



**CHALMERS**  
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# **Purchasing and supply organisation during post-merger phase**

The path towards resilience and harmony

Master's thesis in Supply Chain Management

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## Abstract

During the last couple of years, companies in various industries have been forced to handle significant disruptions in their supply chains. This has affected the various functions within firms in different ways, where the purchasing functions, which is the scope of this thesis, have been forced to handle a troubled supplier base. One of the industries particularly affected by disruptions was the electronic industry. The industry is also growing due to the world becoming more interconnected. These factors have led to companies pursuing acquisitions in order to position themselves inside this growing industry. Thus, capturing the potential value of an acquisition requires the implementation of a successful integration process involving various functions such as purchasing, production and R&D. This integration process can be additionally challenging to manage due to firms, as a result of the recent years of disruptions, also strives to increase the supply chain resilience.

The purpose of the thesis has been to explore how a purchasing function at a firm in the electronic industry, in a post-merger phase, can contribute to the creation of resilience within the supply organisation. The purpose was fulfilled by a qualitative research design where a single case study was conducted. The chosen case company consisted of an industrial electronic manufacturing that recently has experienced shortages, in addition to, having conducted three acquisitions. The data collection process consisted of semi-structured interviews that were done at the parent company and at the subsidiaries. For the data analysis process a thematic analysis approach was, which consisted of provisional coding. The set of codes originated from a developed framework, which described factors that is important to consider when organising a purchasing function for resilience.

The empirical findings showed that there exists both external and internal factors, in addition to a moderator, that is important to consider when designing the organisation of a purchasing function. Three focus areas for a purchasing function to consider, when increasing its contribution of resilience to a supply organisation in a post-merger phase, were identified. The importance of controlling to quantify the operations, formalising of processes to increase overall collaboration and exploring an optimal macro-level structure to capture purchasing synergies.

**Keywords:** Supply chain resilience, post-merger integration, purchasing, purchasing and supply organisation, purchasing maturity, resilience capabilities



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Lastly, we would like to thank everyone at our case company Westermo Network Technologies. To the people who participated in our interviews, thank you. Despite your busy schedules, you dedicated time to sit down and share your thoughts openly with us. Besides providing us with valuable information for the thesis process, it also gave us an overall insight about how a company operates. This created an understanding about the importance of all the various parts working together in order to contribute to a firms overall performance. The knowledge gained from these interactions was truly inspirational and gave great insight to us who are about to transition from academia to our professional careers.

Once again, thank you!

Andreas Hawerman & Martin Lidhammar

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# 1

## Introduction

*This section will begin with the background of the thesis where the context of the thesis will be presented. Then the purpose of the thesis will be presented, with the research questions that will be answered. The chapter will be concluded with a description of the demarcation of the thesis.*

### 1.1 Background

The importance of purchasing functions within firms has varied throughout history. Globalisation began around the year 1980 and has since expanded supply chains to stretch across the globe (den Butter et al., 2008; Nikookar et al., 2021). The expansion and increased complexity of supply chains have been one of the main drivers behind the increased importance of purchasing within firms. This increased importance of purchasing is shown by that the proportion of the volume purchased relative to a company's turnover has risen significantly during the last decades (Schiele, 2007).

The importance of purchasing has once again become apparent in recent years due to the Covid-19 pandemic which caused disruptions in the global supply chains according to Nikookar et al. (2021). One sector affected significantly by the supply chain disruptions was the electronics industry where lead times and prices skyrocketed due to a shortage of semiconductors (Hasan et al., 2023). The supply issues will henceforth be referred to as the component crisis. The electronic industry consists of several sectors that produce product for industries and consumers (Miller, 2022). The industry is characterised by both complex supply chains as well as production procedures which hence make them susceptible to disruptions. Which as mentioned became present during the component crisis.

As a consequence of the component crisis this has, according to Patrucco and Kahkonen (2021), led companies to critically examine their supply network structures by focusing on their purchasing and supply management. Once again highlighting the importance of the purchasing function which nowadays is occupied with rearranging supply chains to decrease the risk of disturbances (Sodhi & Tang, 2020). Firms have partially changed focus from cost-minimising to increasing their resilience by, for instance, creating more redundancy within the supply chains.

Another event besides disruptions that affect a supply chain is acquisitions with the subsequent integration of the separate entities. This process of integration is generally referred to as post-merger integration and occurs with the objective of achieving various synergies related to either costs or revenues (Whitaker, 2012). Since the purchasing functions constitute an entity within the supply chain it is often, to various extent, impacted by an acquisition. Davis and Kummer (2012) states that the purchasing functions in larger mergers on average accounts for 40 % of the synergies that are gained. Since, for example, if the merged companies have the same suppliers, lower costs could be achieved by consolidating the demand. Thus, post-merger integration is often challenging and complex since synchronising two firms' operations, which hence includes the purchasing function, requires a consideration of many aspects. According to Davis and Kummer (2012) that leads to around 80 % of merger fails to capture these potential synergies. For instance, Whitaker (2012) describes that poorly conducted integration efforts can lead to customer defections and decreased overall productivity within the organisation, besides missed opportunities of obtaining synergies.

Although the present focus is on resilience, relevant literature that includes an extensive description of how a purchasing function should handle that, combined with implementing a post-merger integration in a highly complex industry such as electronics, is scarce. Therefore, an understanding is needed of what to consider when adapting a purchasing organisation to increase its contribution to the overall resilience of the supply chain, in a complex and growing industry context.

## 1.2 Purpose

This thesis aims to explore how a firm in the electronic industry, in a post-merger phase, can create a purchasing and supply organisation (PSO) that contributes to increasing resilience within the supply organisation. The purpose will be fulfilled by first creating an understanding of what factors are important to consider when adopting a purchasing organisation in the stated context. Therefore, the first research question is as follows:

*What factors are important when implementing an integrated PSO in a post-merger phase?*

Thereafter, based on the previously identified factors, the thesis will explore how a PSO can affect the creation of resilience within the supply organisation in post-merger integration. Therefore, the second research question is as follows:

*How can a PSO contribute to increased resilience in the supply organisation in a post-merger phase?*

### 1.3 Delimitations

In order to fulfill the purpose of the thesis data will be collected at a case company, in a post-merger phase, in the electronic industry. Since the case company operates in the electronic industry, the results from the thesis will primarily be applicable to firms within this specific industry. Furthermore, since only one company was included in the data sample the generalisability of the results for firms within the electronic industry is also limited. Therefore, the results of the thesis should be interpreted with awareness about these two delimitations.

The thesis will mainly focus on the purchasing organisation within the case company. However, since the purchasing organisation is influencing, and influenced by other functions within the firm, the thesis will include cross-functional aspects. The thesis will however only include cross-functional aspects related to the purchasing organisation.



# 2

## Theoretical Framework

*This chapter will be initiated with a description of purchasing and supply management from an organisational perspective and supply chain resilience. The chapter will be concluded by a synthesis that combine the two preceding subchapter by the construction of a framework describing how a purchasing an supply organisation can contribute to the creation of resilience.*

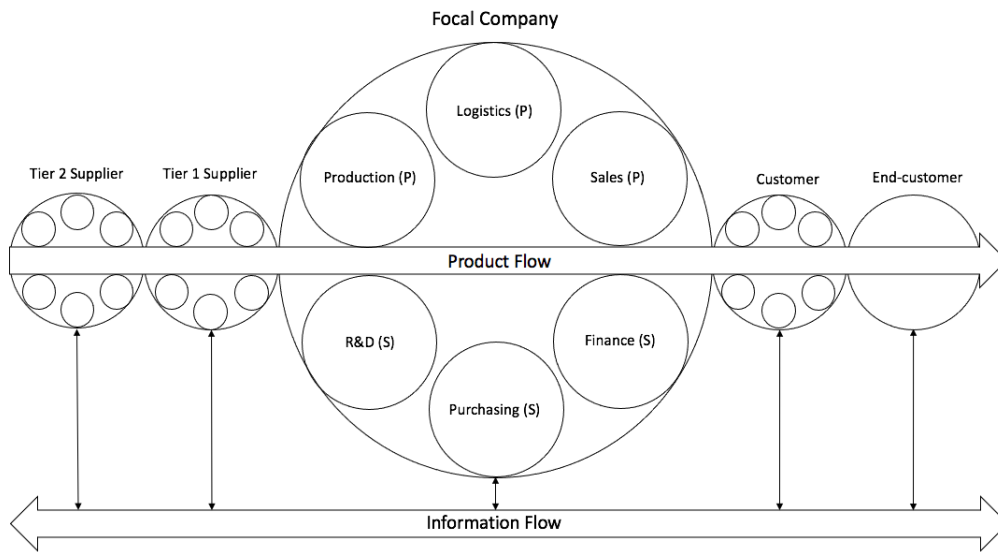
### 2.1 Purchasing and supply management from an organisational perspective

*This chapter will address purchasing from a supply chain perspective. The chapter will be initiated with a definition of how the former is a part of the latter, followed by subchapters about three level of purchasing and factors that influence the organisational structures of the purchasing functions.*

#### 2.1.1 Purchasing's role in the supply chain

The definition of supply chain management varies in the literature. Lambert and Enz (2017) describes supply chain management as the “*management of relationships in the network of organisations, from end customers, through original suppliers, using key cross-functional business processes to create value for customer and other stakeholders*” (p.2). Hence a supply chain can contain several companies which participate in the flow of the product as shown in Figure 2.1. Whereas each company consists of various business functions, such as purchasing, that by cross-functional coordination through information sharing enables the product flow.

Porter (1985) makes a distinction between primary- and supporting activities when describing the concept of a value chain. Thus, note the concept of a value chain is related, but not identical to the concept of a supply chain. The primary activities are directly related to value creation such as logistics, production, and sales. Whereas purchasing along with R&D and finance are examples of supporting activities whose purpose is to support the primary activities.



**Figure 2.1:** An illustration of a Supply Chain, adopted from Croxton et al. (2002) with an indication of what kind of activity the manufacturer’s internal functions is performing based on Porter (1985). (P) and (S) indicate if the function performs primary respective supportive activities.

Lambert and Enz (2017) proceeds by describing that the business functions in the supply chain, as illustrated in Figure 2.1, perform various business processes as listed in Table 2.1. Whereas each business functions contribute to each of these business processes in various degree. The right column in Table 2.1 shows how the purchasing function supports these mentioned business processes.

According to the definition, presented by van Weele et al. (2019), purchasing is responsible for *“the management of the company’s external resources in such a way that all goods, services, capabilities, and knowledge necessary to operate and maintain and manage the company’s primary and supporting activities are secured in the most advantageous way possible”* (p.31). Where example of such supporting activities is purchases of input components, buying machines used in production and ensuring staffing through consultants.

**Table 2.1:** The left column list all business processes, that according to Lambert (2017), builds a supply chain. Whereas the right column shows the purchasing function involvement in each business process.

<b>Business Process</b>	<b>Business function - Purchasing</b>
Customer Relationship Management	Sourcing Capabilities
Supplier Relationship Management	Supplier Capabilities
Customer Service Management	Priority Assessment
Demand Management	Sourcing Capabilities
Order Fulfilment	Material Constraints
Manufacturing Flow Management	Integrated Supply
Product Development and Commercialisation	Material Specifications
Return Management	Material Specifications

Historically the purchasing functions' importance within firms has varied whereas, during the last decades, it has gained more attention. The increased attention and importance have come as the proportion of the purchased volume relative to a company's turnover has risen significantly during the last decades (Schiele, 2007). The fundamental reason for this importance of the purchasing function, as presented by Kähkönen and Lintukangas (2012), is that it enables access to external resources that, if used effectively, contribute to the overall competitiveness of the firm. For instance, the quality of a supplier's products impacts the product of the firm where the supplier selection, which is mainly but not exclusively performed by the purchasing function, forms a crucial role. A further indication of the importance of the purchasing function is, as presented by van Weele et al. (2019) that in general, the proportion of purchased products and services of the total cost for the end product is on average 50 % among several industries. The automotive and computer manufacturers are examples of industries with a higher proportion of around 60-80 % (van Weele et al., 2019).

### 2.1.2 Three levels of purchasing

*Various activities occur at a purchasing function in order to fulfil its responsibility in the supply chain. In general, these activities can be divided into three different levels; strategic, tactical, and operative, as described by van Weele et al. (2019). The following chapters will include a definition of each level and the chapter regarding strategic purchasing also will address how a sourcing strategy is designed, including the various aspects that usually are considered.*

#### Strategical purchasing

At the strategic level decisions concerning the company's long-term sourcing are made (Baily et al., 2015; van Weele et al., 2019). The time horizon is often several years and handles important areas for the company's overall competitiveness and performance. Depending on the strategic importance of the purchased product or service, a sourcing strategy for an individual component is either developed solely by the purchasing function or together with other departments such as R&D, quality or even the top management. A sourcing strategy acts as a basis for which suppliers to engage in long-term partnerships, in order to secure the necessary components and services. Such vital long-term contracts act as a foundation for decisions taken on both the tactical and operative levels. Examples of areas that are considered on the strategic level are larger investments in buildings and machines, but also agreements in joint ventures (Baily et al., 2015). A sourcing strategy is designed based on various trade-offs around the size of the supplier base and the locations of the supplier base and should align with the firm's overall business objectives. In subsequent paragraphs, these concepts are described in more detail.

The location of the supplier base usually varies between the opposite approaches of local or global sourcing. Global sourcing implies that a firm's value creation within its supply chain is scattered across the world with, for instance, material sourcing and production happening at separate locations (Monczka et al., 2005). Note that among the purchased components in a company, the decision to source locally or globally can vary. Hence the benefit of global sourcing is not limited to lower unit costs as it can also mean access to better components. Where the disadvantages, which have been prominent in recent years, are that global supply chains tend to be complex and opaque with a high risk for disruptions (Wiedmer et al., 2021). Global sourcing can also imply various unforeseen and indirect costs, so-called "soft" transaction costs, for communication and the handling of differences in culture as described by den Butter et al. (2008). On the contrary, the disadvantages of global sourcing mostly form the benefits of local sourcing. Further consideration to conduct when constructing a sourcing strategy is around the number of suppliers (van Weele et al., 2019). Where the company can choose between single or multiple sourcing. A consideration about the balance between risk diversification and transaction cost, which for multiple sourcing means higher on the former and latter is needed to be made.

### **Tactical purchasing**

Decisions at the tactical purchasing level derive, as described earlier, from the overlying strategic level (Baily et al., 2015). The time horizon on the tactical level is shorter compared to the strategic level, usually between one to two years. van Raaij (2016) concluded that the tactical level is closely intertwined with the strategic level as both contain the steps from the establishment of the specification and selection of a supplier to entering into an agreement. As with the strategic level, the tactical level can contain aspects of cross-functional decision-making with departments such as production, quality and R&D (van Weele et al., 2019).

The phase of specification and supplier selection can be extensive if it concerns a new product and hence includes, for the purchasing function, a close collaboration with the engineers at the R&D department. The characteristics of the purchasing and development of new products depend on the type of company as well as the properties of the product. One possible approach to handle such a situation is to place a purchaser in the R&D department with the responsibility to apply a purchasing perspective in the new product development process. Lastly, van Weele et al. (2019) state that the tactical level also includes processes around improvement efforts with the supplier such as supplier quality assurance programmes. Where one way of identifying areas in need of improvement at the supplier is by performing supplier audits.

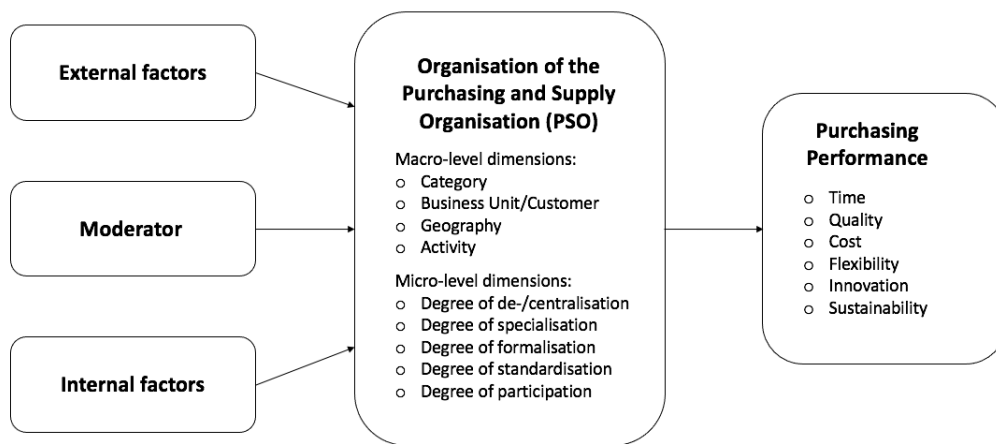
### **Operative purchasing**

Operative purchasing includes everything from the ordering process to monitoring and evaluation of deliveries (van Raaij, 2016). Since ordering is conducted based on the agreements made on the tactical level, simplified operative purchasing continues when the agreements with the suppliers are entered. The ordering process can, depending on the negotiated terms, be initiated by a request from the firm's Enterprise Resource Planning system (ERP), that base its calculations on variables such as current stock level, forecasted demand, and inserted lead time (Jonsson & Mattsson, 2009; van Weele et al., 2019). An order is then placed, and the supplier then sends a delivery confirmation. Note that the transaction does not only include the transfer of the product but also contains the exchange of information and payments. Such as how information about a late delivery should be conveyed. At the operative level, the purchaser also performs invoice clearance (Baily et al., 2015).

The operative level also involves monitoring of all these aspects of the transaction so that the concluded agreements are followed. The satisfaction of the transaction is assessed by various departments. To efficiently perform this step, it is important that clear procedures exist on how the evaluation of information around the transaction should be conducted. Hence, as described by van Raaij (2016), the outcome of the evaluation of the performance of the suppliers is an input for mentioned activities at the strategic level. Thus, according to van Weele et al. (2019), a common challenge is that the various functions evaluate the supplier's performance differently.

### 2.1.3 Designing a PSO: Influencing factors and possible structures

The design of a purchasing and supply organisation (PSO) depends on various factors to achieve desirable performance on different metrics as illustrated in Figure 2.2 (Bals et al., 2018). The presented purchasing performance parameters in Figure 2.2 originate from Bals et al. (2018) it is however not solely the structure of the purchasing function which affects the purchasing performance parameters Rozemeijer et al. (2003). Since a firm consists of several functions, as shown in Figure 2.1, the internal cooperation between them also contributes to the performance of the PSO. The purchasing performance parameters can be further derived into more detailed key performance indicators. Especially, the time, quality and which, for example, can be measured by lead time, product yield and purchase price (van Weele et al., 2019).



**Figure 2.2:** A framework describing what to consider when structuring a PSO, adopted from Bals et al. (2018).

The conceptual research framework by Bals et al. (2018) as presented in Figure 2.2 will act as a foundation when describing the organisation of a purchasing function but will be extended with other relevant factors from additional sources. Chapter 2.1.3 describes the different dimensions that can vary in the purchasing organisation. Followed by chapter 2.1.3 which describes the influencing factors and the moderator.

### **Dimensions to base a structure of a PSO**

Bals et al. (2018) distinguish the dimensions, which can describe the organisation of a purchasing function, into the macro- and micro level, as shown in Figure 2.2. The macro level is the department structure described by an organisational chart. Whereas the micro level describes what is distinctive for the purchasing processes within the applied department structure. This chapter will be initiated with a description of the macro level followed by the micro levels. Thus, a more extensive description will be provided on the degree of centralisation since it, relative to the other dimension on a micro level is more emphasised in the literature, as stated by Glock and Hochrein (2011).

Concerning the macro level, Bals et al. (2018) emphasise, that the purchasing organisational structure can be based on category, geography, business unit/customer and activities. A structure based on categories means that the organisation is divided into different parts, where each has responsibility for a specific group of purchased products or services, such as raw materials, supporting services, or electronics. A structure divided by geography implies that the purchasing function is spread into dispersed independent entities. As a geography-based structure often aims to capture benefits from operating close to suppliers, partly to avoid disruptions in the physical flow, but also to decrease the soft transaction costs, as described by den Butter et al. (2008).

On the third macro-level, the division is instead based on activities as presented in Chapter 2.1.2. Where a possible breakdown could be based on the three levels of purchasing. The final macro-level dimension is the division by business unit/customer which is more common for larger firms when no purchasing synergies from consolidated purchased volumes can be achieved (Rozemeijer et al., 2003). Finally, it is important to note that an organisation can be structured based on more than one of the factors.

### **Elements influencing the structure of the PSO**

Table 2.2 presents factors and a moderator that influence the structure of a purchasing and supply organisation (PSO). In the following subchapter, each of the factors and the moderator will be presented. Thus, purchasing maturity will be described extensively because it was assessed to have a larger impact on the purchasing organisation. Note that the factors, and the moderator, affect and are affected by each other.

**Table 2.2:** A summary of the factors and moderator that is influential in the organisation of a purchasing and supply organisation. Including a note of the source of origin.

<b>Factor</b>	<b>Type</b>
Environmental complexity (Bals et al., 2018; Glock & Hochrein, 2011)	External factor
Environmental dynamism (Bals et al., 2018; Rozemeijer et al., 2003)	External factor
National culture (Hofstede, 1994; Sasaki & Yoshikawa, 2014)	External factor
Size of organisation (Adams et al., 2016; Bals et al., 2018; Trent, 2004)	Moderator
Corporate goals and strategic initiatives (Adams et al., 2016; Bals et al., 2018; Rozemeijer et al., 2003)	Internal factor
Cross-functional alignment (Bals et al., 2018)	Internal factor
Technology in use (Bals et al., 2018; Jonsson & Mattsson, 2009)	Internal factor
Purchasing corporate coherence (Rozemeijer et al., 2003)	Internal factor
Purchasing maturity (Baily et al., 2015; Rozemeijer et al., 2003; Schiele, 2007; van Weele et al., 2019)	Internal factor
Process organisation (Bals et al., 2018; Schiele, 2007)	Internal factor
The position of the PSO in the organisation (Baily et al., 2015; van Weele et al., 2019)	Internal factor
Product characteristics (Glock & Hochrein, 2011)	Internal factor
Company culture (Hofstede, 1994; Sasaki & Yoshikawa, 2014)	Internal factor

According to Bals et al. (2018) external factors influence the structure of the PSO and hence its ability to pursue purchasing synergies. One of which is supply complexity which reflects the structure of the supplier market. The authors describe that both the number of potential suppliers as well as the pace of the advance around the involved technology will impact the structure of the supplier market. Glock and Hochrein (2011) describe that if the perceived risk of the supply is assessed to be high, an organisation tends to foster a high degree of centralisation. This will however also decrease the degree of specialisation and formalisation to make essential knowledge more available and by that increase flexibility.

Bals et al. (2018) state that there exists an environmental dynamism in the business context, mainly the supply market, that influences the structure of the PSO. In the interface between the firm and its suppliers, several variables around the transaction, such as delivery time and precision, quality, and cost, may vary. According to Defee and Fugate (2010), the current supply chain era is hyper-competitive and rapidly changing. This environmental dynamism will therefore have an impact on the PSO. Rozemeijer et al. (2003) emphasises that increased competitive pressure, a common characteristic in a mature industry, frequently leads to more initiatives to improve the PSO. For example, by increasing the degree of standardisation and formalisation, more hierarchical layers are implemented within the PSO. On the contrary, start-ups tend to favour flexibility as an important performance indicator and hence have a lower degree of standardisation and formalisation.

An additional external factor that was not included by Bals et al. (2018) was culture. Culture is an often-neglected factor that influences a firm's operation, and hence the purchasing function, since it is the context in which it operates. Hofstede (1994) defines culture as a collective programming of human minds that makes a distinction between various groups of people possible. Sasaki and Yoshikawa (2014) describe that the content of cultures often consists of shared beliefs, practices, norms, and values. Note that an individual can participate in several groups and is hence influenced by for example both an organisational and a national culture. Therefore, culture can be assumed to be an external, as well as internal factor, which influences the organisation of a PSO. Hence national and organisational culture will be included as an external respective internal factor, as shown in Figure 2.3.

Nowadays, organisational culture often transcends national boundaries since globalisation has led to companies, to a higher extent than in the past, being multinational. According to Sasaki and Yoshikawa (2014), the strength of an organisation's culture tends to correlate with efficient knowledge transfer and the overall collaboration between people within it. A strong organisational culture tends to lead to subsidiaries more easily adapting to various internal procedures. The process of diffusing an organisational culture to a newly acquired subsidiary is, however, often time-consuming due to resistance from the employees. However, according to Sasaki and Yoshikawa (2014), a "more isolated" subsidiary from the firm's perspective may be necessary to foster innovation or be able to source from vital local suppliers. Therefore, the complete adoption of the organisational culture at a subsidiary should not constitute as an end goal for the parent company but should instead depend on the situation.

The purchasing function is part of the supply chain, as shown by Figure 2.1, which then is part of a firm. Therefore, the firm's goals and strategic initiatives concerning the supply chain will impact the PSO, and hence constitute an internal factor. (Bals et al., 2018; Rozemeijer et al., 2003). Examples of initiatives that, directly or indirectly, affect the purchasing functions are the integration after a merger, divestment, or a new company vision. There could also be an indirect impact if an adjacent department change working procedures. Strategic initiatives can also origi-

nate from external factors such as an increased environmental complexity leading to an increased focus on developing better supplier relationships (Adams et al., 2016). Since the process of integrating firms after an acquisition constitutes an essential part of the aim of the thesis an overview of how a successful post-merger integration is conducted will be provided below.

A company event that has an impact on the purchasing functions, as well as the other departments in the firm, is a post-merger integration in order to obtain various synergies (Davis & Kummer, 2012; Whitaker, 2012). A common barrier to achieving all potential synergies is that the different departments, in both firms, are not synchronised in their integration processes (Davis & Kummer, 2012; Whitaker, 2012). Therefore, it is vital that the top management, by clearly stating the overall aim of the integration, is present and control the integration processes.

Furthermore, Chapman et al. (1998) and Davis and Kummer (2012) emphasises the importance of measuring the integration process. Since the goal of a post-merger integration should be possible to quantify, otherwise it will be unclear if the synergies are captured. However, it can be challenging due to the quality of data collection may vary across the firms. Moreover, the developed data collection method can also identify areas where one of the companies outperformed the other. Davis and Kummer (2012) emphasises that it is especially important for the acquiring company to admit that the purchased firm may have processes that are valuable to implement in the integration process.

Moreover, Bals et al. (2018) state that cross-functional alignment is an additional internal factor that influences the PSO. By implementing cross-functional teams from several departments the desired result is that knowledge and information can flow more efficiently throughout the organisation. Another internal factor is what technology, such as ERP systems, that is used within the firm for the purchasing process (Bals et al., 2018; Jonsson & Mattsson, 2009). The latter author states that the increased use of various IT programs in purchasing has made it possible to decentralise decision-making and improve information flow.

A further internal factor that influences the organisation is company coherence which, according to Rozemeijer et al. (2003), is the ability of a company to identify and pursue various synergies. Hence, as mentioned regarding a decentralised organisation, the company coherence should be high if homogeneous demand exists across separate business units to capture the benefits of economies of scale. Company coherence is since it depends on the efficiency of internal coordination and communication, related to the concept of transaction costs as described by den Butter et al. (2008).

Purchasing maturity constitutes one important internal factor in the organisation of the purchasing function (Bals et al., 2018). During a firm's lifetime, the PSO matures which means that the department is undergoing a process of professionalisation, formalisation and standardisation of tasks. The PSO is revised depending on several factors such as desired performance or change in the business context (Roze-meijer et al., 2003; van Weele et al., 2019). Purchasing maturity does not directly imply stronger overall financial results according to Schiele (2007). Exceptions exist when an organisation is over-ambitious in its purchasing-related improvement efforts.

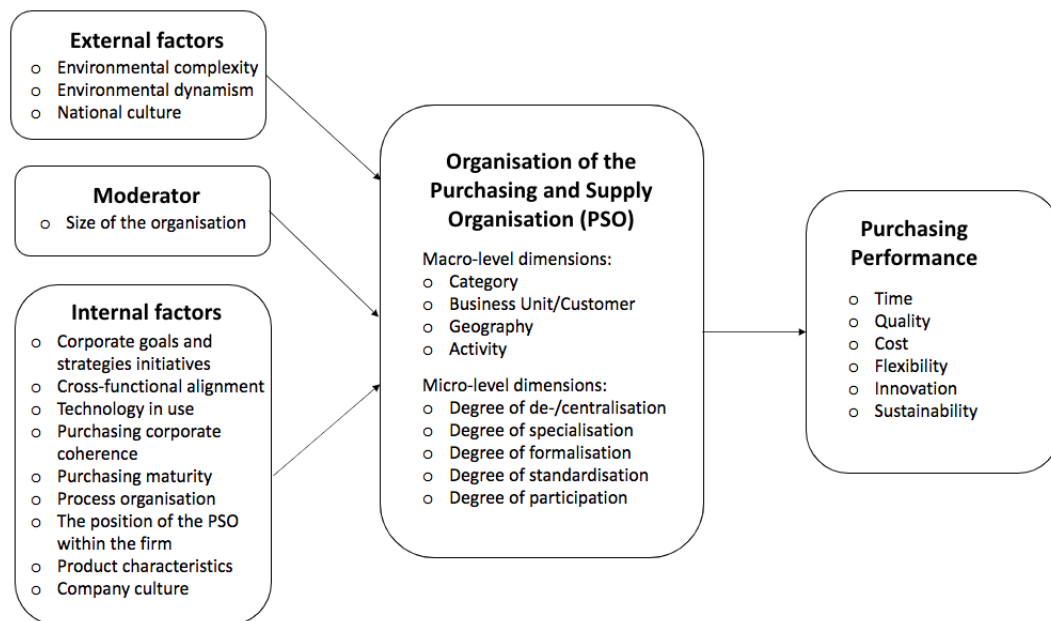
In the literature, there exist several models describing the purchasing maturity process (Schiele, 2007). The author constructs a new model which will act as a foundation in this theoretical framework. The model involves procurement planning, the organisational structure of purchasing, process organisation, human resources and leadership and purchasing controlling, which themselves consist of several dimensions. The logic of the model is that a purchasing function is positioned at one of four different stages on each dimension. Among other things, Schiele (2007) empathise that the usage of IT systems to support the purchasing function is considered to contribute to purchasing maturity. Moreover, the author states that a higher degree of cross-functional alignment leads to increased purchasing maturity which is also consistent with both Bals et al. (2018) and van Weele et al. (2019).

Another internal factor that influences the organisation of the PSO is supplier management practises, as described by Bals et al. (2018). The PSO must foster an efficient organisation with dedicated processes in order to perform management of the supplier base, supplier performance and early supplier involvement in new product development. This is consistent with the purchasing maturity framework by Schiele (2007). The author mentions how supplier selection, supplier evaluation, supplier development and early supplier involvement in new product development is performed, contribute to the overall purchasing maturity of the organisation. Schiele (2007), thus, addresses a process at the purchasing function that Bals et al. (2018) disregard which is how the sourcing strategy is created. Therefore, this factor will be referred to as process organisation to also include that process.

The proportion of the purchased material of the total cost for a product constitutes, according to Baily et al. (2015) affects the PSO position within a firm which is an additional internal factor. Moreover, the bargaining power of the supplier market, mainly depending on the number of viable suppliers, and the firm's overall economic situation are the two additional factors that decide the PSO's position (van Weele et al., 2019). Whom the purchasing manager reports to may vary depending on the complexity of the products as well as the logistics. Thus, according to Baily et al. (2015), in firms where the PSO is assessed to have high strategic significance, the reporting is done directly to the top management.

An additional internal factor, besides organisational culture, that was not included in the framework presented by Bals et al. (2018) was the characteristics of the purchased products and services. For example, the purchase complexity may influence the structure of the organisation. If technical expertise is required a centralised approach may be more viable. Thus, Glock and Hochrein (2011) emphasised that as a firm often purchased many different products and services an organisation should foster an ability to handle multiple ways of purchasing. Figure 2.3 compile all presented factors and moderators.

The size of the company referred to in this thesis as a moderator, is also affecting the structure of the PSO (Bals et al., 2018). An organisational advantage of smaller businesses, according to Adams et al. (2016) is that they tend to be more flexible in adapting to environmental changes. Thus, there are several organisational disadvantages, such as implicit rather than explicit corporate strategies and processes that can lead to confusion among employees. Hence the degree of formalisation and standardisation is overall low in smaller firms where the responsibilities of departments as well as individuals, are vague. Furthermore, according to Adams et al. (2016), smaller firms tend to be more cost-centric and not engage in more strategic purchasing activities such as supplier development. Whereas larger and more mature firms, according to Trent (2004), tend to have more extensive and complex purchasing organisations.



**Figure 2.3:** An extended framework based on Bals et al. (2018), that describes what to consider when structuring a PSO. Complemented with two additional internal factors from Baily et al. (2015), Glock and Hochrein (2011), Hofstede (1994), Sasaki and Yoshikawa (2014), and van Weele et al. (2019).

## 2.2 Supply chain resilience

*This section will address what supply chain resilience is, starting with why it is a big topic in the current market situation, after this a definition that will be used throughout the report will be created. After that, purchasing's role in creating a resilient supply chain will be investigated. This will be connected to already existing literature regarding the subject.*

### 2.2.1 Supply chain resilience: Understanding its importance

In today's marketplace, it is not companies that compete, but supply chains that do (Christopher & Towill, 2001). This has been further exacerbated by the globalisation that for the past decades has been the big trend in supply chains according to Nikoogar et al. (2021). Where companies have put pressure on supply chains to lower costs, be more efficient, and to overoptimise, leading to the deployment of strategies such as outsourcing to low-cost countries and an overall reduction of the supplier base (Christopher & Towill, 2001; Christopher, 2005). Resulting in increased complexity in the supply chains, according to Nikoogar et al. (2021) and Wiedmer et al. (2021), making them more exposed and susceptible to disruptions.

Leading to global events, such as the Covid-19 pandemic, created large problems in almost all sectors and regions (Nikoogar et al., 2021). The global and complex supply chains result in that even local events can create worldwide disruptions. Such as the Japanese earthquake and tsunami in 2011 and the blockage of the Suez Canal by M/V Ever Given in 2021, leading to a stoppage in transports from Asia to Europe (Simchi-Levi et al., 2014; Yee & Glanz, 2021). These latter, local events did not have as big of an impact in the past but can today cause problems globally. The number of events causing these types of disruptions are also increasing according to Pereira et al. (2020). This is one of the main reasons that supply chain resilience is such a present topic today and will continue to be so for the foreseeable future. To be able to discuss supply chain resilience, a definition of supply chain resilience will now be presented.

Many different definitions of resilience, and more concretely, supply chain resilience exists. With varying definitions, ranging from essentially just meaning a robust and strong system that can resist disruption and not be as affected by it (Christopher & Peck, 2004). To an antifragile system that not only can resist or react to disruptions but instead embraces disruptions (Nikoogar et al., 2021). Antifragility, a term coined by Taleb (2012) describes the opposite of fragility, a system that becomes stronger when it experiences disorder and therefore sees disruptions as something positive. These disorders can be things such as volatility, randomness, variability, and uncertainty and are now a rule of today's business world according to Taleb (2012).

Resilience is defined as “the capacity for an enterprise to survive, adapt and grow in the face of turbulent change.” by Pettit et al. (2013). Another definition by Christopher and Peck (2004) is “the ability of a system to return to its original state or move to a new, more desirable state after being disturbed”. Resilience is therefore both a proactive and reactive capability as described by Christopher and Peck (2004). It is proactive in the ability to limit the effects of shocks and disruptions. It is reactive in that it gives the ability to bounce back to an original state or a new, preferred, state quickly after the shocks. Resilience is therefore both proactive and reactive in that the new preferred state has built up a tolerance to future similar shocks and disturbances, making the system antifragile. These are the definitions that this thesis will work from, due to them taking in the growth that can be gained from disorders which is consistent with the ideas of Taleb (2012).

### 2.2.2 Creating supply chain resilience

Based on the definition of resilience, the process of applying resilience in a real-world supply chain will now be described. As with the definition of supply chain resilience, there are several approaches presented in the literature on how to achieve it. Overall, the literature contains both proactive and reactive measures to handle disruption whereas Christopher (2005) extensively describes the former approach. According to the author, resilience can be proactively obtained by building an understanding of your supply network in order to then proceed with relevant measures. This understanding of the supply network may be hard to achieve, making the first measure the creation of increased visibility of the downstream operations. This is consistent with Pettit et al. (2010) that mention visibility as a vital capability to build resilience. Both Christopher (2005) and Karl et al. (2018) emphasise the importance of collaboration and information sharing with suppliers, and customers, in order to capture intelligence, and hence build an understanding of the supply chain. The authors proceed by stating that a prerequisite for such information sharing is trust among the stakeholders in the supply chain. This is consistent with Lee et al. (2004) that describes that the alignment of the interest of all stakeholders in the supply chain is essential. Alignment, which is one of the elements of the “triple A” supply chain by Lee et al. (2004) that are considered a key capability that companies should possess when operating in markets that are prone to change.

Understanding the supply network enables, as described by Christopher (2005), an identification of critical paths and nodes. Where the former constitutes various flows consisting of, for example, information and products. The paths connect the nodes that represent entities and facilities such as suppliers, factories and distributors. Knowledge about the probability of disruptions, as well as the potential impact in each individual path and node is vital in order to proceed with proactive measures to lower the former and latter variables. Christopher (2005) mentions that critical paths and nodes have some common characteristics such as long lead times, single source of supply, dependence on specific infrastructure or high degree of concentration among the suppliers and customers. The process of managing various aspects of the supply chain is described by Lee et al. (2004) who states that the stakeholders

should be able to “*adjust the supply chain’s design to meet structural shifts in markets and modify the supply network to reflect changes in strategies, technologies, and products*” (p.4). Which is the second element in the mentioned “triple A” supply chain.

Nikookar et al. (2021) mention the creation of redundancy in the supply network as an example of a measure to increase antifragility. This is consistent with Karl et al. (2018) that proceed by describing that redundancy is created by implementing some slack in the supply network. Slack or overcapacity can be in the form of extra inventory or excess production capacity which rapidly can be accessed in the event of disruptions. Thus, note that managing a critical path to, for example, a supplier, need not exclusively be done by strengthening the collaboration. Nikookar et al. (2021) mentioned that, depending on the situation, a possible approach to mitigate the risk instead could be to weaken the path. This is consistent with Christopher (2005) and van Weele et al. (2019) that mention that increasing the supplier base, by for example the introduction of a dual source, can be vital to avoid supply failures. Thus, adding a second source will imply increasing complexity within the supply network making it more difficult to overview. This can lead to decreased resilience whereas network complexity, as shown by Wiedmer et al. (2021), can influence resilience both positively and negatively depending on the situation.

Thus, when a crisis hits, the design of the supply chain is overall relatively fixed, hence other reactive measure becomes more vital. Karl et al. (2018) mentioned agility as an ability that is important for companies when handling disruptions. This is consistent with the third element of the mentioned “triple A” supply chain by Lee et al. (2004) which defines agility as the capability to “*respond to short-term changes in demand or supply quickly and handle external disruptions smoothly*” (p.4). One concrete measure to foster agility within an organisation could be to implement Sales & Operation Planning (S&OP). According to Dittfeld et al. (2020), a S&OP can during a crisis enable cross-functional collaboration, which can be extended to suppliers and customers as well, to foster efficient information flow about relevant aspects of the situation. Efficient information flow enables rapid decision-making and hence creates agility within an organisation.

As previously defined, resilience is a form of capability that a company may possess. However, as the presented literature highlights resilience does not only come from one specific capability. Instead, it consists of many different capabilities whereas Pettit et al. (2010) present 14 different types of capability factors, including mentioned flexibility in sourcing and visibility. These 14 factors consisting of capability factors may then be broken down into 73 different subfactors, which may be seen as more concrete actionable capabilities. The factors with corresponding subfactors are presented in Table 2.3. For instance, efficiency has subfactors such as labour productivity and product variability reduction among its subfactors. These factors and subfactors present an opportunity for companies to analyse their level of resilience in detail.

**Table 2.3:** All capability factors with descriptions and subfactors. Adapted from table 3 in Pettit et al. (2010).

<b>Capability Factor</b>	<b>Definition</b>	<b>Subfactors</b>
Flexibility in sourcing	Ability to quickly change inputs or the mode of receiving inputs	Part commonality, Modular product design, Multiple uses, Supplier contract flexibility, Multiple sources
Flexibility in order fulfilment	Ability to quickly change outputs or the mode of delivering outputs	Alternate distribution channels, Risk pooling/sharing, Multi-sourcing, Delayed commitment, Production postponement, Inventory management, Re-routing of requirements
Capacity	Availability of assets to enable sustained production levels	Reserve capacity, Redundancy, Backup energy sources and communications
Efficiency	Capability to produce outputs with minimum resource requirements	Waste elimination, Labour productivity, Asset utilisation, Product variability reduction, Failure prevention
Visibility	Knowledge of the status of operating assets and the environment	Business intelligence gathering, Information technology, Products, Assets and People visibility, Information exchange
Adaptability	Ability to modify operations in response to challenges or opportunities	Fast re-routing of requirements, Lead time reduction, Strategic gaming and simulation, Seizing advantage from disruptions, Alternative technology development, Learning from experience
Anticipation	Ability to discern potential future events or situations	Monitoring early warning signals, Forecasting, Deviation and Near-miss analysis, Contingency planning, Preparedness, Risk management, Business continuity planning, Recognition of opportunities

**Table 2.3** Continuation of table on previous page.

<b>Capability Factor</b>	<b>Definition</b>	<b>Subfactors</b>
Recovery	Ability to return to normal operational state rapidly	Crisis management, Resource mobilisation, Communications strategy, Consequence mitigation
Dispersion	Broad distribution or decentralisation of assets	Distributed decision-making, Distributed capacity and assets, Decentralisation of key resources, Location-specific empowerment, Dispersion of markets
Collaboration	Ability to work effectively with other entities for mutual benefit	Collaborative forecasting, Customer management, Communications, Postponement of orders, Product life cycle management, Risk sharing with partners
Organisation	Human resource structures, policies, skills, and culture	Learning, Accountability and Empowerment, Teamwork, Creative problem solving, Cross-training, Substitute leadership, Culture of caring
Market position	Status of a company or its products in specific markets	Product differentiation, Customer loyalty/retention Market share, Brand equity, Customer relationships, Customer communications
Security	Defence against deliberate intrusion or attack	Layered defences, Access restrictions, Employee involvement, Collaboration with governments, Cyber-security, Personnel security
Financial strength	Capacity to absorb fluctuations in cash flow	Insurance, Portfolio diversification, financial reserves and liquidity, Price margin

Various capabilities that foster resilience have now been discussed from multiple points of view, however, there is still a factor that has not been considered, the fact that the world is always evolving and changing, and it is dynamic (Defee & Fugate, 2010). However, the most common view of capabilities is that they are static, ones that do not change. This is however not a practical view due to the previously explained rapidly changing era of supply chains. Therefore, dynamic capabilities are a more suitable concept to build around. To this end, dynamic capabilities are defined as *“a learned and stable pattern of activities through which the organisation*

*systematically generates new static capabilities and/or modifies existing capabilities”* (Defee & Fugate, 2010). Pereira et al. (2020) use the dynamic capabilities view in the context of purchasing, describing resilience as a dynamic set of conditions that helps organisations better cope with unpredictable disruptions, both reactively and proactively.

Capabilities are, as previously described in Table 2.3, only one side of the creation of resilience according to Pettit et al. (2010). Vulnerabilities, or risks as they are called in some parts of the literature, are things that will have a negative impact on a company. Vulnerabilities may be both internal and external, impacting the company in varying ways. Pettit et al. (2010) present seven types of vulnerability factors that companies may face such as turbulence, resource limits and sensitivity as presented in Table 2.4. Each vulnerability factor consists of several subfactors, just as the capabilities previously presented in Table 2.3. With the subfactors being more concrete vulnerabilities that a company may face. There is a total of 38 vulnerability subfactors, with some examples being pandemic, espionage, and complexity.

**Table 2.4:** Vulnerability factor with definitions and subfactors. Adapted from Pettit et al. (2010).

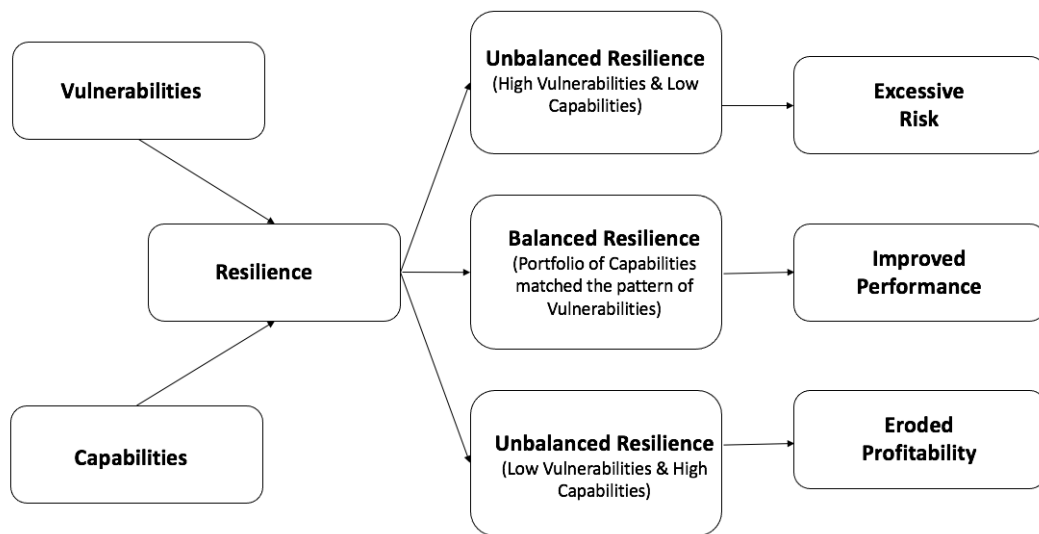
<b>Capability Factor</b>	<b>Definition</b>	<b>Subfactors</b>
Turbulence	Environment characterised by frequent changes in external factors beyond your control	Natural disasters, Geopolitical disruptions, Unpredictability of demand, Fluctuations in currencies and prices, Technology failures, Pandemic
Deliberate threats	Intentional attacks aimed at disrupting operations or causing human or financial harm	Theft, Terrorism/sabotage, Labour disputes, Espionage, Special interest groups, product liability
External pressures	Influences, not specifically targeting the firm, that create business constraints or barriers	Competitive innovation, Social/Cultural change, Political/Regulatory change, Price pressures, Corporate responsibility, Environmental change

**Table 2.4** Continuation of table on previous page.

<b>Capability Factor</b>	<b>Definition</b>	<b>Subfactors</b>
Resource limits	Constraints on output based on availability of the factors of production	Supplier, Production and Distribution capacity, Raw material and Utilities availability, Human resources
Sensitivity	Importance of carefully controlled conditions for product and process integrity	Complexity, Product purity, Restricted materials, Fragility, Reliability of equipment, Safety hazards, Visibility to stakeholders, Symbolic profile of brand, Concentration of capacity
Connectivity	Degree of interdependence and reliance on outside entities	Scale of network, Reliance upon information, Degree of outsourcing, Import and Export channels, Reliance upon specialty sources
Supplier/Customer disruptions	Susceptibility of suppliers and customers to external forces or disruptions	Supplier reliability, Customer disruptions

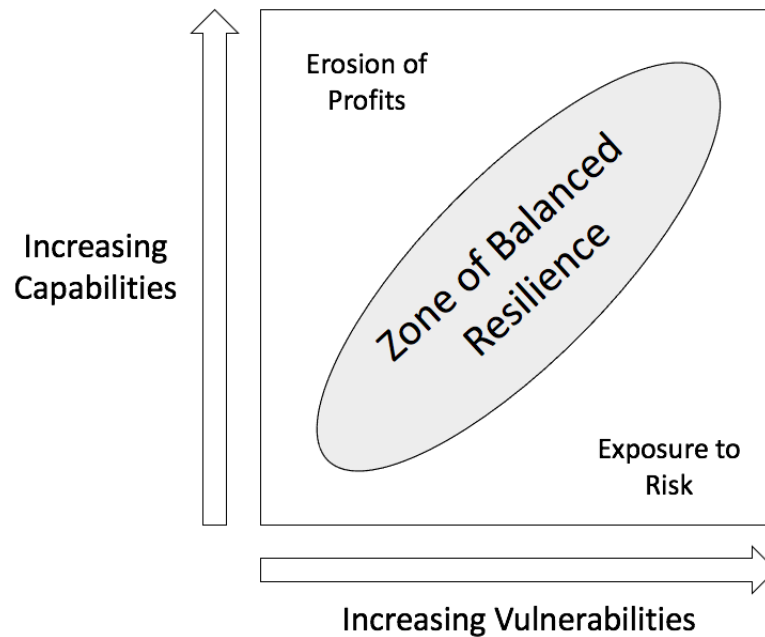
Christopher and Peck (2004) mentions that there are three main types of risks, these are internal, external and network risks. The authors proceed by explaining that internal risks are processes and control systems inside the company that may impact the company negatively. Using some of the subfactors from Pettit et al. (2010) as examples, such as human resources, production and distribution capacity and concentration of capacity. External risks, on the other hand, are things that have an impact without the company being able to affect the risks, either related to the demand or supply side. These risks may be for example natural disasters, fluctuations in currency and price, and raw materials and utilities availability. The final type of risk Christopher and Peck (2004) presents is network risk. This type of risk is external to the company as well as to the supply chain network of which the company is part. Relating to the suppliers and customers that the company has. This type of risk occurs can occur where some node or path in the supply chain is located. Examples of such events are natural disasters or political turmoil. All vulnerabilities or risks do not have the same impact or probability of occurring according to Simchi-Levi et al. (2014). Some events are low-impact, high-probability while some are the inverse or somewhere in between. Depending on the relationship different measures should be implemented.

Thus, resilience is not created by just having all possible capabilities presented by Pettit et al. (2010). Instead, the capabilities should be properly matched with the vulnerabilities that the organisation may face. Matching the capabilities to the possible vulnerabilities is according to Pettit et al. (2010) how resilience is created. The process for conducting the matching, along with the possible outcomes can be seen in Figure 2.5. The three possible states are either unbalanced resilience or balanced resilience. Balanced resilience will lead to improved performance, this is the ideal state. While an unbalanced resilience will lead to either excessive risks or eroded profitability depending on in which way the mismatch occurs.



**Figure 2.4:** Framework for the creation of SC resilience, figure 5 from Pettit et al. (2010).

In Figure 2.5, this relationship between capabilities and vulnerabilities is clearly shown in a diagram. In the figure, the level of risk of each vulnerability is plotted against the corresponding capabilities that a company should possess to cope with that vulnerability (Pettit et al., 2010). As previously described the middle ground or the zone of balanced profitability, is the preferred state for a company. This is where resilience is created. If the capability instead is too good for its matching vulnerability, an erosion of profits may occur. While if the inverse is true, it leads to exposure to risks.



**Figure 2.5:** Figure 1 from Pettit et al. (2013), a diagram showcasing how capabilities need to be well-balanced and matched to the vulnerabilities to create resilience.

### 2.2.3 Purchasing’s role in the creation of Supply Chain Resilience

As illustrated in Figure 2.1 in Chapter 2.1, a supply chain is much larger than the domain of purchasing. A comprehensive overview of purchasing influence in creating resilience is given by Patrucco and Kahkonen (2021) which describes what the three capabilities in the triple-A supply chain mean in the context of purchasing and supply management (PSM). In this work, they created new definitions for each of the A’s to better reflect the model in the context of purchasing. The new definition for the capability of Agility is now “*The PSM ability to quickly adjust purchasing practices and supplier relationship management activities to respond to environmental changes, opportunities, and/or threats*” (p.3). While the new definition of Adaptability is “*The PSM’s ability to profoundly modify and restructure the supply network design to respond to structural shifts in the markets by finding suitable supplier partners and establishing relational governance mechanisms.*” (p.3). Whilst the last capability of alignment is defined as “*The PSM’s ability to align objectives and processes within internal functions and the supply network, as well as develop, incentivise, and monitor the suppliers*” (p.3).

These three capabilities, as well as the additional capabilities as presented in Table 2.3, are in various ways addressed in ordinary operations at a purchasing function. Because purchasing is, according to the definition used by van Weele et al. (2019), “*the management of the company’s external resources in such a way that all goods, services, capabilities, and knowledge necessary to operate and maintain and manage the company’s primary and supporting activities are secured in the most advantageous way possible*” (p.31). Whereas advantageous ways include consideration of

mitigating the risk and impact of disruptions. For example, in the construction of a sourcing strategy, where the location and size of the supplier base are decided, consideration of the risk of disruptions is included. Since the purchasing function has an interface towards the suppliers of the firm it also has a vital role in gathering information regarding the supply chain. Information about, for example, the condition of critical path or node in the supply network, or aspects around external or network risks.

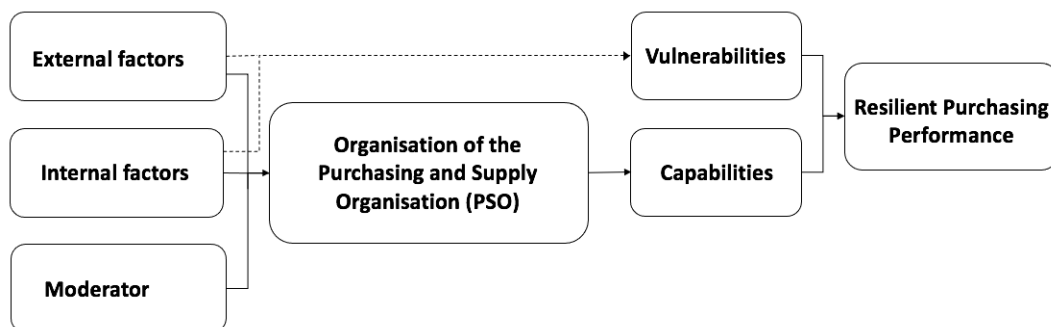
Moreover, the description of the triple-A supply chain in the context of purchasing by Patrucco and Kahkonen (2021) is overall mostly included in the concept of purchasing maturity. Purchasing maturity, as described by Schiele (2007), includes aspects of agility, adaptability and alignment. For example, concerning the former capability, high purchasing maturity means that the firm has implemented processes to foster rapid decision-making based on efficient information flows which is consistent with the definition of agility. Whereas adaptability is addressed in purchasing maturity, by among other things including assessment of how the purchasing functions are transforming its access to various resources by selecting, developing and evaluating suppliers. Lastly, purchasing maturity also includes cross-functional alignment, both internally with various other functions inside the firm, as well as externally with suppliers and customers. Thus, note that the purchasing function is not isolated in its effort to create resilience in the supply chain. But the purchasing function is just one of the entities within a firm, as well as in the supply chain as illustrated in Figure 2.1. Therefore, the purchasing function is not able to control all factors that create overall supply chain resilience but do constitute a vital element in a firm's pursuit of it.

## 2.3 Synthesis: Building resilience in a supply chain from the PSO perspective

*Based on the two previous chapters, the following synthesis aims to build a framework that explains how the PSO can foster resilience within the supply organisation. The chapter will be initiated by a merger of the frameworks from Chapter 2.1 and Chapter 2.2, followed by a re-organisation of the internal factor. The synthesis will be concluded with a description of how the internal factors influence and is influenced by capabilities.*

### 2.3.1 Resilience capabilities generated by the structure of the PSO

In Figure 2.2 the conceptual research framework by Bals et al. (2018) was presented. The framework describes how a purchasing organisation is formed based on external factors, internal factors, and a moderator. Furthermore, the framework by Pettit et al. (2010) was presented which describes how resilience is created by appropriate matching capabilities against possible vulnerabilities. To understand how a PSO can contribute to creating a more resilient supply organisation a new framework was constructed which was based on the mentioned frameworks by Bals et al. (2018) and Pettit et al. (2010). The new proposed framework is presented in Figure 2.6 and the underlying logic is that an organisational structure creates certain capabilities depending on all different factors, and the moderator, that goes into its creation. Note that in this new proposed framework, as presented in Figure 2.6, the vulnerabilities can originate from external and internal factors, as described in Christopher and Peck (2004). Illustrated by the dotted arrow between the external and internal factors, and vulnerabilities.



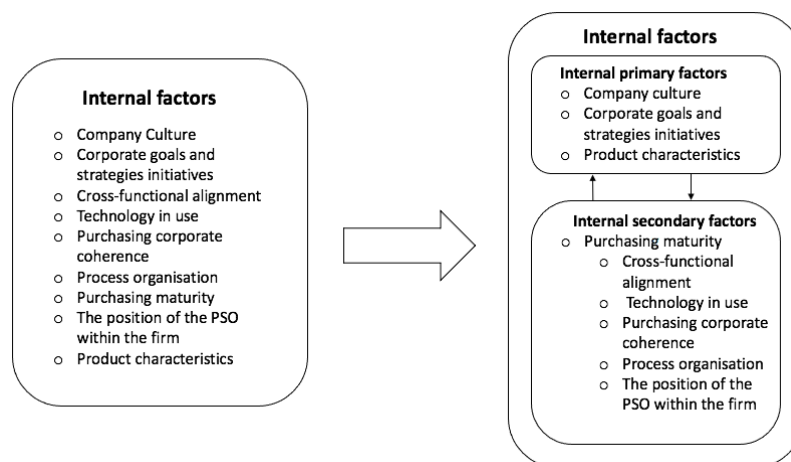
**Figure 2.6:** A synthesis framework describing how internal and external factors influence the PSO's organisation, which generates resilience capabilities. An adaptation of the frameworks presented by Bals et al. (2018) and Pettit et al. (2010).

### 2.3.2 Reviewing the internal factors that influence a PSO

The conceptual research framework presented in Figure 2.2, by Bals et al. (2018), describes the various factors and the moderator that influences the organisation of a PSO. The model was extended by three internal factors and one external, see Figure 2.3 in Chapter 2.1.3, from Baily et al. (2015), Glock and Hochrein (2011), Hofstede (1994), Sasaki and Yoshikawa (2014), and van Weele et al. (2019). As the internal factors were assessed to not be mutually exclusive and some are related to, from the perspective of the PSO, more external aspects a revision was deemed appropriate. A separation, combined with a revision, of the internal factors has been made to overcome the mentioned deficiencies.

The weakness in how the internal factors are presented by Bals et al. (2018) is evident when complementing the literature about purchasing maturity with additional sources. For example, the presented purchasing maturity model by Schiele (2007) it includes an evaluation of the degree of *cross-functional alignment*, *process organisation*, *the usage of technology*, *purchasing corporate coherence* and *the purchasing function position within the firm*. Factors that, as Bals et al. (2018) state, besides the purchasing maturity, affect the structure of the PSO. Therefore, to better illustrate the inter-dependencies between the factors, the five mentioned factors were subordinated to purchasing maturity, as presented in Figure 2.7.

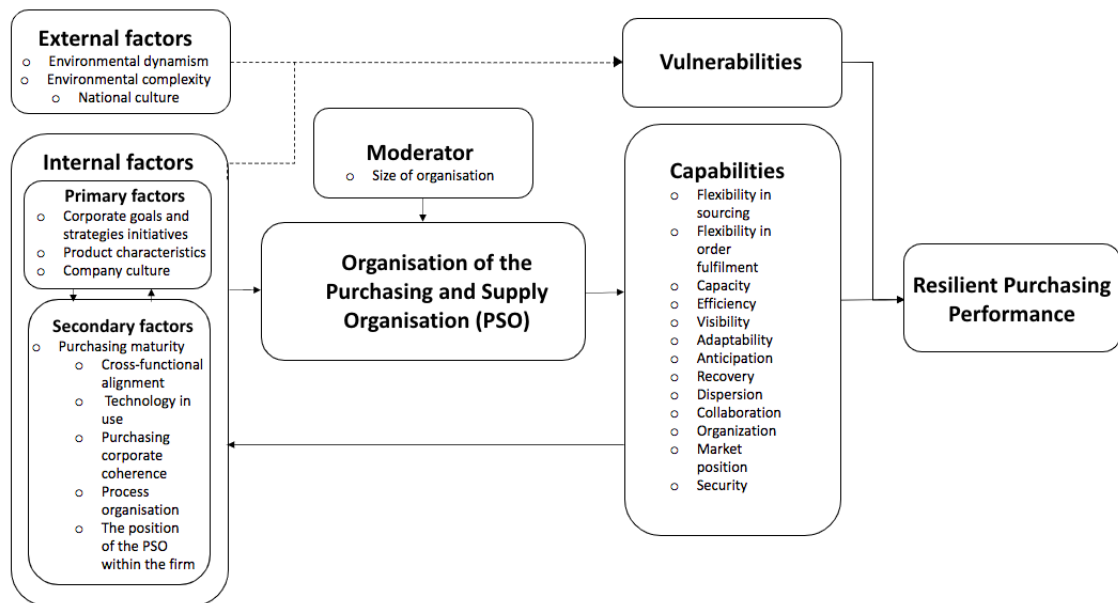
Concerning the separation of the internal factors into two subcategories it was motivated by three of the internal factors, *corporate goals and strategies initiatives*, *company culture* and *product characteristics* were assessed to originate, to a higher extent, from outside the PSO. In combination with that the purchasing model by Schiele (2007) not explicitly takes these three factors into consideration when assessing purchasing maturity. Since these mentioned factors are more related to the firm's value creation the subgroup was named internal primary factors. Hence, the other group was referred to as the internal secondary factors, as presented in Figure 2.7.



**Figure 2.7:** An illustration of the separation and revision of the internal factors influencing a PSO. Adopted from Figure 2.3.

### 2.3.3 Linking purchasing maturity to resilience capabilities

In the concluded stage before reaching a model that can be used to answer the aim of the thesis, a circularity is added to the model, illustrated by the arrow from capabilities to the internal factors. This is due to that the purchasing maturity, as presented by Schiele (2007), is one of the internal secondary factors which also depend on the capabilities of the PSO. Connecting to resilience which, as previously defined, is both reactive and proactive as well as having a learning aspect which creates antifragility in the system (Christopher & Peck, 2004; Taleb, 2012). This in turn can be paired with the dynamism of capabilities, which are the foundation of how resilience is created (Defee & Fugate, 2010; Pettit et al., 2010). Leading to the conclusion that the organisation of the PSO therefore must be dynamic, and constantly evolving to be able to stay resilient. Hence, the learning aspect as well as the dynamics is illustrated by the mentioned circularity between the internal factors and capabilities.



**Figure 2.8:** A framework describing how resilience in a supply chain can be built from the PSO. A merged framework based on Bals et al. (2018), Pettit et al. (2010), and Schiele (2007).



# 3

## Methodology

*This chapter will be initiated with a description of the research design. Followed by a discussion about how the data was obtained as well as analysed. The concluding part will describe how aspects concerning the quality of the study, including a discussion about the validity and ethics of the research.*

### 3.1 Research Design

In order to fulfil the aim of the thesis a qualitative research method with an abductive approach was chosen. The qualitative method was deemed appropriate based on Denscombe (2017) who describes that the object to investigate in that case should operate in a context where a wide range of factors interplay. Isolating the object in order to investigate is not viable since various external factors have influence and hence a holistic perspective is necessary which is achieved by the qualitative approach. Moreover, Creswell (2009) describes that a qualitative study to a higher degree handles words and visual images as analysis unit contrary to numbers. Using especially words as an analysis unit is assumed to be convenient when creating a nuanced understanding of the object to be investigated.

To fulfil the aim of the thesis a case study was chosen to be appropriate to answer the stated research questions. Because, as described by Denscombe (2017) and Eriksson and Wiedersheim-Paul (2014), a case study is suitable when investigating a specific phenomenon in-depth where various factors such as relations, conditions, and events have an impact. The chosen case company in this thesis is a medium-sized industrial electronics manufacturer, operating in the complex electronics industry which during the last couple of years experienced disruptions due to shortages. In addition to a will of pursuing increased resilience after the recent years of disruptions, the company aims to continue its growth by, among other things, integrating the three newly acquired companies. Therefore, it can be concluded that the company operates in a complex environment with many factors to consider which, according to Ellram (1996), makes it suitable to focus on only one single case. The case company is existing and is not an artificial object produced for research purposes which Denscombe (2017) also states constitutes a specific characteristic of a case study. Furthermore, a case study often complements a qualitative research method (Creswell, 2009).

## 3.2 Data collection method: Interview study

This chapter will address how the interview study was conducted. According to Denscombe (2017), interviews are a suitable data collection method for investigating complex and subtle phenomena. An example of such a phenomenon can be the function of a system and how affecting factors are interlinked. Therefore, as the case company operates in an environment where various factors interplay, an interview study was found appropriate.

Semi-structured interviews were used during this part of the data collection process. The approach was chosen since, as described by Denscombe (2017), a semi-structured interview is suitable when examining complex topics. Especially when it is valuable to have flexibility in where the interview progresses in order to examine the topic in-depth. The approach means that the interviewers construct a template with questions and topics that will act as a foundation for the interview (Bell et al., 2022; Denscombe, 2017). But as the interview progresses, the interviewee is allowed to develop their reasoning and speak openly about the topics the interviewer addresses. Thus, the sequence of the questions in the template may be altered during the interview depending on how the conversation progresses. During semi-structured interviews, the template can also be adjusted between interviews due to the collected information in previous interviews (Denscombe, 2017). In order to examine newly arisen topics that are relevant in the process of the fulfilment of the aim of the thesis.

In order to prepare the interviewee, the topics that will be addressed, based on the aim of the thesis, were sent before the actual interview. At the beginning of the interview, these aspects were briefly reviewed in addition to an extensive explanation of the purpose of the thesis, how the anonymisation would be managed, the planned duration as well as a request about the consent of the recording. Concerning the latter, if consent was not given, one of the interviewers noted during the interview. Notes that were revised and supplemented directly after the interview in order to secure that the important aspects of the interview were included. This, otherwise, according to Denscombe (2017) constitutes a risk with interviews where recording is not made since the outcome will be dependent on memory and interpretation.

Since the interviewees have different roles in the company as well as is located geographically dispersed throughout Europe two interview templates were constructed as presented in Appendix A. Both templates had common themes such as resilience, purchasing organisation and component shortages. This was considered appropriate since in order to fulfil the aim of the thesis perspectives on the current and future operations were needed. The articles by Schiele (2007), Bals et al. (2018) and Pettit et al. (2013) formed the basis for the construction of the interview templates. The two templates were designed for people in the purchasing department as well as at departments with an interface against the purchasing department.

In practice was the sample conducted by convenience which as described by Alvehus (2019), implies that the sample of interviewees is based on who is accessible. Since the supervisor at the case company has contact internally this acted as the foundation for the sampling. The number of people to include in the study was settled at 20 interviewees when identical information started to re-emerge recurringly, which according to Alvehus (2019) indicates saturation of the data collection.

### 3.3 Data Analysis

The qualitative data can be difficult to analyse since the volume, according to Bell et al. (2022), tends to be extensive. In order to overcome that difficulty a thematic analysis approach was used as described by Braun and Clarke (2022). The coding of the collected data is based on the content of the individual data points. Coding is used to reduce the detail of the data in order to process the information acquired from interviews. The codes are then consolidated into various theme that is related to the research questions. Braun and Clarke (2022) states that the theme should be distinctive, internally coherent and consistent around some kind of concept.

For the coding procedure, provisional coding was chosen, which implies that the researchers before the interviews, based on the preparatory investigation of relevant literature, creates a set of codes (Miles et al., 2014). The selection of relevant codes is based on an exception of what might appear in the collected data. The initial codes can then, during the data collection process according to Miles et al. (2014), be modified, deleted, or expanded to include new codes. Thereof, the creation of the codes contains deductive as well as inductive elements since they were created before, and later revised or added after, the data collection process. Hence, according to the definition of an abductive approach by Eriksson and Wiedersheim-Paul (2014), abductive coding was conducted in this study.

The preparatory investigation, which led to the initial set of codes, contained a reviewal of relevant literature. Books and articles were mainly used as sources which were found by searching various relevant keywords. Examples of keywords that were the basis for the literature search were “resilient supply chains”, “purchasing function structures”, and “post-merger integrations”. A part of the literature search consisted of backward chaining references. Additional literature was also obtained from the supervisor from Chalmers, an Associate Professor in Service Management and Logistics. Based on this literature review, a framework was developed as presented in Chapter 2.3. This framework was based on both literature about purchasing and resilience, as presented in Chapter 2.1 and Chapter 2.2 respectively. Whereas the framework, as presented in Figure 2.8, contains the initial set of codes that were used during the data analysis. Note that the themes were the external and internal factors, as well as the moderator, which consists of the codes. Where, for instance, environmental complexity, size of organization and technology in use is examples of used codes.

In order to ensure that the researchers had a collective view of the themes and codes, they were given a name and a distinct definition (Braun & Clarke, 2022). The actual coding thus contains a subjective element as the researchers' interpretation has a vital role. Braun and Clarke (2022) and Miles et al. (2014) states that a given code to a data point should not be seen as fixed and instead, the coding of the data should be reviewed during the process. Table 3.1 shows the development of the set of codes during the data analysis process.

**Table 3.1:** A summary of the changes of the set of codes during the data analysis process. The set of codes originated from the compilation in Figure 2.10.

Themes	Codes	Changes during the data analysis process
External factor	Environmental complexity	
External factor	Environmental dynamism	
External factor	National culture	
Moderator	Size of organisation	
Internal factor	Corporate goals and strategic initiatives	
Internal factor	Cross-functional alignment	
Internal factor	Technology in use	
Internal factor	Purchasing corporate coherence	
Internal factor	Purchasing maturity	Disregarded in the data analysis process based on Chapter 2.3.2
Internal factor	Process organisation	
Internal factor	The position of the PSO in the organisation	Disregarded after the data collection process
Internal factor	Product characteristics	
Internal factor	Company culture	
Internal factor	Planning	Added
Internal factor	Controlling	Added

In order to precisely capture the meaning of the data, the fact that the study was conducted by two researchers, and not by a single person, which should enable a nuanced coding according to Miles et al. (2014). Moreover, one of the researchers had a professional background which constitute both advantages and disadvantages. Since basic knowledge about the case company's operations already existed created the risk of biased increased, since a perception about the issue to investigate already existed. Thus, this risk was overcome as the other researcher had a non-prior experience with the company and hence a dual perspective was reached.

Braun and Clarke (2022) describes that the next step in the thematic analysis is to select the data to extract and hence present in the report. Around one to three extract per theme was presented depending on what was necessary to support the analytical claim that was made. For example, more extracts were used when deemed necessary in order to support the analytical claim. For each extract, consideration was also made in order to find the right level of detail that was necessary. Braun and Clarke (2022) states the proportion between data extracts and the accompanying analytical interpretations should approximately be similar, resulting in a 50-50 balance. Which constituted a benchmark when the result and analysis chapters were compiled.

## 3.4 Research Quality

*This concluding section will examine the quality of the research by discussing the validity of the results as well as the ethics considered throughout the thesis process.*

### 3.4.1 Research Ethics

Denscombe (2017) presents the four main principles of research ethics; protect the interests of participants, ensure that participation is voluntary and based on consent, avoid deception and is conducted with scientific integrity, and respect national legislation. These aspects are aligned with the consideration by Creswell (2009) and were a foundation during the thesis process to obtain good research ethics. The primary area where these principles were applicable was in the interview process. Where the principles were established by providing the interviewees with relevant information about their participation, as presented in Chapter 3.2, when booking the interview and before starting the actual interview. Furthermore, the participants were encouraged to establish contact if any reflections would arise after the interview.

Special consideration was given to the guarantee of confidentiality of the participants, which according to Creswell (2009) constitutes one important ethical issue in the data collection process. Due to the size of the company the risk of revealing identities by stating what information originated from each of the respondents was deemed significant. Which inevitably decreases thesis legitimacy by making it impossible for the reader to examine the origin of the data. However, as mentioned, this approach was deemed necessary in order to establish the integrity of the participants and was made in consultation with the supervisors, at Chalmers and at the company.

#### **3.4.2 Research Validity**

Validity is defined by Eriksson and Wiedersheim-Paul (2014) as the ability of the method to measure what it intends to measure. This is consistent with Bell et al. (2022) description of validity as the relevance of the measurements. Bell et al. (2022) conclude that validity consists of internal validity, external validity, ecological validity, and measurement validity. Since the report has a qualitative design only internal and external validity is assessed to be relevant.

The internal validity concerns how the presented causal relationship is proven, which can be summarised as the causality of the conclusions. To ensure internal validity data from several independent respondents were used to understand the relevant causal relationship. For example, since the interviews were conducted with people at the purchasing function as well as in adjacent departments, the important relationship between them was described from a dual perspective which according to Denscombe (2017) constitutes an efficient increase in the internal validity. Furthermore, the sample of the interview study included persons working both operationally and strategically, which further strengthens the internal validity of the report. The internal validity was also improved by the systematic data analysis as presented in Chapter 3.3.

The external validity concerns which extent the conclusion of the thesis can be generalised to other circumstances than those in this conducted thesis (Bell et al., 2022). Eriksson and Wiedersheim-Paul (2014) describes that this constitutes an extra significance in interpretive studies as this conducted thesis represents. The generalisability is, according to Denscombe (2017), complicated if a single case study is used as in this thesis. In order to ensure external validity, mainly related to the usage of a single case study, the report aims to be clear when the settings that the case company operates in impact. This will be conducted by providing a company description at the beginning of the empirical findings, as presented in Chapter 4. In order to simplify for the reader to assess to which extent the case company's circumstances differ from other companies.

# 4

## Empirical Findings

*In this chapter, the empirical findings from the interview study will be presented. Chapter 4.1 provides a description of the case company followed by Chapter 4.2 that includes a view of the current PSO. The structure of the remaining part of the chapter will be based on the framework presented in Figure 2.8. Planning and controlling constitute two added codes, whereas the internal factor PSO position within the firm was disregarded after the interviews.*

*To best be able to differentiate between respondents while still being as anonymised as possible, all may be referred to as “respondent” or “interviewee”. When more context is needed, all buyers may be referred to as “buyer” and other employees may be referred to as “strategic” or “operative” to showcase the level of responsibility the employee has. The four different sites within the group will be referred to as “parent company” and subsidiary “A”, “B” or “C” when needed for context.*

### 4.1 Case company description

The chosen company to conduct the case study is a medium-sized industrial electronics manufacturer with its headquarters in Sweden. For its field, the company has a long and special history, being founded in the 70s. Its factory is still located in the small village where it was founded, which in turn has formed the company’s culture. After having experienced a decade of tremendous growth, the company now employs approximately 400 people across the globe, including its three newly acquired subsidiaries in Europe. The growth trend is expected to continue due to the company catering to industries that are part of the mega-trends currently ongoing in the world. Due to the continuation of this growth, the company now wants to integrate the subsidiaries more into the focal company. Currently, only limited integration at some functions has occurred, partly due to the pandemic and the following component crisis that has affected the firm’s supply chain in recent years. However, when these disruptions now start to decrease, the company has a will to continue the integration. By, among other things, to initiate efforts at other departments, such as purchasing, where the prior integration efforts have been limited.

The acquisitions of the three subsidiaries were all completed between 2019 and 2021, but any form of integration was postponed due to the pandemic and subsequent semiconductor shortages that followed since it took a lot of the company's efforts. The acquisitions of the subsidiaries were made to complement the current product offering and competencies of the focal company. With the goal of being able to offer a complete solution to customers. Some overlaps in the offerings of the different companies do, however, still exist to some degree.

Building high-quality products is the core competency of the focal company, and offering a five-year warranty for all products showcases this fact. This has also led to a large product range with products that have been produced for a long time. Pairing that with the fact that the company offers customers the ability to customise products for special applications, the active product flora has grown to be large and highly complex. Adding the nature of high-technology products that are specified to function in extreme environments, the complexity only becomes greater. To further exacerbate this fact, the products are used for mission-critical applications in mainly industrial settings and infrastructure. Meaning that the components need to be the best available, leading to the use of industrial-grade electronics components. These are the highest quality components made by the component manufacturers, standing for only a small percentage of the total material manufactured. The difference is that industrial-grade components are rated for a wider temperature range, meaning they will function in the harshest of environments.

All the companies in the group do their own research and development, however, the degree of their own production of products differs. The focal company manufactures all but a few of the products itself, all the way from surface mounting electrical components on PCBs to the application of its own developed software onto the finished products. None of the subsidiaries manufacture their own circuit boards, but to a varying degree do the final assembly of the products. This leads to the sourcing for the subsidiaries being less complex than for the focal company, however, they do have less control over their sourcing due to the reliance on electronics manufacturing services (EMS).

### **4.2 The current organisation of the PSO**

The current PSO is decentralised, with all separate companies within the group operating on their own. There is a global purchasing manager, who is responsible for the overall purchasing function, this has however not yet translated into much when it comes to the integration, it has however led to more energy and focus going towards it according to multiple respondents. All companies in the group are different when it comes to overall size, levels of maturity and what resources exist within their PSO.

The parent company has the largest purchasing function within the group, consisting of five full-time buyers, one part-time buyer and the previously mentioned purchasing manager. While the other sites have different organisational setups concerning their purchasing organisations, with Subsidiary A having two full-time buyers and the operations manager as a sourcing manager making the final decisions. Meanwhile, Subsidiary B has one buyer and a strategic manager that supports as purchasing manager. According to a respondent, Subsidiary B has the equivalent of 1.2 full-time buyers. The final site, Subsidiary C, relies on people from other functions to conduct operational purchasing activities, which is equivalent to roughly two full-time employees. Subsidiary C was also described as having a larger supply operations team, consisting of people from multiple departments, that works with more tactical and strategic supply issues.

Out of the five full-time buyers at the parent company, three currently have the title of strategic buyer and two are operative buyers. There was however a common perception among all buyers that the titles are not accurate, with one noting that *“According to my title I am an operative buyer but in reality, that does not reflect my role or responsibilities”*. With another showcasing that the same is true for the strategic buyers stating, *“We are not strategic buyers”*. When presenting the three levels of buyers as described in Chapter 2.1.2, all respondents agreed that the title of a tactical buyer better represented the roles. Not being able to work as strategically as the roles suggest is something that the buyers note as something that needs to change. One buyer described that *“there is always a focus on just surviving the day”* and another that *“we do not have time for more strategic work such as supplier development right now”*.

Currently, the purchasing function at the parent company is structured around a few commodities for which the responsibilities are divided among the strategic buyers and purchasing manager. Examples of commodities are electronic components, mechanics, and electronic manufacturing services (EMS). The commodities have different levels of complexity resulting in the required expertise to handle these varies. The structure is similar at subsidiary A where one buyer is responsible for the EMS suppliers and the other for all other commodities. The previously mentioned lack of role descriptions became further apparent when discussing the different commodities. A strategic buyer at the parent company described doing a lot of operative work both within their own commodity, but also, acting as the supporting operative buyer for another commodity. The buyer continued to describe that within his commodity *“the process cannot be standardised”* with the explanation that it is far too complex and dynamic to be properly formalised.

### 4.3 External factors

*This chapter will present the empirical findings related to external factors. The chapter will be initiated with a description of how the case company experience the complexity and dynamism of its environment. Whereas the subchapter about environmental dynamism will mainly provide an overview of the experience of the component crisis. The chapter will be concluded with a compilation of the impact of national cultures*

#### 4.3.1 Environmental complexity

The supplier base is, as mentioned in Chapter 4.1, divided into various commodities whereas one concerns the outsourced production to the EMS suppliers. The location of the suppliers for these various commodities varies among the group. Some of the commodities are exclusively sourced from Europe while other, often more standardised components, are bought from Asia. Which obviously implies longer lead times if air transports are not used. A buyer at the parent company stated that when buying components that are complex and customised, in addition when the batches are small, it is more beneficial to source from the local area. Some of the commodities are sourced from distributors due to that the purchased volumes are too small to be able to approach the manufacturers directly. The handling of the environmental complexity is complicated by some of the case company's larger customers having influence over the supplier selection as they, among other things, approve component changes.

The outsourced production to the EMS suppliers entails additional complexity to sourcing since the parent company and the subsidiaries' usage of them differs. The parent company, as mentioned in the case company description, has internal production and hence source electronic components. Subsidiary B sources strategic electronic components for its EMS suppliers. The reason is, according to the respondent from Subsidiary B, that sometimes a conflict of objectives occurs when the EMS suppliers try to optimise inventory values by refusing to build up safety stock for critical components. Moreover, the respondent from Subsidiary A described why they negotiate some prices by stating, "*We do the first round of negotiations ourselves since if the EMS goes to the distributor, the distributor will know that we have selected that component. If we instead come to them, that component is not necessarily the chosen one, giving us an advantage in the negotiations*". These experiences and management of the EMS supplier differ from those stated by the respondent at Subsidiary C. The respondent from Subsidiary C had the view that "*Small companies should not buy low volumes of electronic components, it is better to let EMSs handle it, as they are good at it*".

Thus, the respondents agreed that finding good partners when being as small is tough. One respondent explained it as *“You want a partner with a lot of buying power, however, means that the supplier has to be big, meaning we are not a prioritised customer for them”*. Another respondent described that you had to find an EMS supplier that is a good fit in terms of size since you do not want to be too big or too small of a customer for the supplier. Concerning the location of the EMS suppliers the respondents converged towards the importance of proximity. One respondent stated, *“When problems occur it is much easier to get in the car, drive there and discuss it at the production line”*. This overall demonstrates that the sourcing of EMS constitutes an especially complex commodity with many aspects to consider.

### 4.3.2 Environmental dynamism

Overall, the respondents converged that the environment that the company operates in is fluctuating continuously. Especially due to that they are dependent on a supply chain that stretches across the globe. Something which, during the last couple of years, has become more evident due to the component crisis. Therefore, this chapter will focus on the component crisis.

The first signals of emerging disturbances in supply chains came from other companies according to a respondent in a strategic position at the parent company. During the spring of 2020, the purchasing department began to receive worrying information from suppliers. However, this was at first not noticed in the sourcing at the company. This all changed during the summer of 2020, as described by a buyer, *“during the summer, there was an issue with one component, then another”*. Respondents from the subsidiaries described the emergence of the component crisis as similar to the interviewees at the parent company. For them, it also began in the summer of 2020, when suppliers began to not confirm delivery dates and lead time started to increase dramatically. The shortages were in the beginning concentrated around electronics but as stated by a respondent, the *“crisis has spread from electronics to metal parts and housings”*. This, in other words, has implied that the buyers have been forced to handle shortages and supply issues in most of the supplied commodities.

These shortages resulted in a growing order book due to delayed deliveries. However, the overall quality of the end products was not compromised, according to a respondent at the parent company. This was allowed by the fact that other departments than purchasing put in a lot of extra effort. For instance, the respondent from R&D described that they have been forced to invest more resources in redesign to avoid components that were difficult to obtain as well as inspecting components from non-primary suppliers. Which, the subsidiaries also have been forced to do to various degrees.

Depending on the extent to which the various sites use the EMS suppliers, the proportion of the burden has been shared between buyers at the case company and the EMS suppliers. A respondent from Subsidiary A and buyers at the parent company mentioned that occasionally during the crisis they had to assist the EMS suppliers with sourcing. Which highlights the risk of relying on external actors. In addition, the disadvantage of having EMS suppliers constitutes an additional layer between the company and the electronic manufacturers, through which important information is needed to be transmitted. The relaying of information was a challenge for all suppliers, especially for commodities where distributors are used. A buyer at the parent company elaborated on this by explaining that *“the suppliers lacked resources to handle the situation, especially the distributors who were not able to properly understand and relay information”*. Whereas, for example, the agreements that were in place before the crisis was sometimes neglected as *“suppliers began prioritising firm orders above forecasts”*.

Even the manufacturers of electronic components, hence the suppliers’ suppliers, went into some form of panic mode, making the information flow even worse. In order to receive some information about the status of orders, the parent company had to, according to a respondent at a strategic position *“push past the distributors and talk to the major manufacturers to understand the root problem and what they are doing to fix it”*. Which sometimes includes assistance from some of the customers of the parent company. Concerning the customers, they have in general as a consequence of the crisis started to request more resilience operations at the case company. Another external impact of the component crisis that the case company has been forced to handle was that several suppliers, as stated by a respondent from Subsidiary B, *“suddenly just stopped making components that they were supposed to keep alive for much longer”*.

### 4.3.3 National culture

Overall, the differences in national culture between the parent company and the subsidiaries were not deemed to be a barrier. The respondent from Subsidiary B explained that the national culture at the subsidiary was something in between the national cultures of the parent company and Subsidiary A. Whereas the respondent from Subsidiary C also stated that a difference existed but that the impact of it was limited. The respondents at the subsidiaries saw other factors matter more than the national culture. When asking a respondent at the parent company with a strategic position how they have dealt with national culture the answer was *“You shouldn’t interfere with national culture, but they should follow the company’s values”*. The answers from the respondents at the subsidiaries indicate that this approach has been efficient. However, challenges related to cultural differences may arise as the integration of the subsidiaries continuously proceeds. Since increased integration will force them to collaborate more intensely, making the cultural differences more present.

## 4.4 Moderator - Size of organisation

During the interviews, impacts from the size of the organisation was a recurring topic in various context. Due to its small size, the organisation is relatively flat where the top management is accessible and present which, according to multiple respondents, fosters agile processes. A respondent with an operative focus describes this by stating *“It is not thousands of decisions and approvals before we can act”*. Several respondents at the parent company returned to fast and flexible decision-making as beneficial during the component crisis. Moreover, several respondents in operative positions emphasised the importance of, to the greatest extent, maintaining this agility moving forward. This, however, as mentioned by some of the respondents, will be challenging because a growing company will inevitably decrease its agility. Thus, with awareness at the top management level about the value of agility, it should be maintained moving forward.

Concerning the impact of the smallness of the organisation on the purchasing function, a shared sentiment among the interviewed buyers meant that their responsibility as individuals and as a function become unclear. One buyer described it by stating that *“We are a small purchasing function, so the title does not matter as much ... tactical and strategic work overlap when you are as few as we are”*. Other buyers described how the small size of the company has led to them doing many tasks that in a larger organisation would not be tasks for a purchasing function.

The smallness of the firm also impacted the firm during the component crisis. All subsidiaries stated that their relative smallness compared to suppliers had a large influence. The respondent from Subsidiary C described that they did not have the internal resources to establish decent communication with all suppliers. Subsidiary A stated that *“distributors and manufacturers have not paid attention to smaller companies in the crisis. All the focus has been on larger companies”*. This highlights the eventual benefits of consolidating the demand on a group level, increasing the bargaining power against suppliers and other external actors. Because, currently the impact of the external factors, as described in Chapter 4.3, is relatively fixed from the perspective of the case company. An increase in bargaining power could potentially change this perspective, allowing the company to position itself in a more favourable position.

## 4.5 Internal factors

*This chapter will present the empirical findings related to the primary and secondary internal factors.*

### 4.5.1 Corporate goals and strategic initiatives

The current organisational structure within the company was described to be decentralised, with all subsidiaries being able to have control of their own operations and, hence setting their own goals. According to a strategic respondent, it becomes apparent that some level of integration must occur to become more efficient. Thus, the decentralised structure was described as something positive by one of the respondents at a subsidiary, stating *“If we need a decision, we can take those decisions fast. We are looking locally and there is no structure via Sweden that we need to go through before finding a solution.”* The respondent did however go on to describe that this is also an organisational weakness to some degree stating, *“Sometimes we just focus on local issues, not including all resources at group level”*.

The process of aligning the sites according to the strategic goals of the company has been started by top management. However, a respondent from one of the subsidiaries described that it is a challenge for them to embrace the goals of the overall group since it was not part of their old plan prior to the acquisition. The respondent further explained that the integration must be approached in different ways for the separate subsidiaries due to the cultural differences that exist. Furthermore, an interviewee with a strategic focus expressed the importance, in a post-merger phase, of being open with information to avoid confusion and anxiety among the employees. The balance of the level of integration should also be carefully considered as reducing the autonomy of the subsidiaries too much may lead to decreased motivation among its employees.

However, some integration initiatives have been implemented, with products being re-branded and others being developed together within the group. Hence, some departments, such as R&D and sales, have come further in the integration process than others. A respondent from the R&D department described that in order to align their operation at the group level, a common tool-chain is on the way to be implemented. In addition to competence mapping which, in other words, means that the resources possessed by the subsidiaries are identified, in order to explore potential synergies. The mapping of processes, in all functions, was mentioned by a respondent to be vital in the integration in order to find the best practice within the group, instead of only originating from how the parent company currently operates.

At the parent company, multiple strategic initiatives have recently been implemented, such as a Sales and Operation Planning process (S&OP), cross-functional meetings between R&D and the product office and a production system. The two former aim to create better cross-functional alignment within the company. The latter is an internally developed production system that aims to standardise and

formalise processes within the firm. The production system also aims to include a more formal procedure for working with continuous improvements. This is important, according to a respondent in a strategic position, because *“if you haven’t kept up and made the continuous improvements, then when you lift every stone, there are things that need to be fixed before we can take the bigger steps”*.

Another respondent had a similar view stating, *“When we want to address something, we often don’t have the prerequisites, so we have to address the prerequisites”*. Furthermore, this process of formalisation is challenging for the firm since, as expressed by a respondent, sometimes initiatives are initiated *“without an understanding whether you are solving a temporary problem or really solving the root cause”*. The long-term responsibility of the initiative is also not always clearly communicated. An interviewee with an operative position expressed a need for central resources that are dedicated to assisting in this process of implementing a production system across the entire group.

When the respondents in strategic positions were asked about the company’s response to the component crisis, the answers converged that the crisis was merely responded to with reactive measures. According to one respondent, this must be changed going forward, stating that *“It is important that we start to look ahead strategically, better to be proactive than reactive”*. Furthermore, many respondents had the view that resources need to be invested in operations to create slack in the system to better be able to absorb disruptions in the future. Thus, as a respondent with an operative position stated, such investments need to be long-term since *“It’s like an insurance, you always pay the insurance and wonder why when everything goes well. Then after you stop paying it, something goes wrong, and you wonder why you didn’t have insurance.”* However, according to a respondent in a strategic position, the investment must be well considered where for instance, *“the cost of extra stock etc. must be weighed against the cost of the risk of standing still”*.

The respondent from Subsidiary A meant that the ambitious growth goals, in combination with the impact of the component crisis, have led to an increased workload for the personnel resulting in high levels of frustration. The respondent elaborated on this by stating that *“the people at the company have the feeling that it is close to bankruptcy, but we aren’t, because customers are frustrated, we are always behind, we are not able to ship out, not able to produce and so on”*. From the respondent perspective the company should handle this *“growth pain”* with *“clear communication, all the time”* in order to *“pick up people”*.

The overall impression from the interviews was that a consistent company-wide view over the ongoing strategic initiatives, as well as in which areas future initiatives are needed, exists. Respondents in strategic and operational positions at the parent company, as well as at the subsidiaries identified, in general, the same root causes of problems which indicates that the internal communication channels are working well. Since all levels of the company are aligned it should also be easier to implement initiatives to address these areas of improvements.

### 4.5.2 Product characteristics

During the interviews, multiple respondents described how the characteristics of the products and offerings impacted the purchasing function. An interviewee in an operational position emphasised that the bills of materials are highly complex. As a result, the PSO need to consider that if one component is missing, it causes other components to become stuck in inventory, leading to tied-up capital. This became apparent during the components crisis as inventory increased dramatically at all sites within the group. An additional aspect influencing the purchasing function that stems from the end product is the wide product offering, which was mentioned by several interviewees. A wide product offering leads to the purchasing function having to handle a wide range of components and suppliers. The wide range of products originates from, according to a respondent, *“the company’s history of collaborative product development as technology advances”*. Whereas another interviewee also mentioned inadequate processes for phasing out products as an additional reason.

Another aspect which was mentioned recurringly was the fact that the company focuses on building high-quality, mission-critical, industrial products designed to function in extreme environments. Hence, the purchased components’ quality must be high and certified for extreme temperatures. Therefore, many components have also been customised to improve the end-products’ functionality. The latter aspect of many components being customised has, as a respondent describes, led to *“a high dependency on some suppliers overall”*. The customised components pose a risk because, as described by an operative respondent, *“in a crisis situation, they are not a priority”*. These issues are present at all sites within the group, creating further complexity within the organisation.

### 4.5.3 Company culture

When asked about the company culture, the buyers at the parent company described that it is, overall, a flat organisation, where it is easy to work with others no matter the title. However, this has not always been the case and the culture has changed in recent years mainly due to the current management. One buyer described that *“the culture ebb and flow with the tides”*. There was a consensus within the parent company that the current culture is very good, and so is the current management team. Highlighted by a respondent from Subsidiary A that stated that the parent company has *“the best company values I have ever met”*. The culture was described as being a bottom-up culture where all employees have a say in decision-making. At the subsidiaries, the company cultures were all described similarly for the individual sites, with respondents from all sites describing that they see a similar culture within the parent company as within their own. With the company cultures all being described as very familial, mainly created by the smallness of the companies.

During discussions regarding the company culture, the role of leadership in creating a high-performing organisation arose. Several respondents in strategic positions expressed a consensus around the importance of appointing competent managers who can handle their areas with relative independence. One respondent expressed it as *“I don’t like details, I don’t want to dive into details, I want people whom I trust, and then I just want to support when necessary”*. This means that managers, according to a respondent, must stay relatively present to know when to go into the details. Among the respondents, there was also a common view of the importance of a good working environment in a high-performing organisation. Since it contributes to the employee’s willingness to help in times of crisis, as described by an interviewee in a strategic position stating, *“You would rather fight for someone you respect”*.

#### 4.5.4 Cross-functional alignment

The purchasing department is described to affect and being affected by multiple other departments, hence cross-functional alignment collaboration is essential. During the interviews, it was clear that this was the case both at the parent company and subsidiaries. Overall, as mentioned, there exists an ongoing strategic initiative at the parent company to improve the cross-functional alignment through the implementation of an S&OP process. The S&OP will include a short- and long-term focus with attendance from various functions within the organisation. The guidelines and various key performance indicators are defined for this process where Planning is, as explained by multiple respondents, the most important department in relation to purchasing.

The collaboration between purchasing and planning is close at the parent company, as one buyer described by stating *“We have a meeting with the planning department every morning, where we discuss shorter-term supply and planning issues”*. Forecasting was recurrently mentioned to be inadequate throughout the interviews, both from respondents with strategic and operational positions at the parent company, as well as at the subsidiaries. This imposes challenges within the collaboration between the two functions since purchasing bases their decisions, to various extents, on forecasts. The two departments have improved their efficiency in working together during the crisis, with added meetings and a more structured workflow as described by a respondent.

When asked about collaboration with production, the buyers said that they do not interact that much directly with production. Instead, it was explained that the planning department mainly handles the information flow between the two departments by serving as a link between purchasing and production. Another buyer highlighted that some communication is also needed since the inventory of some materials in production is not reported in the IT system. Also, a respondent from the production function mentioned that they are affected by problems caused by using parts from non-primary suppliers, such as all specifications not being identical. Besides more obvious effects such as lack of components despite that, according to the systems, they are supposed to be available.

The R&D department has a large impact on the purchasing function. One buyer described the impact of R&D on purchasing by stating *“They impact us a lot, since they decide what to buy which usually also decides from where to buy”*. A process that does not always work perfectly is the new product introduction process, where purchasing sometimes become involved far too late, creating issues due to long lead times and not always taking sourcing strategies into account. However, the buyers described ongoing initiatives to improve this relationship by defining and implementing new processes for supplier selection. The R&D was described as having a further initiative ongoing to better absorb disruptions in the future, by developing processes to easier change components in a design. This would allow a higher level of resilience due to increased flexibility and agility.

An additional department that influences the purchasing function is the quality function. According to a respondent from the quality department, the interface between quality and the purchasing function consists of recurring monitoring meetings and, when necessary, the quality engineers’ attend meetings with suppliers. The respondent further emphasised that the collaboration becomes more intense concerning customised components. It was mentioned that the overall collaboration has suffered from a shortage of staff on both sides of the interface. Further elaborating that the next step in the collaboration, when sufficient resources are available, should be to introduce a Supplier Quality Assurance role. The role should be placed under the quality function but working directly with the purchasing function and hence suppliers. The motivation for the introduction, the respondent states, is because it *“...would create better conditions for supplier development as well as catch more problems, such as specification issues or other things that currently go under the radar...”*.

A cross-functional initiative which was initiated during the component crisis was a task force. The task force identified and handled issues with components that were hard to obtain. Several respondents deemed the implementation of the task force to be vital in the effort to minimise the damage from the crisis. The respondents described that the task force was implemented early during the crisis. However, it was not the most efficient at first. A buyer described that there were people from most departments in it from the beginning. But as the crisis went on, it became more efficient and slimmed down to mainly include R&D and purchasing.

One respondent described that a strength of the task force was that the top management was present in its work which enabled fast decision-making. Thus, according to several respondents with strategic positions, the long-term strategic work had to be overridden as top management’s presence was needed in the daily operations. The degree of operative work hence increased due to for instance attending meetings with suppliers and customers. The same was, as previously described, true for the purchasing function and the R&D department which had to shift focus from other projects. This wide shift away from strategic work may in the long term be a risk to the supply chain resilience of the company.

There was a clear consensus that all departments have to work cross-functionally to be able to perform at a high level. It was also clear that all departments saw potential ways of improving the cross-functional work by aligning processes and tools to allow for more collaboration and visibility. The implemented task force serves as a successful example of a cross-functional initiative. The idea of having an SQA role within the quality department was further interesting due to freeing up resources within both purchasing and quality functions. Overall, as shown the purchasing function is affected by many other departments within the firm. Due to this reason, the function is dependent on what initiatives are implemented at the surrounding functions. Things such as forecasting and component selection are, as stated, things that directly impact the purchasing function's operations. When planning for improvement initiatives at the purchasing function, awareness regarding the eventual changes in surrounding functions must be included.

#### **4.5.5 Technology in use**

The topic regarding technology in use came up during all conducted interviews, both as it is a large part of the daily work of all interviewees, but also as it constitutes an area with a widely agreed potential for improvement. A respondent with a strategic position emphasised that a functional IT backbone constitutes a vital enabler for, among other things, the previously mentioned cross-functional alignment and the post-merger integration with the subsidiaries.

All subsidiaries have adopted the same ERP system as the parent company. How well the integration of the IT system has been, is different between the subsidiaries. With the respondent from Subsidiary C explained that they must do a lot of extra work at their logistics function to get all information into the ERP system. Due to that, it does not work well with the previous systems that they still use. Another respondent from Subsidiary A explained that the IT system does not work great in their planning practices. A lack of competencies in the new system was, according to a respondent, also an issue that makes the situation worse. Overall, the respondents from the subsidiaries all emphasised that the situation regarding the IT systems must become better to enable further integration of the companies.

The IT systems and the competencies of using them were also deemed, by the buyers at the parent company, to be one of the biggest weaknesses within the firm. It was described that the current ERP system is not fully utilised. Especially, as mentioned, when it comes to planning, the purchasing team saw flaws in the system that directly impacts them. Mainly because there is a limitation in how sales orders are put into the system, meaning purchasing cannot see the actual demand, making them too reliant on the forecasts, which as previously described are not perfect. There is however a current project to change to a new version of the ERP system. A project in which one of the buyers is part to make sure that the purchasing perspective is included. However, it was also mentioned by respondents that there was a lack of quality in the data in the systems, with some information missing and others not being completely correct.

According to a respondent in an operative position at the parent company, the flaws in the usage of the IT systems became more obvious during the crisis. A respondent stated that collaboration both internally and with the subsidiaries would have worked better with improved systems. In this case, the information in the systems about which components were available was inconsistent with reality. The respondent described that *“Every day I was told what the current shortages were instead of someone telling me what my shortages would be going forward”*. A situation that the respondent summarised by stating *“We lost shifts because of internal control failures that made an externally created situation worse”*.

Another respondent with a strategic position stated that *“to be able to predict, you need a very good system support that is not dependent on individuals”*. This statement is consistent with another respondent who highlighted that systems should facilitate informed decision-making and hence avoid basing decisions on gut feeling, which is currently common within the organisation. Informed decision-making by for example simulating aspects of the business such as production planning. Related to IT systems, a respondent mentioned the recent development in large language models by stating that it may alter the way companies are using IT systems. Hence enable new ways of working when various processes become automated. Thus, the respondent emphasised, the firm should not immediately implement such capabilities into its system, but instead allow others to do the experimentation and thus monitor the developments.

As previously mentioned, the IT systems came up as an improvement point in all conducted interviews. It was however not only the systems themselves which were the subject of discussion but also the data quality, competencies in using the systems, and the trust in the systems. Since the systems themselves are not the entire issue, the upgrade of the systems happening later this year will not fix all issues related to the IT systems. The fact that people at all levels in the company, at different sites and in different departments mentioned the same issues did however show that there is potential for a large improvement.

### 4.5.6 Purchasing corporate coherence

Currently, the integration of the purchasing departments within the group is limited, with collaboration between subsidiaries and the parent company being next to non-existent. There has however been some collaboration regarding processes, where one of the sites reached out to ask about what processes the parent company used for certain situations. This was seen as positive with one of the buyers at the parent company stating, *“It is very interesting that they want to share processes and not create their own, it gives us a common ground to stand on”*. Another buyer described that they were generally unaware of how purchasing at the other sites operates. Showcased by the fact that limited knowledge regarding the structures of the purchasing departments at the other sites, as well as their sourcing strategies, exists. The same was true for the respondents at the subsidiaries who did not know much about the purchasing department at the parent company.

An area that recurrently emerged during the interviews with buyers at the parent company, as well as respondents at the subsidiaries was the existence of possible synergies regarding the EMS commodity. The respondents at the subsidiaries did however state different opinions about the possibility to find synergies within the commodity. One respondent emphasised that it would be beneficial to consolidate the demand on the group level, whereas others expressed that it would be challenging as it is a highly complex commodity where a close relationship with the supplier is desirable. Mainly moving such production is a complex task and all entities have different preferences around, for instance, the locations of the EMS suppliers. A respondent mentioned that another possible synergy could be to move, to some extent, the production of the subsidiaries to the parent company's internal electronic manufacturing facility. This constitutes an example of the possible challenges moving forward with aligning various actors' objectives.

Thus, in general, when buyers at the parent company, as well as the respondent from the subsidiaries, were asked about the possible integration with the subsidiaries, the responses were positive, seeing that it would be beneficial for the group. One respondent described that increased integration on the group level could create benefits in terms of purchasing power, avoid a lot of risks and could overall lead to more resilience for the group. Thus, the respondent then emphasised that it however is important that *“everybody understand each other and make sure that everyone gets seen and heard”*. One respondent also described how the current purchasing manager had brought great energy and drive for integration, something which will help the integration efforts.

The component crisis led to the emergence of some communication within the group. According to one of the interviewees, *“During the crisis, there was some contact with the other sites to help each other find components”*. The main comments from all subsidiaries were however along the lines of them trying to get help from the parent company in Sweden, but not getting any due to them not having the time. One of the respondents at a subsidiary suggested that it is because *“it is easier to focus on what is closest to you”*. This fact shows that there is a lack of prioritisation regarding the group perspective for the buyers at the parent company. This a problem which will have to be resolved in some way for the integration to not only happen but to be successful. Therefore, working on the group level will have to somehow become more formalised in the role descriptions of at least some of the buyers at the parent company and possibly also at the other sites.

When it comes to how the PSO should be structured when further integrated, the buyers at the parent company all described that a majority of their work would be difficult to do remotely. One buyer further explained by stating that *“the operational work should be done on-site; they know their products and their needs”*. Multiple buyers also stated the need for the buyers at each site to have a level of autonomy, competencies, and authorisation to be able to handle most daily operations. Thus, there was a clear sentiment of strategical purchasing not having to be site specific since that type of work generally is detached from the daily operations. There were

however differences in the thoughts regarding the need for a centralised strategic purchasing unit or if it could be spread out across the sites. To conclude, when regarding the micro-level of de/centralisation, it is quite clear that according to the buyers, there need to be tactical and operative buyers at each site that handles most daily work. However, the strategic work could be centralised to a further extent, letting buyers specialised in strategic work handle those tasks.

### 4.5.7 Process organisation

Process organisation is a wide topic which entails topics ranging from process involvement with other functions to supplier management and sourcing strategies. The formalisation of processes was a recurring topic in all interviews, with all respondents describing that processes and responsibilities were not clearly defined. This was in part attributed to the previously described small size of the company and multiple respondents noted that this creates challenges for governance and cross-functional collaboration. Thus, one respondent saw the low number of formalised processes as a strength since it allowed flexibility and employees to take responsibility and ownership. Something that is not true at bigger companies where, as the respondent described “*you are just a number*”. Therefore, a respondent in a strategic position stated that it is important for the firm to find an optimal balance of formalisation as taking it too far can weaken flexibility within the organisation.

The lack of defined responsibilities was however seen as a risk with an interviewee in an operative position stating, “*... there are people that do a lot of tasks, if they disappear, nobody knows how to do those things*”. This high dependence on certain people is an overall challenge within the group, as stated by respondents from the subsidiaries and parent company. A buyer at the parent company describes the issue by stating, “*Due to poor documentation, a lot of knowledge is lost when someone quits*” and another states, “*If someone quit or gets sick, we can keep the operative going, but the other things would be very difficult*”.

However, initiatives to better define processes within the purchasing function have picked up over the last year. The sentiment of still having a long way to go before coming to where the function wants to be, in terms of formalisation and standardisation was still however prevalent among all buyers. This sentiment was also shared with interviewees outside of the function, showcased by a respondent in an operational role stating, “*There is a lot of hands-on work that purchasing has to do, things like safety stock and quantities are very much between the thumb and the index finger, they just guess*”. One buyer described that currently, due to limited resources as a consequence of the component crisis, overall strategic improvement work has been side-lined.

Currently, the different sites in the group utilise separate sourcing strategies, which stems from them previously being separate companies, with different prerequisites and preferences. An area where the difference in strategies and preferences is very prevalent is within the EMS commodity, where history and experience have shaped different sourcing strategies as previously mentioned in Chapter 4.3.1. For the company to be able to capture the potential synergies of the post-merger integration as elaborated in Chapter 4.5.6, a common sourcing philosophy should be created by a global strategic purchasing function. Setting a sourcing philosophy and creating formalised processes for deciding which sourcing strategy should be applied in any case would allow the company to build common ground. A common ground which could act as an enabler for further integration. Therefore, aligning the sourcing strategies on a group level should be an early step in the integration process.

According to multiple respondents, the process of supplier selection needs improvement because, as described by a respondent with a strategical position, *“Suddenly you have chosen a component, and consequently a supplier, but nobody really knows how it happened, and it is not certain that we have quality assured that supplier”*. A comprehensive supplier selection has been neglected, especially during the last couple of years when the component crisis has demanded resources. However, a respondent in a strategic position described that recently some improvements have been made in this area, such as the mandate of decisions concerning sourcing has been clarified. This clarification, in broad terms, means that both R&D and purchasing are involved, with R&D having the last call on technology selection and purchasing on supplier selection.

Supplier evaluation was a topic that came up during the interviews with both buyers and respondents from the subsidiaries. The processes regarding supplier evaluation were explained to not have been that formalised in the past. It was however explained that recently, the parent company has begun the creation and formalisation of processes for supplier evaluation. For the company to be able to create supply chain resilience, pool demand and proceed in the utilisation of determined sourcing strategies, the company must create formalised supplier evaluation processes. Since it allows the company to better choose suppliers to build partnerships with, which may help foster better resilience.

A common theme in the interviews was that active, formalised supplier evaluation had taken a back seat during the component crisis due to resource limitations. The crisis has however been a good opportunity to evaluate suppliers, since as one buyer described it *“you see the difference between suppliers, since it’s easy to see who are on top of things and who are not”*. It was further described that *“some have delivered poor information and have had bad delivery precision when it is as most critical”*. Thus, the crisis has meant that the relationship with some suppliers has been improved by working so closely.

The first signals of disturbances beginning to emerge in supply chains came from other companies and suppliers, as previously described in Chapter 4.3.2. However, this view was not consistent with the internal position at the parent company, which was that everything was operating as usual. The reasons were, as described by a respondent in a strategic position, the lack of business intelligence, which in turn, was due to a lack of competence in some areas. This meant that the company missed many opportunities to minimise the damage of the disruption according to a strategic respondent. One buyer, for instance, expressed that it would have been beneficial to have started to monitor shortages further forward than they did. Another buyer described that they had built a well-functioning way of working with suppliers, having a forecast that they did call-offs towards. However, that only works in good times and there were no sufficient monitoring processes implemented. This meant that the processes in place did not account for the possibility of a situation such as this component crisis. This points towards a low level of preparedness at the purchasing function, constituting a low level of supply-side resilience.

Once it was clear that there was a crisis, one of the first step taken was to start placing firm orders on all strategically important components. The main reason behind placing firm orders was visibility in the ERP system and to get updates for all order lines from suppliers. Allowing the purchasing department to gain control and understanding of the situation and being able to see where there were actual problems. However, since the forecasts were not high enough to account for the expected overall growth of sales, it resulted in too little material being ordered. Similar weaknesses related to the creation of forecasts were exposed at the subsidiaries as well. A respondent from Subsidiary A described that the buyers did a very good job considering the circumstances, by stating, *“The buyers did a good job with the sourcing, although they didn’t get any forecast on sales figure, so that was on a high-risk level”*.

At the time of the interviews, the component crisis was not over for the case company as described by a buyer. However, the intensity of the crisis had lowered, meaning there had been time for some retrospective thoughts, and some work to strengthen the organisation had been able to begin. The impact of this disruption is according to a respondent that *“This kind of crisis shows up where the lacks are, where the gaps in your processes are”*. The purchasing department has learnt a lot from the crisis, as empathised by one respondent who stated that, *“there has been an improvement in processes regarding how to handle situations like this”*. Another respondent mentioned that the creation of forecasts is an example of such inadequate processes, something that is now being improved with the previously mentioned S&OP initiative at the parent company. At the subsidiaries, improvement efforts to improve gaps in processes are also underway.

### 4.5.8 Planning

The planning process and especially the forecast creation within the company were recurrently mentioned to be inadequate throughout the interviews. Both from respondents with strategic and operational positions at the parent company, as well as at the subsidiaries. A respondent further explained that this has a significant impact on the performance of the purchasing functions since they base their decisions on forecasts. The need for improvement has become apparent during the component crisis since, as an interviewee stated, “*We haven’t needed it before, but now when the lead times have skyrocketed, if we don’t have a forecast, we don’t get anything*”.

Concerning planning, and especially the creation of forecasts it was, by several respondents, assessed to be complicated by the wide product range, in combination with the complex bills of materials significantly complicates the planning and creation of forecasts. Because “*the more similar everything is, the easier it will be to plan*”, as stated by an operative respondent. A buyer was clear to state that the problem with forecasts is not due to the planning department, instead, it is a deeper issue within the organisation.

A possible measure to improve the forecast creation process is to force the sales staff and customers to provide more accurate forecasts according to an interviewee. However, the respondent emphasised that such measure against the customer must be well considered since “*it is not nice against a customer to force them to order*”. According to a respondent in a strategic position, this has thus begun happening to a greater extent, as many customers are overall eager to assist. Because, as stated by several respondents, customers are demanding more supply chain resilience as a result of the crisis, something which a better forecast will help to create. The previously mentioned implementation of an S&OP process will further also improve the creation of forecasts since it creates a more structured, systematic and cross-functional forecast creation process. The aim of the project is to have a precise 24-month rolling forecast.

Subsidiary C also had another planning process that became insufficient during the crisis, which was how the production plan was made. Efforts to improve this are currently being done by transitioning to “*real-time dynamic planning*” which is revised more frequently than previously to better adjust to disruptions. The fact that all entities within the group have problems with forecasting and planning, shows that this is an area of improvement. Because planning has a significant impact on the PSO, enhancing the planning within the group can consequently help the PSO improve its overall performance.

### 4.5.9 Controlling

The controlling of the purchasing function's performance, both at the parent company and subsidiaries, is deemed by several respondents to be inadequate. A respondent at the parent company with a strategic position thus stated that *"we report some KPIs internally in the operation, but there are no general targets for the function from the top management"*. But the respondent expressed that controlling the purchasing function will be important moving forward, especially, *"if we want to find benefits with a global supply organisation."* Without being able to monitor and measure all purchasing activities at a group level, it will be difficult to construct a plan for the integration process and set overall goals for the PSO. Which makes improvements around the insufficient IT systems a prerequisite for improved control.

One of the key performance indicators that are related to the purchasing function is inventory turnover which always becomes topical during the component crisis. Because, as described by a buyer, *"When the supply situation is good, safety stock is seen as expensive and then they want to optimise the inventory. But then when there are supply issues, everybody wonders why we don't have safety stock"*. This resembles the relationship between purchasing and the top management as well, where it was described that there are opposing directives coming from the top, with one buyer stating, *"they want to build safety stock while lowering the inventory value"*. Therefore, a consistent strategy regarding the inventory was requested from the purchasing department. Whereas a prerequisite for the monitoring of inventory turnover is to have control over inventory which now, according to several respondents at the parent company is insufficient. This is related to insufficient processes around, for example, the classification of components and phase-out of products, which it currently dedicates resources to improve.

The formalisation of processes has been a recurring topic during the entirety of Chapter 4 since it is something that is an issue throughout the company. As previously mentioned, being able to measure things is vital in an integration process as well as during improvement work. Since if you cannot measure the starting point, it is difficult to determine if the initiative has been a success or not. Not having formalised processes, may lead to poor data quality since things may be done in different ways, giving different numbers in the system. Even if no way is the wrong way of doing things, it can still create inconsistencies in the recorded data. Therefore, the creation of formalised processes is vital to be able to gain control and understanding of operations within the case company.

# 5

## Discussion

*In this chapter, three areas for a PSO to focus on, during a post-merger phase, in its pursuit of resilience is discussed. The chapter will be initiated by a discussion about the importance of controlling followed by a description of how formalising processes can foster collaboration. The chapter will be concluded by a discussion regarding the structure of a PSO based on the previously presented macro-levels to increase purchasing corporate coherence.*

### 5.1 Control over the PSO: Knowing the initial position and how to measure the progress

The empirical findings show that controlling is a vital ability for an organisation in a post-merger phase. Because to be able to, based on collected data about the operations, set targets for the integration process and then measure its fulfilment is assessed to be essential at the case company when harmonising the PSO on a global level. This is consistent with Chapman et al. (1998) and Davis and Kummer (2012), who both emphasised the importance of controlling in a post-merger integration, as it enables the determination of whether the overall purpose of the acquisition is fulfilled.

The empirical findings also highlight the importance of controlling when pursuing resilience. Since, for instance, the empirical data stated that the level of resilience must be considered against the related costs. This is consistent with Pettit et al. (2010) description of the optimal balance of resilience, which becomes unreliable if the information that forms the foundation is misleading or even inaccurate. For instance, if the safety stock or the costs of standing still due to shortages cannot be estimated accurately, the decision-making becomes blind.

Overall, the previous examples demonstrate that controlling is closely linked with the capability visibility, which is a vital feature when pursuing resilience, according to Pettit et al. (2010). Because without knowledge about the operating resources in the supply chain and the surrounding environment, the implementation of proactive and reactive measures to mitigate the risk and consequences of disruptions becomes challenging. Visibility is also a prerequisite for developing many of the additional capabilities that foster resilience, as presented by Pettit et al. (2010). The empirical data, for instance, showed that measures to handle disruptions, such as increasing

the order horizon on strategic components and initiating redesign efforts, were postponed due to malfunctioning business information gathering at the beginning of the crisis. Such measures represent examples of the capabilities, flexibility in sourcing, adaptability and anticipation. Therefore, controlling internal operations is essential which is consistent with Christopher and Peck (2004) description of internal risks. Because the dynamism and complexity in the environment will continuously be present as it, to a high extent, constitutes factors that are unchangeable from the perspective of a company.

Thus, controlling must be preceded by the fulfilment of several prerequisites, as shown in the empirical findings. Controlling requires data to be collected by similar processes within a firm in order to obtain sufficient data quality. In addition, as highlighted in the empirical findings, the data collection, as well as the analysis, requires support from various IT systems. This is consistent with Bals et al. (2018) description of the importance of the utilisation of technology in a PSO since it fosters efficient information flows directly related to the mentioned resilience capability visibility.

In the empirical data it was stated that the ability, with the support of IT systems, to simulate various aspects of the operations such as production planning is needed. The ability to simulate would be beneficial when exploring various outcomes of measures or events. This is related to controlling since it fosters informed decision-making, instead of personnel dependent gut-feeling-based management. Because people throughout the organisation make decisions based on their experience without sufficient support from the IT system means that control of the operations is low. A person's experience, however extensive it may be, has the risk to contain various biases which could be devastating, especially in an environment with high dynamism, such as during the component crisis. In addition to that, the resilience capability collaboration, which according to Pettit et al. (2010) contains the ability to learn, deteriorates since the evaluation of decisions becomes impossible without informed decision-making with the support of IT systems. Learning which is important for improving the firm's capability to anticipate future similar events and disruptions.

Another area for a PSO where visibility, enabled by various IT systems, constitutes an essential feature is planning according to the empirical findings. Planning is based on the creation of forecasts whereas the PSO derives its operation from. Thus, Pettit et al. (2010) also emphasised that forecasting constitutes a subfactor in resilience capability collaboration as it requires information from several actors, which also is consistent with Karl et al. (2018). In the empirical findings, this was showcased by respondents stating that during the component crisis, some supplier relationships were improved where the collaboration was functional by mutual information sharing. In addition to that, customers have started to extend their order horizons. Which simplifies the creation of forecasts and hence improve the PSO's ability to operate and control its activities. Thus, the empirical findings suggested that forcing customers to place firm orders should be well-considered since they may

be unwilling to do so. Therefore, the entities must by trustful collaboration balance their separate objectives in order to benefit together in the long term by optimising the supply chain as a whole. Highlighting once again the importance of trust in collaboration.

In the context of post-merger integration, the technology in use also constitutes an essential feature in aligning the various companies' operations. This was highlighted in the empirical data by the recurring references to an IT backbone as an initiating effort for the integration. By synchronising the operations in a common ERP system, the aim was to better coordinate, and hence control, the integration process. This is consistent with Davis and Kummer (2012) who described that post-merger integration can be complicated if the data collection procedure, of where the IT systems are part, varies between the entities. Thus, this development of an IT backbone can, as shown in the empirical data, be resource-intensive and must in turn be coordinated. In order for the involved entities to efficiently change the IT system and avoid, as was the case at the case company in the empirical data, using dual systems for a longer time period.

Thus, concerning technology in the context of controlling, an issue that arose in the empirical data was the recent improvement in large language models. The possible future implementation of such capabilities in ERP systems may, as mentioned in the empirical findings, transform the firm's ability to operate, and hence control their operations. This could completely change the surroundings and condition by which a PSO operates. Various activities in the three levels of purchasing, as presented by van Weele et al. (2019) may become automated and hence transform how a PSO operates. For instance, the geographic distance significance, which according to the empirical data complicates the execution of operative and tactical purchasing, could be lowered with such potential supporting systems. Thus, all of the three levels of purchasing consist of aspects that are too complex to automate since many of the activities involve, among other things, contact with other humans. Such as, for instance, discussing various issues with suppliers during the entering of an agreement or an issue with quality.

## **5.2 Formalising processes and responsibilities: within the PSO and in the interfaces towards its surroundings**

The extent to which a company decide how the operations are performed is determined by the degree of formalisation and standardisation, according to Glock and Hochrein (2011). For instance, the firm can by policies control how the employees conduct various tasks. Policies that then consist of formalised processes in order to manage and control the operations. This is consistent with the empirical findings where various respondents on both strategic and operative levels expressed the need to increase the level of standardisation and formalisation at the company, in order to enhance the control. The reasons for this expressed need varied since it was assessed to be vital to increase the resilience of the firm in addition to enabling a post-merger integration. Both these aspects will be discussed below.

Bals et al. (2018) and Schiele (2007) describe the overall importance of developing various processes at the PSO for activities such as supplier development, creation of a sourcing strategy, supplier selection and early supplier involvement. Since the mentioned supplier management activities constitute a way of collecting information about the environment and hence improve the resilience capability visibility. This, as discussed in the previous section is essential when pursuing resilience in order to create an understanding of the external environment in which the firms operate, as described by Christopher and Peck (2004). Overall, this is consistent with the empirical findings where it was described as essential to control and manage its supplier base to increase the resilience and the overall performance of the firm. Especially this understanding of the supplier base is important since customers in their pursuit of resilience have started to formulate new demand around the reliability of the case company's operations.

Concerning the sourcing strategy and the supplier selection, the empirical findings suggest that it can constitute a risk for a company if it was unclear how a component, and hence the corresponding supplier, has been chosen. Hence, it constitutes a significant area for a PSO to focus on since it risks to influencing the capability of efficiency, as described by Pettit et al. (2010). For instance, quality issues with a supplier's productions, which could have been captured before entering into an agreement, may decrease overall productivity. Especially during a crisis situation, the value of having implemented an extensive supplier selection process based on a calculated sourcing strategy becomes visible. This was shown in the empirical findings where some suppliers were unable to provide sufficient information about deliveries. The overall concern about the insufficient sourcing strategy is supported by Baily et al. (2015) that emphasised the importance of a sourcing strategy, which the supplier selection is derived from, by which such risk can be avoided. Mainly by examining aspects such as the locations and the number of suppliers in order to, among other things, find an optimal balance of resilience, as described by Pettit et al. (2010).

The process of creating a sourcing strategy for complex purchases, such as for the EMS commodity as showcased in the empirical findings, may be challenging. Especially when multiple actors' perspectives on the purchases need to be considered. When, for instance, the current sourcing strategy, as was the case at the subsidiaries, is in various aspects different. In a post-merger integration this becomes additional present since the merging companies have different objectives. But as mentioned by Davis and Kummer (2012) and Whitaker (2012) it is vital for the top management to be present in the integration and examine what is the most optimal for the overall performance. Especially in the case of critical purchases, such as in the case of the EMS commodity. Thus, the creation of a sourcing strategy for critical purchases may require decreasing the degree of participation, as described by Johnston and Bonoma (1981) since all involved parties' wishes will probably be hard to satisfy. Which could lead to frustration and disappointment among the employees especially at geographically dispersed sites. Impacting the motivation of the employees at the specific sites which could decrease its overall performance.

Thus, formalised processes, to some extent, requires standardisation of the activities which, as shown in the empirical findings, can be challenging in complex environment. In the context of purchasing this is showcased by the example from the empirical findings where a buyer stated that the handling of a specific commodities was impossible to standardise due to its complexity and dynamic. Therefore, the degree of specialisation, as described by Glock and Hochrein (2011), will also be needed to be adjusted accordingly since the activities around the procurement of complex products tend to be hard to divide into subprocesses. Instead, the procurement of complex products, showcased by the empirical findings, will involve an object-oriented specialisation where a person's conducts all activities in order to decrease the efficiency losses in the interfaces between the subprocesses. For instance, as showcased in the empirical findings, it could be beneficial for a strategic buyer to also handle the operative purchasing activities if strategic expertise is required for order placement.

Thus, the empirical findings showed that the degree of specialisation should be endeavoured to be lowered, in order to decrease the dependence of specific persons. Because several buyers described that due to certain activities not being formalised it is only performed by one person. Hence, the absence of that person complicates the execution of that activity. Therefore, a PSO should pursue, by a formalisation of processes to the degree that is suitable for the involved complexity, increased dispersion of the ability to execute various purchasing activities. Dispersion constitutes a capability that fosters resilience according to Pettit et al. (2010).

An aspect to consider when creating processes for purchasing is that it can decrease flexibility within the organisation. Flexibility is related to the important resilience capabilities agility and adaptability as described by Lee et al. (2004) and Pettit et al. (2010). In the empirical findings, this concern was present especially since various respondents described the value of fast decision-making during the component crisis. Based on that, firms that pursue the presented capabilities for resilience should be aware that the improvement of one aspect of the operation can imply the deterioration of another.

Overall, the development of common processes is a vital part of post-merger integration according to Davis and Kummer (2012). As shown in the empirical findings where, during the component crisis, the separate entities voluntarily discussed and shared their respective processes. This is an example of a federal, local-led organisation, as described by Rozemeijer et al. (2003), where separate parties, without the involvement of top management, start to collaborate. Thus, a more central-led collaboration may be needed for the post-merger integration in order to determine which common processes to implement. A central-led implementation of processes should thus, as mentioned by Davis and Kummer (2012), consider that the subsidiaries may possess the best practice. Therefore, the enforcement of the parent company's processes on a subsidiary could lead to the losses of potential gains of the acquisition. Hence, the ability to monitor and control the operation at a PSO, as described in Chapter 5.1, constitutes a prerequisite to finding the best practice for various purchasing activities among the separate entities.

Moreover, processes can also be useful when aligning the PSO with surrounding functions within a firm. Proper cross-functional alignment towards the goal of creating supply chain resilience would, overall, allow the case company to improve the previously mentioned capability of collaboration as described by Pettit et al. (2010). This description of the importance of collaboration is consistent with Bals et al. (2018) that describe that for a PSO the cross-functional alignment enables the efficient transfer of information. In the empirical findings, this importance of information flows between functions was showcased by several respondents from surrounding departments who stated that they were affected by and affecting the purchasing functions. Hence, awareness and visibility of each other's operations were necessary. A concrete effort to improve the cross-functional collaboration that had been implemented at the case company was an S&OP process. This implementation aims to improve the visibility of the firm by more accurate forecasts which were deemed to be insufficient during the component crisis.

The aim of improving the resilience of the firm with the implementation of an S&OP process is confirmed by Dittfeld et al. (2020). The author described that an S&OP process can foster agility which is an essential capability during a crisis. Another initiative, as presented in the empirical findings, that is consistent with Dittfeld et al. (2020) was the implementation of a task force during the component crisis. Thus, it was described in the beginning as being not so efficient but due to iterative reconfiguration is now considered an overall successful initiative. This constitutes an example of how an organisation learn to adapt its operations to a dynamic environment which Pettit et al. (2010) describe as a capability that fosters resilience. Thus, it is important for a firm to formalise potential outcomes from this, learning by for example adopting successful processes, such as existed within the task force at the case company, in its daily operations moving forward.

Furthermore, an initiative that fosters cross-functional collaboration which emerged in the literature and the empirical findings was the introduction of dedicated roles to handle the interface between two functions. In the empirical findings the SQA role was discussed which should handle the interface between the purchasing and quality functions, whereas van Weele et al. (2019) discussed it in the context of R&D. Overall, this approach would be suitable for interfaces that strongly influence the performance of the PSO. For instance, as shown in the empirical findings, firms whose core competence is maintaining high-quality products may benefit from introducing such a role in the interface between the PSO and quality function. Besides that, it could also be beneficial to, during a crisis, apply such roles in interfaces that are vital to mitigate disruptions. For instance, the empirical findings describe how an effort by the R&D function was to redesign in order to avoid problematic components. During such efforts, a dedicated role with the responsibility to handle the related information transfer between the functions could be beneficial.

### **5.3 Pursuing purchasing corporate coherence: Organising the PSO at macro level**

As concluded in the empirical findings, the current purchasing corporate coherence is rather low. Mainly due to there not being much communication between the sites in the group. Some exchange of processes has however been occurring, which could be seen as a start to the work of creating coherent processes at the sites. Standardisation may, as previously mentioned, lead to potential gains and improved controlling. Better control may also stem from the level of de/centralisation of the company's PSO.

The PSO of the case company currently has a decentralised structure where all sites are self-governed. A decentralised structure does according to Baily et al. (2015) allow for supplier efficiency especially within manufacturing, as having a purchaser on site to handle internal and external circumstances has value for the operations. However, a decentralised structure has its drawbacks such as less control and may cause situations where the separate sites inflate prices for each other (Baily et al.,

2015; Bals et al., 2018). This could lead to the conclusion that companies should centralise its PSO's. However, centralisation does come with drawbacks that may directly hurt some of the other resilience capabilities. As presented in the empirical finding, the company is very agile and flexible with quick decision-making, which constitutes an example of such capabilities that may deteriorate due to centralisation. According to Bals et al. (2018), a centralised purchasing structure has a higher level of control and efficiency but lower flexibility and customer-service than a decentralised structure. This trade-off must therefore be weighed between each other, to fit with the company's goals and what capabilities are sought after to create resilience.

A company must however not have a fully centralised or decentralised PSO. Instead, there is a scale between the two with various hybrid structures in between. A hybrid structure allows companies to achieve the benefits from both types of structures according to Baily et al. (2015). How the hybrid function is setup up may however be in any way that best fits the PSO of the company. The coordination of a hybrid structure may either be enforced by top-management, central-led, or by the sites themselves, federally local-led (Rozemeijer et al., 2003). Due to the power dynamic of a parent company and subsidiaries, a central-led hybrid organisation may be the simplest to implement. However, it is important from a cultural perspective to include the subsidiaries in the process and to allow them some self-governance according to Sasaki and Yoshikawa (2014), as a more isolated subsidiary may provide benefits to the company. This is consistent with the empirical findings where respondents saw the removal of autonomy from the subsidiaries as a negative since it may cause anxiety and confusion within the company. Therefore, it is important to make sure to allow some levels of self-governance while still implementing some form of central-led management of functions to gain control and efficiency.

The macro-levels as presented by Bals et al. (2018) can be used to design the hybrid structure which best suits the given company. As presented in the empirical findings, the case company utilises a structure based on categories, with each commodity purchased constituting a category. When in a post-merger integration phase, a structure based on categories needs to reflect the categories at all sites within the group to be beneficial. A category-based structure simply categorises all purchased materials, leading to simpler comparing of purchased materials and hence, makes it easier to capture potential synergies. Hence, increasing the purchasing corporate coherence. The synergies may be acted upon by strategic initiatives such as pooling of demand and by introducing a position of global category manager, who will easier be able to control the commodity. Currently, the PSO structure at the company is, in theory, based on activity as well. However, the empirical finding showed that both employees with the title of strategic and tactical buyer are closer to what van Weele et al. (2019) calls tactical buyers in the three levels of purchasing. Therefore, clearer formalisation of the division of activities between the three levels would allow for a larger focus on especially strategic tasks, which as described in the empirical findings, constitute a risk to put to the side.

A further macro-level in the framework presented by Bals et al. (2018) is geography. The geographical placement of resources allows the company to place resources where they may capture the most advantages according to den Butter et al. (2008). As shown in the empirical findings, the buyers at the parent company identified the need for tactical purchasers to be at each separate site to handle the daily operations. This is consistent with the value added by allowing some level of self-governance according to Sasaki and Yoshikawa (2014). Having some activities decentralised geographically while simultaneously having some more centralised, would be another way to gain the advantages of both types of structures. Resulting in a more simply defined hybrid structure as that presented by Baily et al. (2015). The post-merger integration and having resources spread geographically allows the development of multiple capabilities presented by Pettit et al. (2010), such as dispersion, flexibility in order fulfilment and capacity.

In the empirical findings, it was concluded that the PSO is not able to fully create resilience on its own as it is dependent on other functions for some capabilities. However, according to Schiele (2007), the PSO's ability to influence other departments increase as the purchasing maturity of the function increases. Therefore, the design of the PSO may directly influence the level of resilience created not only from the purchasing function but also from other functions within a company.



# 6

## Conclusion

The purpose of the thesis has been to explore how a PSO within a firm in the electronic industry, in a post-merger phase, can contribute to the creation of resilience within the supply organisation. To fulfil the purpose of the thesis literature concerning resilience and purchasing was studied and resulted in the development of the framework, as presented in Figure 2.8. This framework describes what factors to consider when structuring a PSO to contribute to resilience. The data collection process consisted of a single case study where semi-structured interviews was used. Based on the mentioned framework, data from the case company was collected and analysed in order to fulfil the purpose of the thesis. The analysis process resulted in three major areas that are important to consider for firms in a similar context. These three areas are creating control over the operations at the PSO, improving the collaboration within the firm by formalising processes and finding an optimal structure of the PSO at the macro-level in order to capture purchasing synergies.

### 6.1 Practical implications

Controlling the operation at a PSO constitutes an essential feature in both post-merger integration and in the pursuit of resilience. Concerning the former, controlling enables the PSO to set integration targets, measure their fulfilment, and based on that determine the success of acquisitions. Concerning the latter, it plays an essential role when building an organisation that should be able to absorb disruptions, by considering the level of resilience against related costs in addition to facilitating informed decision-making.

Furthermore, controlling requires a certain level of visibility of the internal and external environment. It provides crucial knowledge about operating resources in the supply chain and the surrounding environment, enabling the implementation of proactive and reactive measures by the PSO to increase resilience within the supply organisation. Thus, a prerequisite for achieving sufficient visibility is a trustful collaboration with actors in the supply chain and efficient usage of technology. Trustful collaboration is needed to reach mutual information sharing, whereas IT systems facilitate simulations of the operations by informed decisions can be made. The usage of technology can also be important during post-merger integration, through the development of an IT backbone, in order to align the operations of the separate entities.

The second area to focus on for a PSO in a post-merger phase that pursues resilience is to formalise processes since it can facilitate collaboration between the parent company and the subsidiaries, as well as between functions. Because formalised processes in the form of policies are important when managing operations effectively. The development of common processes is considered important in post-merger integration, where a central-led collaboration is assessed to be necessary to determine which processes to implement. The processes that a PSO should formalise address various supplier management activities which are particularly important for collecting information about the external environment. Especially, a well-defined sourcing strategy and supplier selection process are essential to avoid risks and ensure efficiency. Also, the implementation of cross-functional processes such as S&OP and the introduction of dedicated roles at interfaces between functions can enhance collaboration and improve the firm's ability to adapt to a dynamic environment.

Thus, it can be challenging to formalise processes in complex environments since the handling of complex purchased products may be hard to standardise. Hence, this leads to persons at the PSO needing to specialise in the handling of complex products. Such overall high dependency is, from a resilience perspective, undesirable and to the extent possible should be avoided by a dispersion of the execution of purchasing activities. This shows that exists a trade-off between formalisation and flexibility within an organisation. While formal processes can improve resilience capabilities, they may decrease organisational flexibility and agility.

The final important area to focus on is to find an optimal PSO structure on a macro-level to be able to capture synergies and increase purchasing corporate coherence. The structure of a PSO in terms of the macro-levels, geography, activity, and category has a direct impact on a company's level of supply chain resilience. By changing the structure, the firm can modify its capabilities to better respond to the vulnerabilities that it faces. Choosing different geographical structures for different activities is a way to gain the benefits of decentralisation such as flexibility while simultaneously gaining the control offered by a more centralised structure. However, companies must also have cultural and softer aspects in mind as well. Especially when deciding on how to manage the newly acquired subsidiaries. If too harsh of a line is chosen, it may create anxiety at the subsidiaries lowering their efficiency and outputs. Therefore, the integration of subsidiaries into the group must be done cautiously and systematically to make sure that the possible synergies and benefits are captured.

## 6.2 Delimitations and future research

This thesis contributed to research with an understanding of how a firm in the electronic industry should pursue resilience in a post-merger integration. In future research the scope should be widened to include other industries besides the electronics industry. As this thesis was limited to only one industry, the thesis may not have captured all factors generally applicable at companies in other industries. The electronics industry is a unique industry due to both its complexity and dynamism. Due to the unique context, the results may therefore be skewed, highlighting some factors that in other industries may not matter as much. With the inclusion of other industries, the developed framework may be further adapted to be more generally applicable for the creation of PSO's that foster supply chain resilience in all sectors.

In addition, the generalisability of the result is also limited due to the usage of a single case study in the data collection process. Since provisional coding was used, the data collection process guided the direction of the thesis. If relevant aspects are not present for the selected case company, there is a possibility that significant factors for companies in the electronic industry might have been overlooked. Especially important in future research would be to include additional companies with varying sizes in order to increase the generalisability of the conclusions.

A factor that was assessed to overall capture what factors that influenced the performance of a PSO was purchasing maturity, consisting of several subfactors. The purchasing maturity factor is in the literature, by for instance Schiele (2007), described by defining various stages among several dimensions along which a PSO can be located. Therefore, in future research it should be possible to more systematically examine how a firms position in such purchasing maturity framework correlate with various resilience performances.

Furthermore, an area to conduct future research in is how the recent development of large languages models will impact the operations within a PSO. This subject emerges in the empirical findings whereas the conclusion of this study is not based on the impact of such capabilities on a PSO. Hence, a wider implementation of large language models in systems utilised in business is likely to influence the condition under which a PSO operates. Future research in this area would consequently be interesting.



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# A

## Appendix

### A.1 Interview template – Questions to people at the purchasing function

#### Introduction

1. What is your name and title?
2. What is your educational and professional background?
3. How would you describe your position? What different tasks do you perform?
4. How many years have you been with the company and in this position?

#### The current structure of the purchasing department

5. What is the current structure of the purchasing department? Describe.
  - (a) On company level
  - (b) On this specific site
6. What is your overall satisfaction with today's organizational structure? And why?
  - (a) Procurement at your site?
    - i. Main strengths?
    - ii. Main weaknesses?
  - (b) The interplay between your site and other sites?
    - i. Main strengths?
    - ii. Main weaknesses?
7. How do you see the purchasing function's role in the coming growth journey and mergers?

#### Purchasing activities - Strategic and tactical purchasing

8. Are you involved in deciding sourcing strategies? E.g., global/local, single/-multiple/sole/dual sourcing.
9. Are strategic and tactical purchasing activities conducted by the same employees?
10. Would a separation of strategic and tactical activities leverage synergies?

#### Purchasing activities - Tactical and operative purchasing

11. Are operative and tactical purchasing activities conducted by the same employees?
12. Would a separation of operative and tactical activities leverage synergies?

**Purchasing activities - Tactical and operative purchasing**

13. Do you follow a standardized and formalized procedure for purchasing? Or is it depending on the person?
  - (a) Strategic purchasing (e.g., category strategies, supplier market analysis)
  - (b) Tactical purchasing (e.g., contract management)
  - (c) Operative purchasing
14. Does these originate from group level or on this specific site?
15. Are purchasing activities split in an optimal way?

**Purchasing activities - Supporting IT-systems**

16. Do your purchasing functions utilize the same IT systems as other functions at your sites?
17. Do your purchasing functions utilize the same IT systems as the other sites?
18. What do you base your decisions? What information do you need?
19. How is the performance of the purchasing functions measured and controlled?

**Interface with other departments**

20. How are you affected by decisions at ... ?
  - (a) RD
  - (b) Production
  - (c) Quality
  - (d) Planning
  - (e) Product office
  - (f) Top management

**Collaboration between sites**

21. Does collaboration across sites work well? What kind of communication is currently occurring?
22. Are suppliers approached by more than one purchaser? With other words, do multiple contracts with a supplier exist?
23. Do you buy the same components across sites?
24. Do some purchases require a high degree of expertise?
25. Does it exist value to have a local purchaser on-site?
  - (a) Conducting strategical purchases
  - (b) Conducting tactical purchases
  - (c) Conducting operative purchases
26. Which activities could be done remotely according to you?
27. Which activities could not be done remotely according to you?

**Company culture**

28. Does it exist a special culture at your company? If so, can you describe the culture?
29. How do you think it impact today?

**Resilience***Before the disruption*

30. What types of security do you use to protect against disruptions?
31. When was the disruption first identified?
32. How was the disruption first identified?
33. Did you have any warning?
34. Who was the first to identify the problem?

*During the disruption*

35. How has your department experienced the period of shortages?
36. What was the initial response?
37. Was this successful? Or did it make the problem worse?

*Causes*

38. Have you to analyze the root cause of this disruption?
39. How was this cause related to:
  - (a) characteristics of your products?
  - (b) the production processes?
  - (c) the distribution network?
  - (d) something specific in the interface between your department and the purchasing function?

*External actors – suppliers and customers*

40. How can your suppliers help you to be prepared for a disruption?
41. How can your suppliers help you respond to an event?
  
42. How can you help your suppliers to be prepared for a disruption?
43. How can you help your supplier respond to an event?
  
44. How can your customers help you to be prepared for a disruption?
45. How can your customers help you respond to an event?
46. Have your customers demanded resilience? Or have they started to do it?

*After the disruption*

47. What did your company learn from this disruption?
48. How has the purchasing department's position within the company been affected by the shortage crisis?
49. Besides shortages, what other vulnerabilities for your company can you identify?
  - (a) Something specific in the interface between your department and the purchasing function?
50. According to you and your department, what measurements should be implemented to prepare for a similar situation in the future?
  - (a) Something specific in the interface between your department and the purchasing function?

**Additional open questions**

51. Do you have any further recommendations for us that have not been mentioned during the interview?

## **A.2 Interview template – Questions to people at departments with interface to the purchasing function**

### **Introduction**

1. What are your name and title?
2. What is your educational and professional background?
3. How would you describe your position? What different tasks do you perform?
4. How many years have you been with the company and in this position?

### **The current structure of your department**

5. Describe the structure of your department. What is the structure based on?

### **Acquisitions**

6. How has your department been affected by the acquisitions?
7. What level of integration with the subsidiaries is occurring that impacts your department?
8. What level of integration with the subsidiaries is planned concerning your department?
9. According to you, what is needed in the integration?
  - (a) Before integration
  - (b) During integration
  - (c) After integration

### **Interface with purchasing departments**

10. How are you affected by the decision at the purchasing department?
11. How is the purchasing department affected by the decision at your department?
12. Who at the purchasing department do you have contact with?
  - (a) Strategic/tactical/operative purchaser
13. Where do you see the main strengths in the interface between the purchasing and your department?
14. Where do you see the main weaknesses in the interface between the purchasing and your department?
15. How has the purchasing department's position within the company been affected by the shortage crisis?
16. Do your department and the purchasing functions utilize the same IT systems?
17. Does any cross-functional planning occur in order to coordinate the operations?
  - (a) With the purchasing function
  - (b) Or with other functions e.g., production, quality, sales, RD.
  - (c) Are main suppliers/customers included?

### Company culture

18. Does it exist a special culture at your company? If so, can you describe the culture?
19. How do you think its impact today?

### Resilience

#### *Before the disruption*

52. What types of security do you use to protect against disruptions?
53. When was the disruption first identified?
54. How was the disruption first identified?
55. Did you have any warning?
56. Who was the first to identify the problem?

#### *During the disruption*

57. How has your department experienced the period of shortages?
58. What was the initial response?
59. Was this successful? Or did it make the problem worse?

#### *Causes*

60. Have you analysed the root cause of this disruption?
61. How was this cause related to:
  - (a) characteristics of your products?
  - (b) the production processes?
  - (c) the distribution network?
  - (d) something specific in the interface between your department and the purchasing function?

#### *External actors – suppliers and customers*

62. How can your suppliers help you to be prepared for a disruption?
63. How can your suppliers help you respond to an event?
  
64. How can you help your suppliers to be prepared for a disruption?
65. How can you help your supplier respond to an event?
  
66. How can your customers help you to be prepared for a disruption?
67. How can your customers help you respond to an event?
68. Have your customers demanded resilience? Or have they started to do it?

#### *After the disruption*

69. What did your company learn from this disruption?
70. How has the purchasing department's position within the company been affected by the shortage crisis?
71. Besides shortages, what other vulnerabilities for your company can you identify?

- (a) Something specific in the interface between your department and the purchasing function?
- 72. According to you and your department, what measurements should be implemented to prepare for a similar situation in the future?
  - (a) Something specific in the interface between your department and the purchasing function?

**Additional open questions**

- 73. Do you have any further recommendations for us that have not been mentioned during the interview?



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