 stated that "Since the Covid-19, suppliers become more cautious in the manner they allocate their stock to the retailers". It is not always possible to have immediate availability because also suppliers are producing according to their forecasts and market optimizations decisions, for instance, if there is overstock in the market, suppliers will not produce more to one retailer only – "Suppliers usually work with forecasts

and then it happens that they don't have flexibility to provide more stock" (E3). Again, as part of global SCs, suppliers felt this (and other) disruption(s) even before retailers.

The brands that work with Company XX are aware of their influence and value/power, making it crucial to protect them. To minimize the risk of compromising the brand's original positioning, these companies offer lower margins to retailers. E4 mentioned the importance of keeping a good relationship with those suppliers as they are critical for the business. During Covid-19 sales teams were more worried about robberies, but also due to the increase of security systems by each brand, the number was small (usually classified as inventory breaks with no need to use insurances).

Another topic related with the transparency of the Company's SC, regards how visible to stakeholders are the errors in the operations. All six respondents agreed that the SC is transparent enough that it can always be told if something happened. When the problem affects stock availability and harm sales, either commercial teams, suppliers or customers notice the gaps. Finishing, interviewees showed some concern with the difficulty of hiring and retaining qualified workers, because the Company does not want to pay for high qualifications or specialisation, and it prefers to invest in training internally.

Recovery and Learning

To conclude, it was assessed the Company's recovery and learning capabilities. Overall, every respondent agreed that the Company is now better prepared for any similar disruption but, at the same time, they felt difficult to say if the recovery would be less costly. Some noticed that certain measures would remain the same, allowing for a faster response. While most of the necessary investments have already been made, there is still a need for additional workforce in logistics and operations. Others mentioned that depending on the type of products, the disruption would likely be costly, but it would be quicker and smoother – "the Company would act quickly and smoothly" (E4). It was also noted that, despite the existent learning curve, the retailers are dependent on various external factors and agents as well, which means that can always exist different occurrences, whose Company XX were not so prepared to.

It was said by the interviewees that some changes have become permanent, as for the case of telesales, extended cut-off in the online shopping, more openness to digitalization, hybrid work and teamwork. However, most of the tools are the same, things only change in function of the need. E6 mentioned that "Covid-19 was an accelerator of existent plans to improve tools and methods, and not the trigger". In general, all assumed that tools could be better. Additionally,

the answers allow to understand that, indeed, something was learned in terms of resilience. All six respondents mentioned agility, adaptability, flexibility, readiness and responsiveness as the most developed and learned capabilities. For instance, E1 remembered that the agility to work with short-term strategies was developed, together with the previously mentioned adaptation, to optimize time and better resources allocation. E2 mentioned the importance of E-commerce and omnichannel presence as something learned by Company XX. Besides, it was also mentioned the increase in the Company's awareness to employees, together with an increase in diversified groups of work. Additionally, all of them stated that this type of disruption is different from seasonal times because seasonality is predictable and, despite the peaks in demand and workload, it happens every year and forecasts count on it. E6 added that "Covid-19 disruption appears, and people start to look at seasonal times as easier to deal with".

To understand this difference in the effects of unpredictable disruptions and seasonality, secondary data such as internal processing times was analysed. The average monthly processing times (since the moment that suppliers deliver the product until it is available in the system) from the year 2019 to the first quarter of 2024 were assessed. When Covid-19 started, in 2020, the average internal processing time increased by about 600% at first, remaining higher than the average. There was no value like that neither before nor after pandemic, and even when working with demands variability and seasonal peaks, the increase used to be smaller than 50% compared to the annual average. Moreover, in 2023, the first year after pandemic, internal processing times were always close to the average of 2.5 days, even in seasonal times. This data helps to understand what was said by interviewees and explained in the previous paragraph regarding the fact that seasonality and disruptions have completely different effects on the Company's SC.

Critical capabilities for the Company

Finally, before the end of the interviews, interviewees were asked on what they consider to be the critical capabilities that Company XX SC had developed or should have developed to become more resilient. Interviewees E3, E4, and E6 mentioned some critical capabilities that they believed the Company had developed, such as transparency and market strength (which helped in dividing the risk), and others that company improved, such collaboration with suppliers and information sharing. As mentioned earlier in this chapter, other capabilities highlighted by interviewees as important SCRES capabilities that Company XX has improved were agility, adaptability, flexibility, readiness and responsiveness. Three interviewees (E4, E5

and E6) showed concern about the lack of IT integration, even though the Company is more digitalized since Covid-19, respondents believe that there is still some path to go to become more efficient. The reduced information sharing between all stages of SC and the need for better tools and procurement systems (the capability factor of ambidexterity) were also highlighted by three respondents (E3, E4 and E6) as something that should be developed. Overall, interviewees noticed that the more automated the processes, the more efficient would it be.

5. DISCUSSION OF RESULTS

This study aims to answer the RQ: "How has the Covid-19 pandemic affected a retailer's management practices to enhance the resilience of its SC?". To help in answering this RQ, six objectives arose, and will be forward discussed.

To answer this research question and achieve the five research objectives outlined in the introductory chapter, this study collected primary data through six semi-structured interviews and secondary data from company reports. The results show that the Covid-19 pandemic had an effect on Company's XX supply chain resilience capabilities, some of which enabled Company XX to maintain its position in the market. Even though the pandemic disruption did not trigger critical changes in tools or processes, it is relevant to notice that it served as an accelerator, stimulating diversified working group to improve methods and increasing the efforts and investment in the website. However, Covid-19 indeed motivated some other changes such more cautious investments in buffer stock, renegotiations of contractual conditions that were better for the Company, expansion of transport partnerships, as well as an increase in the capacity to adapt.

In what concerns the strategies Company XX put in place to deal with SCD caused by Covid-19, it is possible to highlight the omnichannel presence of the company, with a clear and huge increase of e-commerce. This entails as diversification strategy with the aim of keeping the Company's performance and fulfilling the customer's demand. Forced by the market, the Company also felt the need to diversify in terms of transportation partnerships, increasing the number of transporters during Covid-19 times, also due to the increase in the business flow from the e-commerce side. Moreover, the Company has become more aware of the supply side risks, changing some suppliers to the brand itself instead of small distributors, which also allows them to renegotiate contractual conditions. Some of these strategies are in line with Christopher and Peck (2004) who suggest to adopt SC strategies that kept several options open,

even if it is not the cheapest choice in the short term, as well as to work in partnership with suppliers (something that Company XX does when using a Win-Win strategy as said by interviewees). These strategies are also in light with other studies; Ivanov & Das (2020) support that SCRES is improved through investments alternative supply and transport partners, and subcontracting. The same authors, as well as Pettit et al. (2013), also suggest reorganising material flows withing the SC and create flexible structures to guarantee continuous operations as key to improve SCRES. Moreover, it was mentioned in the literature review that Pettit et al. (2010) highlighted sourcing flexibility as key to improve SCRES and demonstrates how businesses in the consumer electronics market may adopt open-sourcing to interact with several suppliers and improve competitiveness. Pimenta (2022) refer sourcing as a key factor required for SCRES as well, as it is linked with important operational activities capabilities such collaboration, agility, flexibility and adaptability.

There was an increase in the digitalization of the Company, either by the use of digital platforms or through the investment in machines to automatize some operational processes. However, this investment was not triggered by the Covid-19 disruption, was instead accelerated by it. There is a clear concern among employees about the need to exploit the whole potential of the technologies adopted to increase the Company's efficiency, together with a need to integrate all tools into a better procurement system.

The second research objective is to understand how the Covid-19 pandemic has contributed to the development of the retailer's new SCRES capabilities. The results show that the company was 'tested' during the pandemic and has naturally developed or improved some capabilities, to remain both competitive and reliable in the market. Most interviewees recognize the critical importance of flexibility and adaptability capabilities to cope with an SC disruption and also mention that the company has improved these capabilities during the Covid-19 pandemic. These findings corroborate the literature review developed by Hohenstein et al. (2015), which found that most SCRES research focuses on flexibility as an important factor in ensuring SCRES. Collaboration and agility are discussed, as well, by academics as important capabilities to develop SCRES (Hohenstein et al., 2015). Responsiveness, readiness and agility were developed SCRES capabilities, and efficiency was improved due to Covid-19, even though respondents noticed that there are still some adjustments that the Company can make to achieve a higher level of efficiency. Market strength, collaboration and information sharing were also improved during Covid-19 and due to this pandemic disruption, because otherwise it would take longer for the Company to achieve/gain these SCRES capabilities. On the other hand,

redundancy (over-capacity and extra-inventory) is also emphasized as an essential capability, required across different stages of SCRES, but the Company XX needs to increase capacity and to manage costs to gain this capability. Even though having buffer stock is part of the Company needs and strategy (at least in top products), due to its actual budget and capacity constraints, redundancy as a capability gets overlooked.

Considering that is not possible to eliminate all risks, the literature consistently highlights the ability to anticipate, respond, and learn as key for SCRES (Ali et al., 2017; Hohenstein et al., 2015). Agility in responding to unexpected events is an underlying principle of SCRES (Christopher & Peck, 2004b; Pettit et al., 2010). Indeed, Company XX was able to respond to the Covid-19 disruption through the investment in e-commerce, the agility and adaptability in relocating resources, through the flexibility in managing stocks and through the increase in collaboration with suppliers and information sharing among teams. Ultimately, it can be said that the Company learned and indeed some of the adjustments done and strategies adopted to overcome the pandemic disruption are still in practice. So, the fact that the Company was able to respond and learn from the disruption indicates that some of the perceived SCRES capabilities were indeed applied (regardless of whether they were developed or improved).

As to changes in stock management practices that resulted from the Covid-19 pandemic, the gathered data shows that Covid-19 was more an accelerator than a trigger. Nevertheless, this can be approached in two ways: during and after the disruption. When first hit the pandemic, the Company decided to close stores and to move the efforts to the online channel, which was the only way to get to the customers. More than ever, there was a need to have stock availability in the central warehouse, thus the decision went by optimize stocks and collect the majority of the stock back to the warehouse to serve as much online orders as possible. SC teams were aware of the importance of buffer-stocks, but the stock-outs on the suppliers' side were not a common reality until then. Hence, during months, the strategy went by cautious purchasing (partial orders) and more centralized stocks with buffer in the warehouse. However, after Covid-19 things start to go back to pre-pandemic normality, which means that capacity and budget restrictions are at the heaviest side of the balance again. So, only top products with higher lead times on supply side have buffer stocks in the warehouse, while others are managed according to sales percentage. Despite the learning, it can be concluded that even though there were changes in stock management practices during the pandemic period, nowadays practically none of these changes remain in practice. However, it can be mentioned the fact that it is now crucial to always have stock available in the warehouse for the web channel, which means that

there is always a percentage of total stock that remains in warehouse not necessarily as a buffer for stores but as safety stock for e-commerce.

The fourth research objective was to explore the challenges Company XX faced in implementing these new resilience strategies. This is based on the goal of fulfilling the customer demand, which was harder with all the restrictions imposed by a global pandemic, named "super disruption" (Ivanov, 2021a). In general, the restrictions include resource limitations (human and financial) (Hamouche, 2023) and the need to focus on the long-term success with short-term strategies with limited scenarios planning. The Company was "forced" to accelerate their digital transformation efforts rapidly, to keep up with the business. Security of employees was indeed mentioned by all respondents as the biggest concern, which has brought more HR limitations than other type of disruption would. Moreover, one important challenge still is to manage capacity and budget at the same time. These challenges are in line with the studies of Pettit et al. (2010, 2013), aforementioned in the literature, that noticed the link between vulnerabilities and capabilities, being vulnerabilities a trigger and a challenge to become more resilient. Capacity constraints, more than budget, are highlighted as a critical problem since it interferes with the need to have buffer stocks, during Covid-19 and nowadays.

Finally, it was possible to think about the long-term implications of these adapted practices on SCRES and Company's performance. In line with the interviews Company XX is now more ready to deal with disruptions and this means that would act quickly, which follows the Sand Cone Model studied by Hohenstein et al. (2015). This happens because some investments are already done, the digital channel is perfectly working, and the awareness developed would help in quickly relocate resources and efforts. Moreover, the Company was able to respond to the disruption, was reliable to suppliers and customers, keeping a good level of service and even increasing it, and as a result the position in the market now is better than before Covid-19 disruption.

Above of all the company kept reliable to stakeholders and kept the macro/long-term projects running. This also allows a better relationship with larger suppliers and puts the Company in a better negotiation position.

6. CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

This research aimed to explore how the Covid-19 pandemic affected Company's XX SCRES. By analyzing Company's XX response to Covid-19 disruption, it became evident that while the pandemic did not trigger drastic changes in processes or tools, it acted as an accelerator for automation, improving SC strategies, and enhancing resilience capabilities. For instance, it served as a driving force for accelerating initiatives, such as renegotiating contracts to better align with the company's needs. The findings suggest that the Company responded effectively to pandemic-induced disruptions by leveraging omnichannel strategies, diversifying transportation partnerships, focusing on flexibility and adaptability, being the investments in the e-commerce a crucial strategy to handle the pandemic. Stock management practices, while temporarily adjusted to optimize centralized stock availability during the crisis, returned largely to pre-pandemic methods once SC stabilized. Moreover, the Company XX improved key SCRES capabilities such as responsiveness, readiness, agility, market strength, information sharing, flexibility, adaptability and collaboration, positioning itself to handle future disruptions more efficiently.

However, challenges remain particularly in managing capacity constraints to ensure adequate buffer stock, which are critical for maintaining SCRES. There is also significant room for improve the resilience in terms of collaboration and information sharing among the different stages of the SC. IT integration and automation continue to be a concern in this company, and exploiting these can make it easier to optimise all the processes throughout the SC. Despite these constraints, the Company managed not only to maintain but also enhance its market position, suggesting that its strategic adaptations contributed to long-term competitive advantage.

This research contributes to the growing body of literature on supply chain resilience by demonstrating how a major disruption like Covid-19 can foster the development and improvement of SCRES capabilities (Ivanov & Dolgui, 2021b; Sheffi, 2020; Shen & Sun, 2023) . Besides being highly relevant to the academic community, it is also important to the develop awareness in other retail companies about improving SCRES capabilities. Conclusions were drawn regarding the objectives under analysis to ultimately understand how the Company's SCRES was affected. Each objective offers a distinct lens for analysing how the pandemic reshaped the retailer's SC.

While managers are generally aware of the challenges posed by supply chain disruption, the uncertainty created by a Covid-19 pandemic requires a deeper understanding of how to deal with an extreme disruption. To cope with severe disruptions, managers need to improve and develop several SCRES capabilities, create strong relationships with suppliers, manage the capacity to allow buffer stocks, increase the transporters network, have an efficient communication within the entire SC, and invest in automation to optimize the process.

Although the study makes a valuable contribution to the literature, it is important to note that there are some limitations. The study's sample was limited to six respondents from one organization only, without any examination of suppliers' opinions or comparison with competitors in the market. As it is a case study in one company, it is essential to avoid generalization. Additionally, as data analysis and discussion are based mainly on information gathered during semi-structured interviews, it's not possible to totally confirm the perceptions of interviewees, which could potentially introduce bias.

Further research could also extend to a multiple case study analysis for broader understanding of the effects of the Covid-19 pandemic on multiple companies' resilience in the same business activity. Another recommendation would be to include some of the Company's suppliers in the sample, as part of its SC stages, to understand the upstream effects. By doing so, the analysis could be brought closer to business reality, resulting in a more accurate and generalized study.

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APPENDIX

APPENDIX 1: DEFINITIONS FOR SCRES

Table I: Supply Chain Resilience (SCRES) - definitions

Definitions for Supply Chain Resilience	Sources
"Ability to react to an unexpected disruption and restore normal operations"	Rice & Caniato, (2003), p.25; Pettit et al. (2010), p. 17; Hohenstein et al., (2015), p. 97
"The ability of the system to return to its original state or move to a new more desirable state after being disturbed"	Christopher & Peck, (2004), p. 2; Kochan & Nowicki (2018), p. 845
"Containment of disruption and recovery from it"	Sheffi (2005) p.2; Pettit et al. (2010), p. 17
"Capacity for complex industrial systems (enterprise) to survive, adapt, and grow in the face of turbulent change"	Fiksel (2006), p. 16; Pettit et al. (2010, 2013)
"The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them, by maintaining continuity of operations at the desired level of connectedness and control over structure and function"	Ponomarov and Holcomb (2009), p. 131; Kochan & Nowicki (2018), p. 845; Hohenstein et al., (2015), p. 97
"The ability of a supply chain to proactively plan and design its network to anticipate ensuing supply chain disruptions and to respond to disruptions effectively"	Ponis and Koronis (2012), as cited in Chowdhury & Quaddus (2017), p. 11
"The capability of a supply chain to anticipate and overcome potential disruptions."	Alikhani et al. (2021), p. 2
"A supply chain can thus be resilient if its original stable situation is sustained or if a new stable situation is achieved as long as the supply chain is able to 'bounce back from a disruption'. [...] A supply chain is resilient if it uses resources that enable it to cope with change."	Recently, Wieland (2013), as cited in Münch & Hartmann (2023), p. 108
"The capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change" – Considering an individual firm's level	Day (2014), as cited in Münch & Hartmann (2023), p. 2545
"The ability of a supply chain to both resist disruptions and recover operational capability after disruptions occur"	Steven A Melnyk et al., (2014), p. 36
"SCRES is defined as the ability of a system to return to its original state, within an acceptable period of time, after being disturbed"	Brandon-Jones et al., (2014), p. 58
"The adaptive capability of a supply chain to prepare for and/or respond to disruptions, to make a timely and cost-effective recovery, and therefore progress to a post-disruption state of operations-ideally, a better state than prior to disruption"	Tukamuhabwa et al. (2015), p. 8; Kochan & Nowicki (2018), p. 845

"The supply chain's ability to be prepared for unexpected risk events, responding and recovering quickly to potential disruptions to return to its original situation or grow by moving to a new, more desirable state in order to increase customer service, market share and financial performance"	Hohenstein et al. (2015), p. 108; Münch & Hartmann (2023), p. 2546

Source: Own Elaboration

APPENDIX 2: DEFINITIONS OF SCRES DRIVERS

- **Flexibility**: Enhances capabilities that help to sustain the supply chain not only during disruptions, but also on a daily basis. For instance, authors found that minor adjustments in flexibility lead to a drastic reduction in disruption impact by incorporating adaptable pricing or sourcing strategies within the SC.
- **Efficiency**: Resiliency can be defined as "the ability to return to normal performance levels following SCD" (Zsidisin and Wagner, 2010, as cited in Agrawal & Jain, 2021, p. 2513). Performance outcomes include efficiency, effectiveness, and resiliency, which ultimately assist firms to mitigate negative effects of disruption. E.g.: Cross-trained employees enhance a company's SC efficiency. SCRES can help mitigate risk, but SC efficiency directly impacts an organization's financial performance.
- **Reserve Capacity**: It is about keeping spare capacity available for production during SCD. Reserve capacity and risk mitigation inventory, helps firms to mitigate the negative impact of SCV to achieve SCRES. As per Chowdhury & Quaddus (2017), to mitigate the effects of an uncertain environment, organizations should have buffer stock as well as backup capacity.
- **Collaboration**: Occurs within the SC when two or more independent firms work closely together to implement appropriate supply chain strategies toward a common goal. Collaboration between supplier and buyer is required to reduce the upstream negative impact of SCD.
- **Supply Chain Responsiveness**: The ability of a firm to respond rapidly to market volatility and customer demands is a key indicator of its resilience and adaptability. "SC response concerns mitigating disruptions in the shortest possible time and with the smallest impact" (Chowdhury & Quaddus, 2017). It involves ensuring the appropriate quantity and quality of services, delivering the right product to the right location, swiftly responding to customer demands, and minimizing lead times.
- **Information Sharing**: The lack of info sharing increases vulnerability and the bullwhip effect (refers to the amplification of demand variability) throughout the SC; Thus. it can help to mitigate risk in case of a disruption. Communication between supply chain partners, before and after a disruption, can also help to build SCRES. Firms benefit from sharing information across different levels of the SC as it allows the achievement of greater resilience provided by uncertainty reduction.

- **Velocity:** It is the SC's ability to respond quickly to changes in the market. Studies SC velocity, primarily concern the rate of change in adjustment. It allows for immediate response to unexpected changes as well as improving the speed of recovery from disruptions.
- **Data Analytics**: Studies believe that there is a positive relationship between data analytics and resilience. It has been discovered that firms can better build demand and visibility by applying systems and procedures incorporating data analytics capabilities.
- **Agility**: Enables firms to quickly and smoothly bounce back, during a change period, in a cost-effective manner, with the possibility to transform changes into new business opportunities. Authors conclude that higher the level of agility quicker the recover from an uncertain market condition.
- **Recovery**: The integration of recovery elements along with proactive strategies are essential for managing SCV. Incorporating recovery policies, based on collaborative efforts, and enhanced by visibility measures, enables a comprehensive assessment of disruptions and material flows.
- **Redundancy**: Is about adding extra capacity and inventory to respond to the SCD through capital investment. It is considered an expensive method of increasing SCRES. A firm can use excess capacity in various domains such as production, inventory, storage facilities, and transportation with the help of appropriate strategic planning.
- **Integration**: A proactive strategy for achieving resilience, as well as improving risk assessment capabilities. Some authors say that firms must use internal SC integration to overcome upstream or downstream disruptions. Integration with a Supply Chain partner also improves quality performance.
- **Supply Chain Readiness**: Readiness, response, and recovery (3R framework intrinsic to resilience definition) strategies assist firms in the first moments of disruption and post recovery (Ponomarov & Holcomb, 2009). Academics have been concerned with whether the SC is prepared, after SCD, to recover the previous level by absorbing the impact or, if possible, improve the level of operational performance.
- **Ambidexterity**: is based more a dynamic capability than a proactive or reactive one, some authors mentioned it as the ability to find a balance between *exploration* (experimenting with new technologies, processes, markets, or business models to adapt to changing conditions, seize opportunities, and mitigate potential risks) and *exploitation* (refining and optimizing existing processes, systems, and resources to

maximize efficiency, reduce costs, and meet current demand effectively), so it can explore innovation while using current competencies. To effectively mitigate the negative effects of SCD, the SC must employ higher-order capabilities (ambidextrous).

- **Visibility**: Capacity to obtain real-time, accurate, and comprehensive information about the various components, processes, and activities within the supply chain network. It enables organizations to monitor, analyse, and respond to changes, disruptions, and risks effectively, as it fundamental for transparency within SC, helping in identifying potential risks or signals, as well as changes in market conditions.
- **Robustness**: ability of the system to withstand and absorb disruptions without experiencing significant degradation in performance or service levels, maintaining stable and reliable operations in the face of various disruptions.
- **Diversity**: refers to the strategic inclusion of diverse suppliers, partners, workforce and products to enhance the robustness and adaptability of the SC.
- **Market and Financial strength**: Market strength refers to an organization's ability to adapt to changing market conditions, customer demands, and competitive pressures, serving as base for diversity, responsiveness, and to position the company in the market. Meanwhile, Financial strength refers to an organization's fiscal health, liquidity, and access to capital resources, which is essential for resources allocation, business continuity planning and innovation’s investment. Both are fundamental to ensure operational continuity and capitalize on opportunities for growth in uncertain environments.

APPENDIX 3: INTERVIEW GUIDE – COMPLETE

This research is part of the master's programme in Management and Industrial Strategy, as part of the Master Final Work, to obtain a master's degree. The aim of this study is to examine the practices used by company XX to ensure the resilience of its supply chain. Being one objective to understand if any of these practices result from the Covid-19 pandemic.

The participation of the interviewees consists of answering open and semi-open questions during a semi-structured interview. All the information obtained will be treated confidentially, with the data used only for research purposes.

Please answer all questions honestly and truthfully.

Local:

Time:

Job title:

To begin, will be presented one of the definitions of resilience that serve as the foundation for this work: Resilience is a system's ability to adapt to change, or to recover and restore its original state. The Competition Council defined resilience as 'a company's ability to survive, adapt, and grow in the face of turbulent change'.

1. **Severity of Covid-19 disruption**
    a. What was the immediate impact of the disruption?
    b. Do you think that the end customers felt any impact, at first? When did they possible felt the impact?
2. **During Disruption – Responsiveness and Redundancy**
    a. What was the initial response to the disruption? E.g. Investment in E-commerce, tele buying…
    b. Your primary concern was the length of time that the disruption would last or the severity of the disruption (i.e., minimize impact of longer period, or short but painful)?
    c. Were the company able to quantify the impact of the disruption (performance, financial)?
    d. Do you think that the company were able to maintain stable and reliable after the disruption? Is it now more ready to deal with uncertainty / to quickly respond to disruptions?

3. **After disruption – Recovery and learning**
    a. Do you think that the company is able to recover from crisis in a less painful and less costly way?
    b. What did the company learn with a disruption like covid-19? Do you think is it more prepared now to deal with seasonal uncertainty? Are the learnings shared with the teams?
    c. Any changed in methods or processes become permanent?
4. **Other vulnerabilities**
    a. Do the products face unpredictable demand shifts?
    b. Are the products regularly stolen or vandalized?
    c. Do the products face strong price competition?
    d. Social or cultural changes have significant impact on your ability to serve the markets?
    e. Does the suppliers have limited capacity?
    f. Is there any difficult to retain or recruit highly skilled/ qualified workers?
    g. Are errors or deficiencies in the operations highly visible to stakeholders?
    h. Do the products carry brand names that are important to protect?
    i. Do the suppliers frequently face significant disruptions?
5. **Developed Capabilities**
    a. **Flexibility**
        i. Do you think that the work-force is multi-skilled to keep up with the business processes?
        ii. How are the contracts? Were made any changes within the contracts to enhance flexibility? (partial payments, partial orders, partial deliveries)?
        iii. Is there flexibility in the distribution? (more than 1 source of distribution)
        iv. How is the capability of integrating new products in the sale process?
        v. Are you critically dependent on any supplier? (TD, Samsung)
        vi. Do you think that having only 1 distribution centre could be critically to the company?
        vii. Do you have a sophisticated inventory management system that regularly computes both safety stock and cycle stock at all storage and retail locations?

b. **Redundancy / Reserve Capacity**
    i. Do you invest in having back-up capacity? What about back up logistical support?
    ii. Is the buffer stock a reality? Are the investments in products more or less cautious?
    iii. Do you have accurate demand forecasting?

c. **Collaboration, integration, info sharing**
    i. Did something changed in terms of information sharing with partners? Is it more collaborative? (defining strategies together…)
    ii. What about the integration within the company – among different departments and teams?

d. **Market and Financial Strength**
    i. How is the relationship between the company and the overall suppliers?
    ii. In terms of band positioning, is the company better or worse?
    iii. Does the company have insurance against potential damages?

e. **Diversity**
    i. Do you have more than 1 supplier for the same product, if needed? What about distribution partners?
    ii. Are the suppliers all from the same geographic region?
    iii. If the workforce fails, what is the solution? Outsourcing?

f. **Efficiency**
    i. Is there any quality control process? How do you describe it?
    ii. Are the employees cross-trained? I.e. Is it clear the knowledge among all?
    iii. Is the labour productivity very high?
    iv. Is the equipment reliable?

g. **Adaptability**
    i. Do you continually strive to reduce internal lead-times? I.e. keep changing the strategies
    ii. Can you quickly reallocate orders or products?

6. Covid-19 upstream and downstream impact

a. Did Covid-19 directly or indirectly affect the procurement prices for the purchased items?

b. Did Covid-19 directly or indirectly affect the delivery reliability (on-time delivery, order accuracy)
c. Did Covid-19 directly or indirectly affect the responsiveness to customer demands?

Overall, what do you think that are the fundamental/ critical capabilities that the company's supply chain has or should have developed over time to become more resilient?

Interview Guide – E1 and E2

1. **Severity of Covid-19 disruption**
    a. What was the immediate impact of the disruption?
    b. Do you think that the end customers felt any impact, at first? When did they possible felt the impact?
2. **During Disruption – Responsiveness and Redundancy**
    a. What was the initial response to the disruption? E.g. Investment in E-commerce, tele buying…
    b. Your primary concern was the length of time that the disruption would last or the severity of the disruption (i.e., minimize impact of longer period, or short but painful)?
    c. Were the company able to quantify the impact of the disruption (performance, financial)?
    d. Do you think that the company were able to maintain stable and reliable after the disruption? Is it now more ready to deal with uncertainty / to quickly respond to disruptions?
3. **After disruption – Recovery and learning**
    a. Do you think that the company is able to recover from crisis in a less painful and less costly way?
    b. What did the company learn with a disruption like covid-19? Do you think is it more prepared now to deal with seasonal uncertainty? Are the learnings shared with the teams?
    c. Any changed in methods or processes become permanent?
4. **Other vulnerabilities**
    a. Do the products face unpredictable demand shifts?
    b. Do the products face strong price competition?

c. Social or cultural changes have significant impact on your ability to serve the markets?
d. Does the suppliers have limited capacity?
e. Is there any difficult to retain or recruit highly skilled/ qualified workers?
f. Are errors or deficiencies in the operations highly visible to stakeholders?
g. Do the suppliers frequently face significant disruptions?

5. Developed Capabilities

a. **Flexibility**
   i. Do you think that the work-force is multi-skilled to keep up with the business processes?
   ii. Is there flexibility in the distribution? (more than 1 source of distribution)
   iii. How is the capability of integrating new products in the sale process?
   iv. Are you critically dependent on any supplier? (TD, Samsung)
   v. Do you think that having only 1 distribution centre could be critically to the company?
   vi. Do you have a sophisticated inventory management system that regularly computes both safety stock and cycle stock at all storage and retail locations?

b. **Redundancy / Reserve Capacity**
   i. Do you invest in having back-up capacity? What about back up logistical support?
   ii. Is the buffer stock a reality? Are the investments in products more or less cautious?
   iii. Do you have accurate demand forecasting?

c. **Collaboration, integration, info sharing**
   i. Did something changed in terms of information sharing with partners? Is it more collaborative? (defining strategies together…)
   ii. What about the integration within the company – among different departments and teams?

d. **Market and Financial Strength**
   i. How is the relationship between the company and the overall suppliers?
   ii. In terms of brand positioning, is the company better or worse?

iii. Does the company have insurance against potential damages?

e. **Diversity**
   i. Do you have more than 1 distribution partners?
   ii. If the workforce fails, what is the solution? Outsourcing?

f. **Efficiency**
   i. Is there any quality control process? How do you describe it?
   ii. Are the employees cross-trained? I.e. Is it clear the knowledge among all?
   iii. Is the labour productivity very high?
   iv. Is the equipment reliable?

g. **Adaptability**
   i. Do you continually strive to reduce internal lead-times? I.e. keep changing the strategies
   ii. Can you quickly reallocate orders or products?

6. **Covid-19 upstream and downstream impact**
   a. Did Covid-19 directly or indirectly affect the delivery reliability (on-time delivery, order accuracy)?
   b. Did Covid-19 directly or indirectly affect the responsiveness to customer demands?

Overall, what do you think that are the fundamental/ critical capabilities that the company's supply chain has or should have developed over time to become more resilient?

Interview Guide – E3 and E4

1. **Severity of Covid-19 disruption**
   a. What was the immediate impact of the disruption?
   b. Do you think that the end customers felt any impact, at first? When did they possible felt the impact?
2. **During Disruption – Responsiveness and Redundancy**
   a. What was the initial response to the disruption? E.g. Investment in E-commerce, tele buying…

b. Your primary concern was the length of time that the disruption would last or the severity of the disruption (i.e., minimize impact of longer period, or short but painful)?
c. Were the company able to quantify the impact of the disruption (performance, financial)?
d. Do you think that the company were able to maintain stable and reliable after the disruption? Is it now more ready to deal with uncertainty / to quickly respond to disruptions?

3. After disruption – Recovery and learning

a. Do you think that the company is able to recover from crisis in a less painful and less costly way?
b. What did the company learn with a disruption like Covid-19? Do you think is it more prepared now to deal with seasonal uncertainty? Are the learnings shared with the teams?
c. Any changed in methods or processes become permanent?

4. Other vulnerabilities

a. Do the products face unpredictable demand shifts?
b. Do the products face strong price competition?
c. Social/cultural changes have signifi. impact on the ability to serve the markets?
d. Does the suppliers have limited capacity?
e. Is there any difficult to retain or recruit highly skilled/ qualified workers?
f. Are errors or deficiencies in the operations highly visible to stakeholders?
g. Do the products carry brand names that are important to protect?
h. Do the suppliers frequently face significant disruptions?

5. Developed Capabilities

a. **Flexibility**
    i. Do you think that the work-force is multi-skilled to keep up with the business processes?
    ii. How are the contracts? Were made any changes within the contracts to enhance flexibility? (partial payments, partial orders, partial deliveries)?
    iii. How is the capability of integrating new products in the sale process?
    iv. Are you critically dependent on any supplier? (TD, Samsung)

v. Do you think that having only 1 distribution centre could be critically to the company?

b. **Redundancy / Reserve Capacity**
   i. Do you invest in having back-up capacity? What about back up logistical support?
   ii. Is the buffer stock a reality? Are the investments in products more or less cautious?
   iii. Do you have accurate demand forecasting?

c. **Collaboration, integration, info sharing**
   i. Did something changed in terms of information sharing with partners? Is it more collaborative? (defining strategies together…)
   ii. What about the integration within the company – among different departments and teams?

d. **Market and Financial Strength**
   i. How is the relationship between the company and the overall suppliers?
   ii. In terms of brand positioning, is the company better or worse?
   iii. Does the company have insurance against potential damages?

e. **Diversity**
   i. Do you have more than 1 supplier for the same product, if needed? What about distribution partners?
   ii. Are the suppliers all from the same geographic region?

f. **Efficiency**
   i. Is there any quality control process? How do you describe it?
   ii. Are the employees cross-trained? I.e. Is it clear the knowledge among all?
   iii. Is the labour productivity very high?

6. Covid-19 upstream and downstream impact

a. Did Covid-19 directly or indirectly affect the procurement prices for the purchased items?
b. Did Covid-19 directly or indirectly affect the delivery reliability (on-time delivery, order accuracy)?
c. Did Covid-19 directly or indirectly affect the responsiveness to customer demands?

Overall, what do you think that are the fundamental/ critical capabilities that the company's supply chain has or should have developed over time to become more resilient?

Interview Guide – E5

1. **Severity of Covid-19 disruption**
    a. What was the immediate impact of the disruption?
    b. Do you think that the end customers felt any impact, at first? When did they possible felt the impact?
2. **During Disruption – Responsiveness and Redundancy**
    a. What was the initial response to the disruption? E.g. Investment in E-commerce, tele buying…
    b. Your primary concern was the length of time that the disruption would last or the severity of the disruption (i.e., minimize impact of longer period, or short but painful)?
    c. Do you think that the company were able to maintain stable and reliable after the disruption? Is it now more ready to deal with uncertainty / to quickly respond to disruptions?
3. **After disruption – Recovery and learning**
    a. Do you think that the company is able to recover from crisis in a less painful and less costly way?
    b. What did the company learn with a disruption like covid-19? Do you think is it more prepared now to deal with seasonal uncertainty? Are the learnings shared with the teams?
    c. Any changed in methods or processes become permanent?
4. **Other vulnerabilities**
    a. Do the products face unpredictable demand shifts?
    b. Are the products regularly stolen or vandalized?
    c. Do the products face strong price competition?
    d. Social or cultural changes have significant impact on your ability to serve the markets?
    e. Do the products carry brand names that are important to protect?
5. **Developed Capabilities**

a. **Flexibility**
    i. Do you think that the work-force is multi-skilled to keep up with the business processes?
    ii. How is the capability of integrating new products in the sale process?
    iii. Do you think that having only 1 distribution centre could be critically to the company?
b. **Collaboration, integration, info sharing**
    i. Did something change in terms integration within the company – among different departments and teams?
c. **Market and Financial Strength**
    i. Does the company have insurance against potential damages?
d. **Diversity**
    i. If the workforce fails, what is the solution? Outsourcing?
e. **Efficiency**
    i. Is the labour productivity very high?
    ii. Is the equipment reliable?

6. **Covid-19 upstream and downstream impact**
    a. Did Covid-19 directly or indirectly affect the responsiveness to customer demands?

Overall, what do you think that are the fundamental/ critical capabilities that the company's supply chain has or should have developed over time to become more resilient?

Interview Guide – E6

1. **Severity of Covid-19 disruption**
    a. What was the immediate impact of the disruption?
    b. Do you think that the end customers felt any impact, at first? When did they possible felt the impact?
2. **During Disruption – Responsiveness and Redundancy**
    a. What was the initial response to the disruption? E.g. Investment in E-commerce, tele buying…

b. Your primary concern was the length of time that the disruption would last or the severity of the disruption (i.e., minimize impact of longer period, or short but painful)?
c. Do you think that the company were able to maintain stable and reliable after the disruption? Is it now more ready to deal with uncertainty / to quickly respond to disruptions?

3. After disruption – Recovery and learning

a. Do you think that the company is able to recover from crisis in a less painful and less costly way?
b. What did the company learn with a disruption like covid-19? Do you think is it more prepared now to deal with seasonal uncertainty? Are the learnings shared with the teams?
c. Any changed in methods or processes become permanent?

4. Other vulnerabilities

a. Are the products regularly stolen or vandalized?
b. Is there any difficult to retain or recruit highly skilled/ qualified workers?

5. Developed Capabilities

a. **Flexibility**
    i. Do you think that the work-force is multi-skilled to keep up with the business processes?
    ii. Is there flexibility in the distribution? (more than 1 source of distribution)
    iii. Do you think that having only 1 distribution centre could be critically to the company?
    iv. Do you have a sophisticated inventory management system that regularly computes both safety stock and cycle stock at all storage and retail locations?
b. **Collaboration, integration, info sharing**
    i. Did something change in terms of integration within the company – among different departments and teams?
c. **Market and Financial Strength**
    i. Does the company have insurance against potential damages?
d. **Diversity**

i. If the workforce fails, what is the solution? Outsourcing?

e. **Efficiency**
   i. Is there any quality control process? How do you describe it?
   ii. Are the employees cross-trained? I.e. Is it clear the knowledge among all?
   iii. Is the labour productivity very high?
   iv. Is the equipment reliable?

f. **Adaptability**
   i. Do you continually strive to reduce internal lead-times? I.e. keep changing the strategies
   ii. Can you quickly reallocate orders or products?

6. Covid-19 upstream and downstream impact

a. Did Covid-19 directly or indirectly affect the delivery reliability (on-time delivery, order accuracy)?
b. Did Covid-19 directly or indirectly affect the responsiveness to customer demands?

Overall, what do you think that are the fundamental/ critical capabilities that the company's supply chain has or should have developed over time to become more resilient?

APPENDIX 4: TRANSLATED INTERVIEW GUIDE – COMPLETE

Esta pesquisa integra a Dissertação de Mestrado em Gestão e Estratégia Industrial, para obtenção do grau de mestre. O objetivo deste estudo é analisar as práticas utilizadas pela empresa XX para garantir a resiliência da sua cadeia de abastecimento, e perceber se alguma dessas práticas resulta da pandemia de Covid-19.

A participação dos entrevistados consiste em responder a perguntas abertas e semiabertas durante uma entrevista semiestruturada. Todas as informações obtidas são confidenciais, sendo os dados usados apenas para investigação.

Por favor, responda todas as perguntas de forma honesta e verdadeira.

Local:

Tempo:

Cargo na empresa:

Em jeito introdutório, será apresentada uma das definições de resiliência que serve de base a este trabalho: A resiliência é a capacidade de um sistema para lidar com a mudança, isto é, a capacidade de recuperar e restaurar a sua condição. O Conselho da Concorrência definiu resiliência como "a capacidade de uma empresa sobreviver, adaptar-se e crescer face a mudanças turbulentas".

1. **Gravidade da perturbação provocada pelo Covid-19**
    a. Qual foi o impacto imediato da perturbação?
    b. Considera que, inicialmente, os clientes sentiram algum impacto? Quando é que os clientes poderão ter sentido o impacto?
2. **Durante a perturbação – Capacidade de Resposta e Redundância**
    a. Qual foi a reação/ resposta inicial à perturbação? Ex.: Investimento em E-commerce, compra telefônica...
    b. A vossa preocupação principal era com a duração da perturbação ou com a gravidade da perturbação (ou seja, minimizar o impacto de um período mais longo, ou mais curto mas doloroso)?
    c. A empresa foi capaz de quantificar o impacto da perturbação (desempenho, financeiro)?
    d. Considera que a empresa foi capaz de manter-se estável e confiável após a perturbação? Está agora mais preparada para lidar com a incerteza / para responder rapidamente a interrupções/perturbações?
3. **Após a perturbação/rutura - Recuperação e aprendizado**
    a. Considera que a empresa é capaz de recuperar de crises idênticas de maneira menos “dolorosa” e menos dispendiosa?
    b. O que é que a empresa aprendeu com uma perturbação como a covid-19? Acredita que agora estão mais preparados para lidar com a sazonalidade/ incerteza sazonal? As aprendizagens são compartilhadas pelas equipas?
    c. Houve alguma mudança em métodos ou processos que se tenha tornado permanente?
4. **Outras vulnerabilidades**
    a. Os produtos estão sujeitos a alterações imprevisíveis na procura?
    b. Os produtos sofrem “regularmente” furtos ou vandalismos?
    c. Os produtos enfrentam forte concorrência de preços?

d. Mudanças sociais ou culturais têm um impacto significativo na capacidade de servir aos mercados?
e. A capacidade dos fornecedores é limitada?
f. Há dificuldade em reter ou recrutar trabalhadores especializados/ qualificados?
g. Possíveis erros ou deficiências nas operações são altamente visíveis para os stakeholders (partes interessadas)?
h. Há produtos que têm marcas que são importantes de proteger?
i. Os fornecedores são frequentemente afetados por perturbações significativas?

5. Capacidades desenvolvidas

a. **Flexibilidade**
   i. Considera que a mão-de-obra é multifuncional/polivalente para acompanhar os processos de negócios?
   ii. Como são os contratos? Foram feitas quaisquer alterações nos contratos para aumentar a flexibilidade? (pagamentos parciais, pedidos parciais, entregas parciais)?
   iii. Há flexibilidade na distribuição (mais do que um distribuidor)?
   iv. Qual é a capacidade de integrar novos produtos no processo de venda?
   v. Dependem de algum fornecedor, de forma critica? (TD, Samsung)
   vi. Considera que ter apenas 1 centro de distribuição pode ser crítico para a empresa?
   vii. Existe um sistema sofisticado de gestão de stocks que calcula regularmente o stock de segurança e o stock movel em todos os locais de armazenamento e venda?

b. **Redundância / Capacidade de Reserva**
   i. A empresa investe para ter backup capacity? E quanto a um plano de backup logístico, existe?
   ii. Trabalham com stocks de seguranças? Os investimentos em produtos são mais ou menos cautelosos, desde o covid?
   iii. Trabalham com forecasts reais da procura?

c. **Colaboração, integração, compartilhamento de informações**
   i. Mudou alguma coisa em termos de partilha de informações com os parceiros? É mais colaborativo? (definir estratégias juntos...)

ii. E quanto à integração dentro da empresa - entre diferentes departamentos e equipas?

d. **Força de Mercado e Financeira**
   i. Como é a relação entre a empresa e os fornecedores em geral?
   ii. Em termos de posicionamento da marca, a empresa está melhor ou pior?
   iii. A empresa tem seguro contra eventuais danos?

e. **Diversidade**
   i. A empresa tem mais do que 1 fornecedor para o mesmo produto, se necessário? E quanto a parceiros de distribuição?
   ii. Todos os fornecedores são da mesma região geográfica?
   iii. Se a mão-de-obra falhar, qual é a solução? Outsourcing?

f. **Eficiência**
   i. Existem processos de controlo de qualidade? Consegue descrever-lo(s)?
   ii. Os funcionários são formados para atuar em várias áreas? Ou seja, é claro o conhecimento entre todos para atuar noutras áreas em caso de necessidade?
   iii. Considera que a produtividade de trabalho é muito alta?
   iv. Os equipamentos são confiáveis?

g. **Adaptabilidade**
   i. As equipas esforçam-se continuamente para reduzir o tempo de processamento interno? Ex.: ir mudando as estratégias...
   ii. É possível uma rápida realocação de encomendas ou produtos? Existem mecanismos à disposição para ajudar?

6. Impacto a montante e a jusante da Covid-19

a. A Covid-19 afetou diretamente ou indiretamente os preços de aquisição dos artigos comprados?
b. A Covid-19 afetou diretamente ou indiretamente a fiabilidade da entrega (entrega no prazo, exatidão do pedido)?
c. A Covid-19 afetou diretamente ou indiretamente a capacidade de resposta à procura dos clientes?

No geral, quais são as capacidades fundamentais/críticas que a cadeia de abastecimento da empresa desenvolveu ou deveria ter desenvolvido ao longo do tempo para se tornar mais resiliente?

Algum tipo de investimento adicional? Negociar melhores condições com o fornecedor? Outras "regras de jogo"?

Translated Interview Guide – E1 and E2 (pt)

1. **Gravidade da perturbação provocada pelo Covid-19**
    a. Qual foi o impacto imediato da perturbação?
    b. Considera que, inicialmente, os clientes sentiram algum impacto? Quando é que os clientes poderão ter sentido o impacto?
2. **Durante a perturbação – Capacidade de Resposta e Redundância**
    a. Qual foi a reação/ resposta inicial à perturbação? Ex.: Investimento em E-commerce, compra telefônica...
    b. A vossa preocupação principal era com a duração da perturbação ou com a gravidade da perturbação (ou seja, minimizar o impacto de um período mais longo, ou mais curto, mas doloroso)?
    c. A empresa foi capaz de quantificar o impacto da perturbação (desempenho, financeiro)?
    d. Considera que a empresa foi capaz de manter-se estável e confiável após a perturbação? Está agora mais preparada para lidar com a incerteza / para responder rapidamente a interrupções/perturbações?
3. **Após a perturbação/rutura - Recuperação e aprendizado**
    a. Considera que a empresa é capaz de recuperar de crises idênticas de maneira menos "dolorosa" e menos dispendiosa?
    b. O que é que a empresa aprendeu com uma perturbação como a covid-19? Acredita que agora estão mais preparados para lidar com a sazonalidade/ incerteza sazonal? As aprendizagens são compartilhadas pelas equipas?
    c. Houve alguma mudança em métodos ou processos que se tenha tornado permanente?
4. **Outras vulnerabilidades**
    a. Os produtos estão sujeitos a alterações imprevisíveis na procura?
    b. Os produtos enfrentam forte concorrência de preços?
    c. Mudanças sociais ou culturais têm um impacto significativo na capacidade de servir aos mercados?
    d. A capacidade dos fornecedores é limitada?
    e. Há dificuldade em reter ou recrutar trabalhadores especializados/ qualificados?

f. Possíveis erros ou deficiências nas operações são altamente visíveis para os stakeholders (partes interessadas)?
g. Os fornecedores são frequentemente afetados por perturbações significativas?

5. Capacidades desenvolvidas

a. **Flexibilidade**
   i. Considera que a mão-de-obra é multifuncional/polivalente para acompanhar os processos de negócios?
   ii. Há flexibilidade na distribuição? (mais de um distribuidor)
   iii. Qual é a capacidade de integrar novos produtos no processo de venda?
   iv. Dependem de algum fornecedor, de forma critica? (TD, Samsung)
   v. Considera que ter apenas 1 centro de distribuição pode ser crítico para a empresa?
   vi. Existe um sistema sofisticado de gestão de stocks que calcula regularmente o stock de segurança e o stock movel em todos os locais de armazenamento e venda?

b. **Redundância / Capacidade de Reserva**
   i. A empresa investe para ter backup capacity? E quanto a um plano de backup logístico, existe?
   ii. Trabalham com stocks de seguranças? Os investimentos em produtos são mais ou menos cautelosos, desde o covid?
   iii. Trabalham com forecasts reais da procura?

c. **Colaboração, integração, compartilhamento de informações**
   i. Mudou alguma coisa em termos de partilha de informações com os parceiros? É mais colaborativo? (definir estratégias juntos...)
   ii. E quanto à integração dentro da empresa - entre diferentes departamentos e equipas?

d. **Força de Mercado e Financeira**
   i. Como é a relação entre a empresa e os fornecedores em geral?
   ii. Em termos de posicionamento da marca, a empresa está melhor ou pior?
   iii. A empresa tem seguro contra eventuais danos?

e. **Diversidade**
   i. A empresa tem mais do que 1 fornecedor para o mesmo produto, se necessário? E quanto a parceiros de distribuição?

ii. Se a mão-de-obra falhar, qual é a solução? Outsourcing?

f. **Eficiência**

i. Existem processos de controlo de qualidade? Consegue descrever-lo(s)?

ii. Os funcionários são formados para atuar em várias áreas? Ou seja, é claro o conhecimento entre todos para atuar noutras áreas em caso de necessidade?

iii. Considera que a produtividade de trabalho é muito alta?

iv. Os equipamentos são confiáveis?

g. **Adaptabilidade**

i. As equipas esforçam-se continuamente para reduzir o tempo de processamento interno? Ex.: ir mudando as estratégias...

ii. É possível uma rápida realocação de encomendas ou produtos? Existem mecanismos à disposição para ajudar?

6. Impacto a montante e a jusante da Covid-19

a. A Covid-19 afetou diretamente ou indiretamente a fiabilidade da entrega (entrega no prazo, exatidão do pedido)?

b. A Covid-19 afetou diretamente ou indiretamente a capacidade de resposta à procura dos clientes?

No geral, quais são as capacidades fundamentais/críticas que a cadeia de abastecimento da empresa desenvolveu ou deveria ter desenvolvido ao longo do tempo para se tornar mais resiliente?

Algum tipo de investimento adicional? Negociar melhores condições com o fornecedor? Outras "regras de jogo"?

Translated Interview Guide – E3 and E4 (pt)

1. Gravidade da perturbação provocada pelo Covid-19

d. Qual foi o impacto imediato da perturbação?

e. Considera que, inicialmente, os clientes sentiram algum impacto? Quando é que os clientes poderão ter sentido o impacto?

2. Durante a perturbação – Capacidade de Resposta e Redundância

a. Qual foi a reação/ resposta inicial à perturbação? Ex.: Investimento em E-commerce, compra telefônica...

b. A vossa preocupação principal era com a duração da perturbação ou com a gravidade da perturbação (ou seja, minimizar o impacto de um período mais longo, ou mais curto mas doloroso)?

c. A empresa foi capaz de quantificar o impacto da perturbação (desempenho, financeiro)?

d. Considera que a empresa foi capaz de manter-se estável e confiável após a perturbação? Está agora mais preparada para lidar com a incerteza / para responder rapidamente a interrupções/perturbações?

3. Após a perturbação/rutura - Recuperação e aprendizado

a. Considera que a empresa é capaz de recuperar de crises idênticas de maneira menos "dolorosa" e menos dispendiosa?

b. O que é que a empresa aprendeu com uma perturbação como a covid-19? Acredita que agora estão mais preparados para lidar com a sazonalidade/ incerteza sazonal? As aprendizagens são compartilhadas pelas equipas?

c. Houve alguma mudança em métodos ou processos que se tenha tornado permanente?

4. Outras vulnerabilidades

a. Os produtos estão sujeitos a alterações imprevisíveis na procura?

b. Os produtos enfrentam forte concorrência de preços?

c. Mudanças sociais ou culturais têm um impacto significativo na capacidade de servir aos mercados?

d. A capacidade dos fornecedores é limitada?

e. Há dificuldade em reter ou recrutar trabalhadores especializados/ qualificados?

f. Possíveis erros ou deficiências nas operações são altamente visíveis para os stakeholders (partes interessadas)?

g. Há produtos que têm marcas que são importantes de proteger?

h. Os fornecedores são frequentemente afetados por perturbações significativas?

5. Capacidades desenvolvidas

a. Flexibilidade

i. Considera que a mão-de-obra é multifuncional/polivalente para acompanhar os processos de negócios?

ii. Como são os contratos? Foram feitas quaisquer alterações nos contratos para aumentar a flexibilidade? (pagamentos parciais, pedidos parciais, entregas parciais)?

iii. Qual é a capacidade de integrar novos produtos no processo de venda?

iv. Dependem de algum fornecedor, de forma critica? (TD, Samsung)

v. Considera que ter apenas 1 centro de distribuição pode ser crítico para a empresa?

b. Redundância / Capacidade de Reserva

i. A empresa investe para ter backup capacity? E quanto a um plano de backup logístico, existe?

ii. Trabalham com stocks de seguranças? Os investimentos em produtos são mais ou menos cautelosos, desde o covid?

iii. Trabalham com forecasts reais da procura?

c. Colaboração, integração, compartilhamento de informações

i. Mudou alguma coisa em termos de partilha de informações com os parceiros? É mais colaborativo? (definir estratégias juntos...)

ii. E quanto à integração dentro da empresa - entre diferentes departamentos e equipas?

d. Força de Mercado e Financeira

i. Como é a relação entre a empresa e os fornecedores em geral?

ii. Em termos de posicionamento da marca, a empresa está melhor ou pior?

e. Diversidade

i. A empresa tem mais do que 1 fornecedor para o mesmo produto, se necessário? E quanto a parceiros de distribuição?

ii. Todos os fornecedores são da mesma região geográfica?

f. Eficiência

i. Existem processos de controlo de qualidade? Consegue descrever-lo(s)?

ii. Os funcionários são formados para atuar em várias áreas? Ou seja, é claro o conhecimento entre todos para atuar noutras áreas em caso de necessidade?

iii. Considera que a produtividade de trabalho é muito alta?

6. **Impacto a montante e a jusante da Covid-19**
    - **a.** A Covid-19 afetou diretamente ou indiretamente os preços de aquisição dos artigos comprados?
    - **b.** A Covid-19 afetou diretamente ou indiretamente a fiabilidade da entrega (entrega no prazo, exatidão do pedido)?
    - **c.** A Covid-19 afetou diretamente ou indiretamente a capacidade de resposta à procura dos clientes?

No geral, quais são as capacidades fundamentais/críticas que a cadeia de abastecimento da empresa desenvolveu ou deveria ter desenvolvido ao longo do tempo para se tornar mais resiliente?
Algum tipo de investimento adicional? Negociar melhores condições com o fornecedor? Outras "regras de jogo"?

Translated Interview Guide – E5 (pt)

1. **Gravidade da perturbação provocada pelo Covid-19**
    a. Qual foi o impacto imediato da perturbação?
    b. Considera que, inicialmente, os clientes sentiram algum impacto? Quando é que os clientes poderão ter sentido o impacto?
2. **Durante a perturbação – Capacidade de Resposta e Redundância**
    a. Qual foi a reação/ resposta inicial à perturbação? Ex.: Investimento em E-commerce, compra telefônica...
    b. A vossa preocupação principal era com a duração da perturbação ou com a gravidade da perturbação (ou seja, minimizar o impacto de um período mais longo, ou mais curto mas doloroso)?
    c. Considera que a empresa foi capaz de manter-se estável e confiável após a perturbação? Está agora mais preparada para lidar com a incerteza / para responder rapidamente a interrupções/perturbações?
3. **Após a perturbação/rutura - Recuperação e aprendizado**
    a. Considera que a empresa é capaz de recuperar de crises idênticas de maneira menos "dolorosa" e menos dispendiosa?
    b. O que é que a empresa aprendeu com uma perturbação como a covid-19? Acredita que agora estão mais preparados para lidar com a sazonalidade/ incerteza sazonal? As aprendizagens são compartilhadas pelas equipas?

c. Houve alguma mudança em métodos ou processos que se tenha tornado permanente?

4. Outras vulnerabilidades

a. Os produtos estão sujeitos a alterações imprevisíveis na procura?
b. Os produtos sofrem "regularmente" de furtos ou vandalismo?
c. Os produtos enfrentam forte concorrência de preços?
d. Mudanças sociais ou culturais têm um impacto significativo na capacidade de servir aos mercados?
e. Há produtos que têm marcas que são importantes de proteger?

5. Capacidades desenvolvidas

a. **Flexibilidade**
    i. Considera que a mão-de-obra é multifuncional/polivalente para acompanhar os processos de negócios?
    ii. Qual é a capacidade de integrar novos produtos no processo de venda?
    iii. Considera que ter apenas 1 centro de distribuição pode ser crítico para a empresa?
b. **Colaboração, integração, compartilhamento de informações**
    i. Como vê a integração dentro da empresa - entre diferentes departamentos e equipas?
c. **Força de Mercado e Financeira**
    i. A empresa tem seguro contra eventuais danos?
d. **Diversidade**
    i. Se a mão-de-obra falhar, qual é a solução? Outsourcing?
e. **Eficiência**
    i. Considera que a produtividade de trabalho é muito alta?
    ii. Os equipamentos são confiáveis?
f. **Adaptabilidade**
    i. É possível uma rápida realocação de encomendas ou produtos? Existem mecanismos à disposição para ajudar?

6. Impacto a montante e a jusante da COVID-19

a. A Covid-19 afetou diretamente ou indiretamente a capacidade de resposta à procura dos clientes?

No geral, quais são as capacidades fundamentais/críticas que a cadeia de abastecimento da empresa desenvolveu ou deveria ter desenvolvido ao longo do tempo para se tornar mais resiliente? Algum tipo de investimento adicional? Negociar melhores condições com o fornecedor? Outras "regras de jogo"?

Translated Interview Guide – E6 (pt)

1. **Gravidade da perturbação provocada pelo Covid-19**
    a. Qual foi o impacto imediato da perturbação?
    b. Considera que, inicialmente, os clientes sentiram algum impacto? Quando é que os clientes poderão ter sentido o impacto?
2. **Durante a perturbação – Capacidade de Resposta e Redundância**
    a. Qual foi a reação/ resposta inicial à perturbação? Ex.: Investimento em E-commerce, compra telefônica...
    b. A vossa preocupação principal era com a duração da perturbação ou com a gravidade da perturbação (ou seja, minimizar o impacto de um período mais longo, ou mais curto, mas doloroso)?
    c. Considera que a empresa foi capaz de manter-se estável e confiável após a perturbação? Está agora mais preparada para lidar com a incerteza / para responder rapidamente a interrupções/perturbações?
3. **Após a perturbação/rutura - Recuperação e aprendizado**
    a. Considera que a empresa é capaz de recuperar de crises idênticas de maneira menos "dolorosa" e menos dispendiosa?
    b. O que é que a empresa aprendeu com uma perturbação como a covid-19? Acredita que agora estão mais preparados para lidar com a sazonalidade/ incerteza sazonal? As aprendizagens são compartilhadas pelas equipas?
    c. Houve alguma mudança em métodos ou processos que se tenha tornado permanente?
4. **Outras vulnerabilidades**
    a. Os produtos sofrem "regularmente" de furtos ou vandalismo?
    b. Há dificuldade em reter ou recrutar trabalhadores especializados/ qualificados?
5. **Capacidades desenvolvidas**
    a. **Flexibilidade**
        i. Considera que a mão-de-obra é multifuncional/polivalente para acompanhar os processos de negócios?

ii. Há flexibilidade na distribuição? (mais de um distribuidor)
iii. Considera que ter apenas 1 centro de distribuição pode ser crítico para a empresa?

b. **Colaboração, integração, compartilhamento de informações**
   i. E quanto à integração dentro da empresa - entre diferentes departamentos e equipas?

c. **Força de Mercado e Financeira**
   i. A empresa tem seguro contra eventuais danos?

d. **Diversidade**
   i. Se a mão-de-obra falhar, qual é a solução? Outsourcing?

e. **Eficiência**
   i. Existem processos de controlo de qualidade? Consegue descrever-lo(s)?
   ii. Considera que a produtividade de trabalho é muito alta?
   iii. Os equipamentos são confiáveis?

f. **Adaptabilidade**
   i. As equipas esforçam-se continuamente para reduzir o lead time interno? Ex.: ir mudando as estratégias...
   ii. É possível uma rápida realocação de encomendas ou produtos? Existem mecanismos à disposição para ajudar?

6. Impacto a montante e a jusante da Covid-19

a. A Covid-19 afetou diretamente ou indiretamente a fiabilidade da entrega (entrega no prazo, exatidão do pedido)?
b. A Covid-19 afetou diretamente ou indiretamente a capacidade de resposta à procura dos clientes?

No geral, quais são as capacidades fundamentais/críticas que a cadeia de abastecimento da empresa desenvolveu ou deveria ter desenvolvido ao longo do tempo para se tornar mais resiliente? Algum tipo de investimento adicional? Negociar melhores condições com o fornecedor? Outras “regras de jogo”?