Doctoral Thesis

Sourcing Strategising in the New Product Development Process

Insights from the Strategy-as-Practice Lens and Engineer-to-Order Context

Ewout Reitsma

JÖNKÖPING UNIVERSITY
Jönköping International Business School

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We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time

T. S. Eliot

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Abstract

In many cases, manufacturers have changed from sourcing only a few, simple, and separate components from local suppliers to sourcing a high variety of modules from globally dispersed suppliers. This has resulted in the implementation of a wide variety of sourcing strategies, including, for example, multiple sourcing and supplier integration. All these and other sourcing strategies are aimed at achieving a certain level of supply chain (SC) responsiveness. The level of SC responsiveness ideally matches the characteristics of a product. For example, highly innovative products typically require highly responsive SCs.

In order to match products with their SCs, manufacturers are advised to engage in sourcing strategy in their new product development (NPD) process. However, there are at least two knowledge gaps in the literature on this topic: (1) the lack of a widely accepted, comprehensive conceptualisation of how manufacturers can engage in sourcing strategy in NPD, and (2) the lack of empirical insights into manufacturers operating in the engineer-to-order (ETO) context. This dissertation focuses on filling these knowledge gaps.

Addressing the first gap, the dissertation uses the theoretical lens of 'strategy-as-practice' (SAP) and the literature to conceptualise the 'doing of sourcing strategy' in NPD as three interrelated dimensions: (1) practitioners, (2) activities, and (3) practices. Through discussing these dimensions and their potential interplay throughout NPD, the dissertation demonstrates the potential of the SAP lens in providing a common framework and reducing the fragmented nature of the literature. By using the SAP lens, the dissertation also contributes to practice. Despite not being 'actionable' in the sense of constituting detailed guidelines for acting, the SAP lens produces insights that can help practitioners to become more reflective. For example, they can learn to see sourcing strategising as a multidimensional, dynamic concept and the place it can occupy in the NPD process.

The second knowledge gap in the literature regards the lack of empirical research focusing on the ETO context. Therefore, the dissertation includes a case study focusing on practitioners' sourcing strategising *activities* and *practices* in this context. First, five approaches to performing sourcing strategising activities in NPD are explored in terms of their conditions and intended outcomes. Secondly, four practices that can support sourcing strategising in NPD are identified. These practices – referred to as 'Design for Supply Chain' (DFSC) practices – are also examined in terms of their interrelations. Practitioners can use the case study findings to compare the advantages of the five sourcing strategising approaches when sourcing items or services. Furthermore, the findings allow practitioners to assess how the four interrelated DFSC practices can support their sourcing strategising efforts in NPD.

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List of Key Abbreviations

DFSC	Design for Supply Chain
ETO	Engineer-to-order
NPD	New product development
OM	Operations management
PSM	Purchasing and supply management
R&D	Research and development
SAP	Strategy-as-practice
SC	Supply chain
SCM	Supply chain management
SLR	Systematic literature review

1   Introduction

This introductory chapter first describes the background of the research presented in the dissertation. Then, based on knowledge gaps in the literature, the aims and questions of the dissertation research are formulated. The chapter concludes by describing the scope and providing an outline of the dissertation.

1.1   Background

Manufacturing supply chains (SCs) have become increasingly complex due to globalisation, outsourcing, modularisation, shorter product life cycles, and an explosion in product variety (Christopher et al., 2004; Doran et al., 2020; Wynstra et al., 2003). In many cases, manufacturing companies (hereafter referred to as 'manufacturers') have changed from sourcing only a few, simple, and separate components from local suppliers to sourcing a high variety of modules from globally dispersed suppliers (Handfield et al., 2020; van Hoek, 2020).

This development has made manufacturers vulnerable to supply disruptions. For example, the Swedish home furniture manufacturer IKEA faced SC challenges due to the COVID-19 pandemic (BBC, 2021). IKEA uses suppliers in Asia that are dependent on container ships for distributing their products to warehouses across the globe. The pandemic-induced lockdowns led to container ships being taken out of service, resulting in an overall reduction in shipping capacity. This caused massive bottlenecks at ports and low product availability at IKEA stores. As another example, the 2011 earthquake in Japan caused supply disruptions for manufacturers across the globe (Hookway & Poon, 2011). This required affected manufacturers to reconstruct their SCs and search for new suppliers for components that were previously sourced from Japan.

These and many other examples (e.g. Brexit, the war in Ukraine) have made sourcing strategy an important focus area for manufacturers (Handfield et al., 2020; Linton & Vakil, 2020; van Hoek, 2020). As an essential component of SC management, sourcing strategy is aimed at maximising the value of sourced items (e.g. components, modules) or services (e.g. research and development, manufacturing operations) (Anderson & Katz, 1998; van Hoek & Thomas, 2021). Specifically, sourcing strategy can improve product quality, reduce costs, shorten delivery times, and improve the overall competitiveness of a manufacturer (Faes & Matthyssens, 2009; Kern et al., 2011). Furthermore, even though supply disruptions may be unavoidable, sourcing strategy can at least reduce their negative consequences (Jain et al., 2022).

For example, the 2000 fire in New Mexico destroyed a manufacturing plant responsible for supplying components to both Nokia and Ericsson (Latour, 2001). Due to the consequent supply shortages, Ericsson lost sales worth 390 million

dollars and the market share dominance shifted to Nokia. Compared to Ericsson, Nokia was much less affected by the supply disruption due to being able to source components from alternative suppliers. This example shows that manufacturers can protect themselves against supply risks by sourcing from multiple suppliers – a strategy known as 'multiple sourcing' (Treleven & Schweikhart, 1988).

Apart from multiple sourcing, many more sourcing strategies exist, including, for example, supplier integration (So & Sun, 2010), global sourcing (Monczka & Trent, 1991), and single sourcing (Spekman et al., 1994). One of the main challenges in implementing these and other sourcing strategies is achieving the 'right' level of responsiveness to customer needs (Richey et al., 2021). In the context of this dissertation, responsiveness is defined as *"the ability to react purposefully and within an appropriate timescale to customer demand or changes in the marketplace"* (Holweg, 2005, p. 605).

But what level of responsiveness should be achieved? Fisher (1997) suggests that the answer to this question depends on the product that flows – or will flow – through the SC. For example, the level of responsiveness ideally matches the innovativeness of a product. This means that products with low levels of innovativeness (e.g. toothbrushes) require a highly efficient SC, with minimal waste and loss, while retaining the ability to adapt to unexpected delays (Fisher, 1997). Alternatively, products with high levels of innovativeness (e.g. new computer chips) require a highly responsive SC, with minimal shortages, while retaining the ability to minimise stocked inventory (Fisher, 1997).

Matching a product with its SC requires engaging in sourcing strategy in the process of new product development (NPD) (Dowlatshahi, 1996; Fine et al., 2005; Melnyk et al., 2014). (The terms 'NPD' and 'NPD process' are used interchangeably throughout the dissertation.) Since the success of a product over its life cycle is dependent on decisions made in NPD (Whitney, 1988), failing to adequately engage in sourcing strategy in NPD may lead to problems such as low product performance, low SC performance, and ultimately market failure (Browning & Ramasesh, 2007; Dowlatshahi, 1996).

The causes of these problems can be demonstrated with an example. Consider the following situation: a new product is designed based solely on customer needs, thus independently of a desired sourcing strategy. After the new product has been designed, upstream SC operations are ramped up and examined for their level of responsiveness. If the performance of these operations is not within acceptable limits, the design of a product may need to be revised until satisfactory performance is achieved. However, towards the end of NPD, it is not always possible to make product design changes. For example, strict NPD deadlines may prevent exchanging scarce components for ones for which there is abundant supply. In the long term, this can result in unnecessarily long delivery times and high product costs, due to dependency on a few expensive suppliers with low inventory levels (Dowlatshahi, 1992; Gokhan et al., 2010; Mather, 1992).

Sony's PlayStation 5 (PS5) is a real-life example of the possible negative consequences of inadequately engaging in sourcing strategy in NPD. During an earnings release in May 2022, Sony stated that it was unable to provide PS5 units

to customers on a timely basis, mainly due to low levels of component inventory in China. This led to a situation where the demand for the PS5 outpaced its supply, and Sony was forced to cut its sales forecast. Furthermore, in order to resolve the supply shortages, Sony had to change its source of supply and exchange scarce PS5 components for ones for which there was more supply.

These examples indicate that manufacturers can benefit from knowledge on how to engage in sourcing strategy in NPD. The next section provides a brief overview of the knowledge that the literature has created on the topic and identifies two gaps in this body of knowledge.

1.2   Gaps in the Literature on Sourcing Strategy in NPD

The literature on how manufacturers can engage in sourcing strategy in NPD has two main focus areas: (1) early supplier involvement and (2) early sourcing involvement.

The literature on early supplier involvement research reveals how suppliers can be involved and contribute to a manufacturer's NPD process (Mikkelsen & Johnsen, 2019; Suurmond et al., 2020). For example, Bidault et al. (1998, p. 719) define early supplier involvement as *"a form of vertical cooperation where manufacturers involve suppliers at an early stage in the product development/innovation process, generally at the level of concept and design"*. When involved early, manufacturers can leverage suppliers' insights and suggestions on how to improve the design of a new product (Dowlatshahi, 1998; McIvor & Humphreys, 2004). For example, suppliers may have the knowledge and expertise needed to design items that are competitively important (Monczka & Trent, 1991).

The literature on early supplier involvement also emphasises the importance of selecting suppliers with the ability to contribute to NPD (Petersen et al., 2005; Song & Di Benedetto, 2008). For example, suppliers involved in product design *"must contribute to product design and have technical, engineering, and design capabilities better than the buying company"* (Monczka & Trent, 1991, p. 9). Suppliers' technical capabilities are of particular importance when NPD is associated with technological uncertainty (Song & Di Benedetto, 2008; Wasti & Liker, 1997). Ultimately, early involvement of the 'right' suppliers can improve product quality, as well as reducing the time to market and NPD costs (Mikkelsen & Johnsen, 2019; Monczka & Trent, 1991). (See Suurmond et al. (2020) for a meta-analysis of the relationship between early supplier involvement and NPD performance.)

Alternatively, the literature on early sourcing involvement reveals how the sourcing function can be involved and contribute to the NPD process (Picaud-Bello et al., 2022). For example, Wynstra et al. (2000, p. 65) define the involvement of the sourcing function in NPD as *"contributing knowledge, taking part in managerial processes, and participating in decisions with regard to*

product development from a perspective of purchasing". Furthermore, the sourcing function can identify *"critically purchased items or those requiring early supplier design involvement and selection. This includes the identification of items for which there are specific design or timing requirements"* (Monczka & Trent, 1991, p. 9).

Factors such as product complexity and technological uncertainty affect the extent to which the sourcing function is involved in NPD (Lakemond et al., 2001; Mikkelsen & Johnsen, 2019). For example, NPD characterised by high product complexity may involve dedicated, full-time sourcing specialists in combination with a sourcing coordinator (Lakemond et al., 2001). Ultimately, early involvement of the sourcing function in NPD can lead to several benefits, including:

- The sourcing function can provide information about the availability, quality, and reliability of suppliers to the research and development (R&D) function (Burt & Soukup, 1985).
- The sourcing function can increase the commercial feasibility of new products by collecting supply market data and obtaining technical feedback from suppliers (Schiele, 2010).
- The sourcing function can facilitate the involvement of suppliers in NPD (Luzzini et al., 2015).
- The sourcing function can contribute to technology selection as a sparring partner of the R&D function (Mikkelsen & Johnsen, 2019).
- The sourcing function can facilitate the absorption of supplier knowledge by obtaining knowledge from suppliers and sharing this knowledge with the R&D function (Picaud-Bello et al., 2022).

Even though the literature on sourcing strategy in NPD is well established (Mikkelsen & Johnsen, 2019), it has at least two knowledge gaps.

The first knowledge gap concerns the theoretical underpinnings of the literature. Scholars draw on a diverse range of theoretical lenses, including transaction cost economics (Petersen et al., 2005; Wasti & Liker, 1997), the resource-based view (Kaufman et al., 2000; Takeishi, 2001), resource dependency theory (Swink, 1999; van Echtelt et al., 2008), and absorptive capacity (Picaud-Bello et al., 2022). It is also worth noting that, while early research was primarily empirical and lacked theoretical foundations (e.g. Clark, 1989; Cusumano & Takeishi, 1991), using theoretical lenses has become the norm in recent research (Giunipero et al., 2019).

Due to the theoretical diversity underlying the literature, there is a lack of a widely accepted, comprehensive conceptualisation of how manufacturers can engage in sourcing strategy in NPD. Scholars often propose their own conceptualisations, and these tend to be both limited in scope and hard to integrate with one another. This makes it difficult to synthesise individual research findings into a coherent body of knowledge. As argued in this dissertation, the theoretical lens of 'strategy-as-practice' (SAP) – which has shaped strategy research over the

last few decades (Jarzabkowski & Spee, 2009; Kohtamäki et al., 2022; Whittington, 1996) – can help overcome the fragmented nature of the literature. The power of this lens lies in the ability to create knowledge of the activities and practices by which practitioners engage in sourcing strategy in NPD.

Despite the practice-oriented nature of the literature on sourcing strategy in NPD, it has thus far neglected the SAP lens. This is surprising, given SAP's focus on the activities and practices through which rather abstract strategic ideas or objectives are interpreted and enacted by practitioners who, in turn, shape and develop these ideas in the situated contexts of organisations (Jarzabkowski et al., 2007; Whittington, 2006). The increased focus on the micro-dynamics of strategy work has led to SAP research replacing the noun 'strategy' with the verb 'strategising'. This indicates that there is an opportunity to conduct research on 'sourcing strategising' instead of 'sourcing strategy'. Such research could explore what actually takes place in the 'doing of sourcing strategy' in NPD. Ultimately, this would provide a common language and understanding of the who, what, and how of sourcing strategising in NPD.

The second knowledge gap in the literature relates to its empirical context. Scholars do not always disclose the manufacturing context under investigation (e.g. Ragatz et al., 2002) and often explore more than one manufacturing context in a single study (e.g. Petersen et al., 2005; Song & Di Benedetto, 2008). Most of those who do disclose context information focus on manufacturers from automotive (e.g. Aoki & Staeblein, 2018; Clark, 1989; Kamath & Liker, 1994; Takeishi, 2001) and computer (e.g. Eisenhardt & Tabrizi, 1995; Graves & Willems, 2005; Lee & Sasser, 1995; van Echtelt et al., 2008) industries. These two manufacturing contexts are probably mostly represented, due to being characterised by vertical integration, standardisation, outsourcing, high volumes, and relatively short product life cycles.

This implies that the literature tends to neglect manufacturers operating in the engineer-to-order (ETO) context (Gosling et al., 2020a, 2020b; Suurmond et al., 2020). However, findings from research focusing on high-volume, standardised contexts may not be directly applicable to the ETO context (Cannas & Gosling, 2021). This context involves low-volume, engineering-intensive products, such as gas turbines and advanced aerospace systems (Hobday, 2000; Hobday et al., 2000; Willner et al., 2016). Products are engineering-intensive, due to being customised to the requirements of individual customers and other stakeholders (e.g. governments, regulatory bodies, end-users) (Gosling & Naim, 2009; Willner et al., 2016).

Customisation typically requires manufacturers to source a large variety of distinct items and services from suppliers (Hobday, 2000; Willner et al., 2016). This poses risks for manufacturers, due to outsourcing increasing the chances of SC disruptions and financial penalties for missing customer deadlines (Inman & Blumenfeld, 2014; Vachon & Klassen, 2002). As a result, the sourcing challenges in the ETO context may be different from those in more standardised contexts (Gosling et al., 2020a, 2020b; Seth & Rastogi, 2018). Thus, there is a need for

research exploring the extent to which findings from the literature on sourcing strategy in NPD may be applicable to the ETO context.

1.3   The Research Aims and Questions

Grounded in the motivation to address the two knowledge gaps identified in the preceding section, the aim of the research presented in this dissertation is twofold. The first aim is to develop a conceptual framework of sourcing strategising in NPD. Achieving this aim involves using insights from the SAP lens. Guided by the conceptual framework, the second aim is to compare the literature on sourcing strategy in NPD with findings from the ETO context. Therefore, the second aim builds on and enhances the findings of the first aim. Its achievement requires empirical data providing insights into how sourcing strategising can unfold in the NPD process of manufacturers operating in the ETO context.

The aforementioned gaps in the literature on sourcing strategy in NPD thus prompt an examination of the following research questions (RQs):

- RQ1: How can sourcing strategising in the NPD process be conceptualised through the theoretical lens of SAP?
- RQ2: How can sourcing strategising unfold in the NPD process of manufacturers operating in the ETO context?

1.4   Scope of the Research

The overarching research topic addressed in this dissertation is sourcing strategising in the context of a manufacturer's NPD process. This implies a focus on manufacturers that are 'NPD process owners', and thus responsible for developing, documenting, improving, and deploying the NPD process (Griffin, 2002). Moreover, while a manufacturer's SC involves suppliers and customers, this dissertation adopts the manufacturer's point of view. The suppliers' and customers' point of view is, therefore, beyond the dissertation's scope.

Set in a manufacturing context, the dissertation's research focuses on physical products, and Cooper's (1994, 2008, 2014) stage-gate model is used to define NPD. Section 2.2 provides an example of such a model and discusses NPD in more detail. In the NPD process, there is a specific focus on the 'doing of sourcing strategy'. This implies a focus on manufacturers that source items and services from suppliers during NPD. These suppliers can be internal (i.e. within organisational boundaries) or external (i.e. beyond organisational boundaries).

Sourcing strategy is a concept that focuses on ensuring the reliable provision of items and services from upstream suppliers. Therefore, the research belongs to the field of purchasing and supply management (PSM), and Section 2.1 discusses this field in more detail. It should also be made explicit that the dissertation does

not focus on instances of sourcing strategising occurring before or after the NPD process.

The dissertation conceptualises sourcing strategising in NPD through the theoretical lens of SAP. This lens, which has been increasingly used in strategy research during the last few decades (Kohtamäki et al., 2022), focuses on the practitioners, activities, and practices of strategising (Jarzabkowski et al., 2007; Johnson et al., 2003; Whittington, 1996). Chapter 3 discusses the SAP lens further, with particular emphasis on how it guides the research of this dissertation.

While the conceptual research of the dissertation (RQ1) is not limited to a specific manufacturing context, the empirical research (RQ2) only involves manufacturers operating in the ETO context. Even though some of the empirical results of the dissertation may be valid in other contexts as well, such as make-to-stock, the dissertation does not support this claim with evidence. Section 2.3 discusses the characteristics that distinguish the ETO context from other types of manufacturing contexts.

The empirical research is limited to incorporating practitioners' views regarding sourcing strategising in their organisation's NPD process. Hence, no attempt is made to quantify the relationship between instances of sourcing strategising and performance outcomes. The practitioners involved in the empirical research mainly originate from two organisational functions: R&D and sourcing. The dissertation focuses on these functions because they can both play a crucial role in sourcing strategising in NPD (Luzzini et al., 2015; Mikkelsen & Johnsen, 2019; Schiele, 2010).

Figure 1 summarises the scope of the dissertation research.
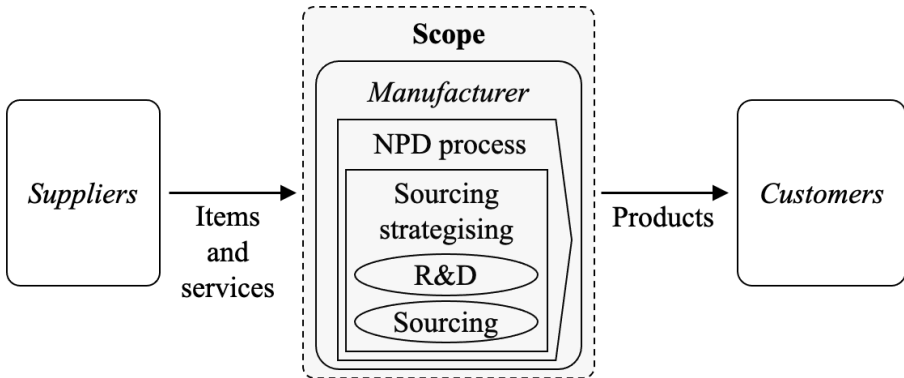
Figure 1 Scope of the Research

1.5   Dissertation Outline

This dissertation comprises a 'kappa' (i.e. summary and discussion) and four appended papers. The kappa consists of six chapters:

Chapter 1: Provides the background of the dissertation, formulates research aims and questions, and defines the scope and outline of the dissertation.

Chapter 2: Clarifies the key concepts of the dissertation, including sourcing strategy, the NPD process, and the ETO context.

Chapter 3: Introduces SAP as the theoretical lens of the dissertation and discusses its origin and key dimensions as well as how it contributes to conceptualising sourcing strategising in NPD.

Chapter 4: Discusses the methodology used for addressing the research aims and questions of the dissertation.

Chapter 5: Discusses the findings of the four appended papers to address the research aims and questions of the dissertation.

Chapter 6: Discusses the contributions of the dissertation, their limitations, and directions for future research.

The four papers forming the basis of the kappa are appended after Chapter 6. Together, they address the research aims and questions that were formulated in Section 1.3.

2 Clarification of Key Concepts

Before discussing the theoretical lens of SAP as well as how it can be used to conceptualise the 'doing of sourcing strategy' in NPD, this chapter clarifies the three key concepts that were introduced in the preceding chapter: (1) sourcing strategy, (2) the NPD process, and (3) the ETO context.

2.1 Sourcing Strategy

Strategy, in the context of this dissertation, can be defined as the stream of activities that characterises the match a manufacturer achieves with its environment and that constitutes a determinant for the attainment of its goals (Hofer & Schendel, 1987; Mintzberg & McHugh, 1985). Many different types of strategy are possible at different organisational levels and functions within a manufacturer. Similarly, many different types of strategy are discussed within different fields of research.

The dissertation focuses on sourcing strategy, which is a concept from the research field of purchasing and supply management (PSM). As shown in Figure 2, this field has its roots in, and is closely related to, two other fields – operations management (OM) and supply chain management (SCM). Therefore, before clarifying the concept of sourcing strategy, these research fields and their main strategic orientations require brief discussion.
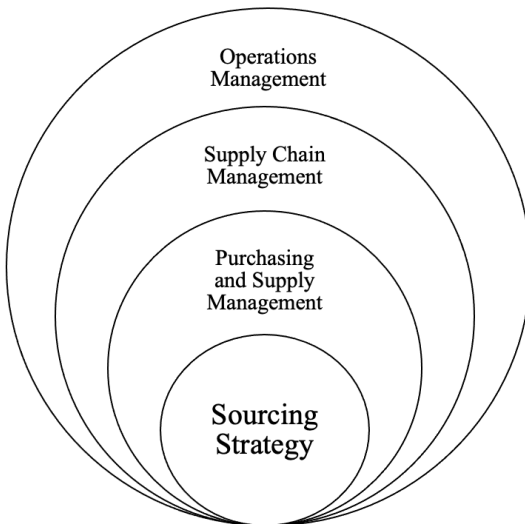
Figure 2 Positioning Sourcing Strategy as a Research Concept

OM is concerned with the fundamental activity of organisations – how they provide products to their customers (Slack et al., 2010). While OM traditionally concentrated on operations within the firm boundary, it has shifted its focus to operations beyond the firm boundary. For example, Slack et al. (2010) focus on inbound material flows and the interface with suppliers, as well as outbound material flows and the interface with customers.

OM focuses on operations strategy, which can be defined as the stream of activities that shape the role, objectives, and activities of operations and their contribution to overall corporate strategy, through the reconciliation of market requirements with operations resources (Skinner, 1969; Slack et al., 2010). Operations strategy is concerned with the relative prioritisation of objectives such as cost, flexibility, quality, dependability, and speed in relation to the firm's competitive strategy (Miller & Roth, 1994; Wheelwright, 1984). This involves making decisions regarding, for example, capacity, facilities, technology, workforce, and quality.

As a subfield within the broader field of OM, SCM examines three or more organisations involved in the upstream and downstream flows of products, services, finances, or information from suppliers to customers (van Weele & van Raaij, 2014). SCM is mainly concerned with the coordination of functions within and across organisations in an SC, for the purpose of improving the performance of the individual organisations and the SC as a whole (Giunipero et al., 2008; Mentzer et al., 2001).

SCM focuses on SC strategy, which can be defined as the stream of activities *"related to sourcing products, capacity planning, conversion of raw materials, demand management, communication across the supply chain, and delivery of products"* (Narasimhan et al., 2008, p. 5234). SC strategy is concerned with how organisations arrange and conduct themselves when interacting with other SC actors, in order to satisfy markets in the long and short terms (Harland, 1996; Harland et al., 1999). Therefore, SC strategy builds on and externalises the concept of operations strategy, to extend it to inter-organisation networks (Harland et al., 1999). When correctly formulated and executed, SC strategy improves the performance of the entire SC (Harland & Knight, 2001).

Having discussed the research fields of OM and SCM and their strategic orientations, the focus of the discussion now shifts to the PSM research field and its conceptualisation of sourcing strategy.

PSM is concerned with the management of external resources – goods, services, capabilities, and knowledge – necessary for running, maintaining, and managing the primary and support processes of a firm in the most favourable conditions (van Weele, 2010). Due to mainly focusing on the interaction with the upstream SC, PSM is a more focused field than SCM (Schoenherr et al., 2012). Still, PSM should fulfil this responsibility while considering the needs and interests of both internal functions and downstream customers (van Weele & van Raaij, 2014).

PSM has increasingly gained recognition as a field separate from OM or SCM. According to Spina et al. (2013), this is caused by trends such as outsourcing,

globalisation, and e-business. Times of difficult supply, such as wars and economic recessions, have further established PSM as a research field (Leenders & Fearon, 2008; van Hoek, 2021). For example, the economic recession and supply disruptions at the end of the 1970s put the management of the upstream SC high on the agenda of both practitioners and scholars (Kraljic, 1983; Porter, 1985). The COVID-19 pandemic may only have increased the relevance of PSM (Handfield et al., 2020; van Hoek, 2020).

In PSM, sourcing – also known as buying, purchasing, or procurement – has received considerable attention (Giunipero et al., 2019). Sourcing is concerned with finding, selecting, and contracting suppliers of items and services (van Weele, 2010). It concentrates on securing the supplies needed for the manufacturing of products that are delivered to customers (van Hoek & Thomas, 2021). Sourcing fulfils organisational buying needs by managing a supply base through interactions with suppliers in alignment with corporate goals (Giunipero et al., 2019).

Sourcing strategy is an essential concept of PSM (van Hoek & Thomas, 2021) and has varying definitions. Narasimhan et al. (2008, p. 4) define sourcing strategy as the stream of activities *"related to the acquisition of required materials and services to support the operational activities of a firm consistent with the overall corporate competitive strategy"*. Mikkelsen and Johnsen (2019) define sourcing strategy as the decisions regarding the number of suppliers used for buying particular items or services, the type of supplier relationship to pursue, the duration of contracts, and the location of suppliers. Monczka et al. (2016) define sourcing strategy as a systematic analysis of organisational purchase expenditures leading to opportunities for improved cost savings and supplier management.

A firm's sourcing strategy can vary greatly from one sourcing situation to another (Nollet et al., 2005). For example, sourcing strategy is dynamic and evolves throughout the SC life cycle stages, which include emergence, growth, maturity, and decline (MacCarthy et al., 2016). While technology and innovation are essential components of sourcing strategy during SC emergence and growth, enhanced efficiency is important when an SC matures (MacCarthy et al., 2016).

Reflecting both the varying definitions and the dynamic nature of sourcing strategy, PSM research covers a wide variety of specific sourcing strategies. Examples of these strategies include supplier integration (So & Sun, 2010), outsourcing (Linder et al., 2003), global sourcing (Monczka & Trent, 1991), multiple sourcing (Treleven & Schweikhart, 1988), and single sourcing (Spekman et al., 1994). The remainder of this section briefly discusses these sourcing strategies.

Supplier integration refers to using information systems for business process integration between a manufacturer and its supplier (So & Sun, 2010). This enables communication and information sharing as well as joint decision-making regarding customer demand, forecasts, inventory levels, and capacity planning. Supplier integration also enables suppliers to be selected based on relevant

measurements, and evaluating suppliers' capability of providing innovations that meet customer needs (So & Sun, 2010).

Outsourcing refers to contracting out certain activities to a supplier (Linder et al., 2003). This involves distinguishing 'core' from 'non-core' activities (Hamel & Prahalad, 1989), the latter often being seen as those activities that can be outsourced to a supplier (Miles & Snow, 1992). However, core activities could also be outsourced when a supplier improves the speed and quality of innovation and provides access to disruptive new ideas (Linder et al., 2003).

Global sourcing refers to integrating and coordinating sourcing requirements across worldwide business units, which involves looking at common items, processes, technologies, and suppliers (Monczka & Trent, 1991). The main reasons for global sourcing include offset requirements, lower prices, higher quality, technology access or access to new markets, shorter development lead times, and quicker product introductions (Bozarth et al., 1998). Manufacturers choosing this strategy often design products in one part of the world, manufacture them in another, and sell worldwide (Zeng, 2003).

Multiple sourcing refers to making two or more suppliers responsible for an item or service (Treleven & Schweikhart, 1988). During a supply disruption, this strategy allows a manufacturer to shift sourcing from suppliers that are affected by the disruption to other suppliers (Jain et al., 2022). Furthermore, multiple sourcing creates competition in the supply base, which motivates suppliers to make upfront investments that increase their manufacturing capacity (Jain & Hazra, 2017) and improve their ability to recover from disruptions (Iyer et al., 2005).

Single sourcing refers to making one supplier responsible for an item or service (Spekman et al., 1994). The strategy is termed 'sole sourcing' when a manufacturer cannot select more than one supplier, which occurs, for example, when a supplier has a monopoly (Treleven & Schweikhart, 1988). Single sourcing has several objectives, including increased loyalty between the manufacturer and its supplier, better purchasing conditions due to volume consolidation, reduced order lead times due to the supplier dedicating capacity to the manufacturer, and reduced complexity of transportation routes (Bozarth et al., 1998; Faes & Matthyssens, 2009; Spekman, 1988).

These examples show that sourcing strategy is traditionally conceptualised as something that manufacturers *have*, rather than as something that people *do*. Constituting a first attempt to shift focus to the latter, the research presented in this dissertation is guided by the SAP lens. Chapter 3 will discuss this lens in more detail, with particular emphasis on its origin, key dimensions, and how it can provide insights into the 'doing of sourcing strategy' in NPD.

2.2   The NPD Process

'The NPD process' is the second key concept of the research presented in the dissertation. First, 'NPD' refers to activities related to identifying customer needs

and creating products that meet these needs (Cooper & Kleinschmidt, 1986; Ulrich & Eppinger, 2016). Table 1 provides examples of such activities.

Table 1 Examples of NPD Activities (based on Cooper and Kleinschmidt, 1986)

NPD Activity	Description
Initial screening	Deciding whether to allocate funds to a new product idea.
Preliminary market assessment	An initial market assessment; a first and quick look at the market.
Preliminary technical assessment	An initial appraisal of the technical merits and difficulties of realising a new product idea.
Detailed market research	Marketing research, involving a reasonable sample of respondents, a formal design, and a consistent data collection procedure.
First business analysis	Evaluating the benefit, cost, and risk of designing a new product.
Product design	Product concept and detail design, resulting in a prototype or sample product.
In-house product testing	Testing the product in a lab or under controlled conditions.
Customer tests of product	Testing the product under real-life conditions.
Test market	Trying to sell the product to a limited or test set of customers.
Trial production	A trial production run to test the manufacturing processes.
Second business analysis	Evaluating the benefit, cost, and risk of a full-scale product launch.
Production ramp-up	The start-up of full-scale or commercial production.
Market launch	The full-scale or commercial launch of the new product.

Secondly, 'process' refers to a sequence of individual or collective activities unfolding over time in context (Pettigrew, 1997). It is a series of continuous or intermittent activities that are connected together with work flowing through these activities to produce an outcome (Bititci et al., 2011; Davenport, 1993; Davenport & Short, 1990).

Cooper (e.g. 1994, 2008, 2014) developed arguably one of the most influential NPD process models: the stage-gate model. The dissertation uses this model to provide a generic overview of the NPD process and its main activities. In the stage-gate model, stages reflect the points in time at which NPD activities are performed, and gates act as quality control checkpoints. This way, it becomes possible to link NPD activities to input and output (Nicholas & Steyn, 2008).

While an input is an object necessary to carry out an activity, an output is an object produced in an activity.

The stage-gate models from the literature differ in terms of the number and titles of stages and gates; this is also true for those used by manufacturers (Phillips et al., 1999). Also, different products do not necessarily pass through the same stages or gates, meaning that stage-gate models may require adjustment to individual products (Cooper, 2008). Figure 3 shows an example of a stage-gate model.

The NPD process can either be functional or cross-functional. The functional process – also known as 'over-the-wall NPD' (Galbraith, 1973; Lee, 1992) – breaks down NPD into distinct stages and reduces interdependencies between organisational functions (Haque, 2003; Thompson, 1967). Work flows sequentially from one stage to another, each function performing its work in isolation. When NPD requires organisational integration, 'working in silos' can lead to a large number of engineering change requests, which in turn increase the time to market (Lee, 1992).

Alternatively, the cross-functional process – also known as 'integrated NPD' (Andreasen & Hein, 1987) – minimises functional silos by promoting interaction between different stages and functions (Gerwin & Barrowman, 2002; Naveh, 2005). In this process, *"no stage is owned by any one function: for example, there is no 'marketing stage' or 'manufacturing stage'. Rather, at each stage, players from all functions are on the field together and are active players on the project team at each stage"* (Cooper, 1994, p. 5). Supporting this view, Wynstra et al. (2000, p. 65) define the involvement of the sourcing function in NPD as *"contributing knowledge, taking part in managerial processes, and participating in decisions with regard to product development"*.

Brown and Duguid (2001) argue that the cross-functional process allows manufacturers to capitalise on knowledge that is collaboratively produced by different functions. Ultimately, this can increase product quality and reduce the number of engineering change requests, the time to market, and life cycle costs (Ganapathy & Goh, 1997; Thomke & Fujimoto, 2000).

2.3   The ETO Context

As indicated in the preceding section, the NPD process unfolds over time in a context. 'Context' is *"a nested arrangement of structures and processes where the subjective interpretations of actors perceiving, learning, and remembering help shape process"* (Pettigrew, 1997, p. 341). Furthermore, context is an identifiable framework for activity, with properties transcending the experience or control of individual actors (Lave et al., 1984).
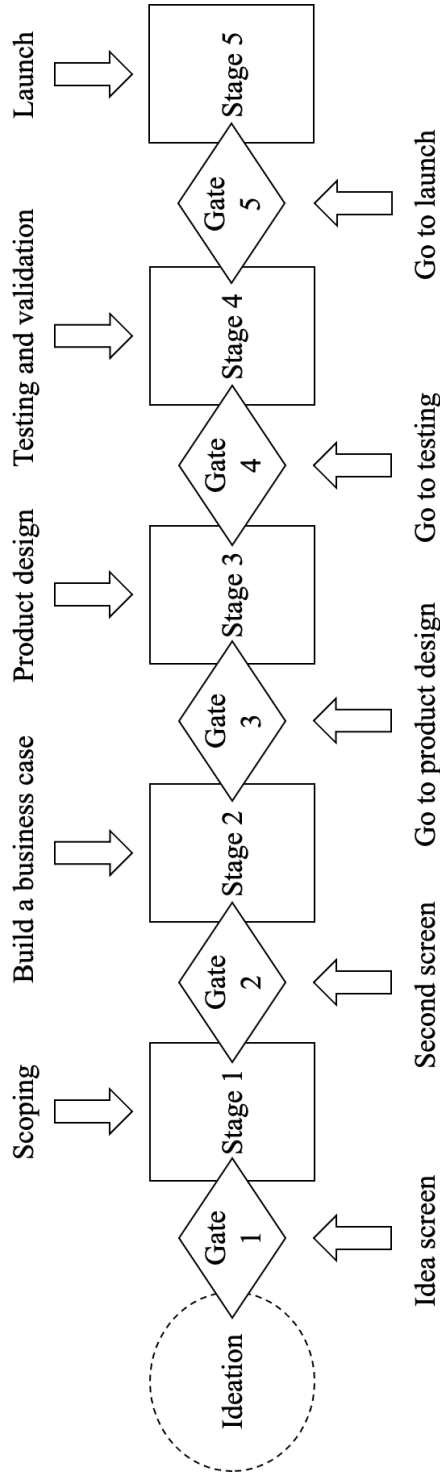
Figure 3 Example of a Stage-Gate Model (based on Cooper and Kleinschmidt, 2001)

Therefore, research focusing on the NPD process should be sensitive to the contextual variables (e.g. antecedent factors, conditions) that may influence the process, *"rather than to divide the world into limited sets of dependent and independent variables"* (Pettigrew, 1985, p. 57). This can provide insights into how context shapes the activities part of the NPD process.

The empirical research presented in this dissertation focuses on sourcing strategising in the NPD process of manufacturers operating in the ETO context. This makes 'the ETO context' the third key concept of the dissertation. The remainder of the section discusses its characteristics in relation to other concepts.

At least four types of manufacturing contexts exist: (1) make-to-stock (MTS), (2) make-to-order (MTO), (3) assemble-to-order (ATO), and (4) ETO (Lampel & Mintzberg, 1996; Olhager, 2003; Yang et al., 2004). First, the MTS context involves products with a high degree of standardisation (van Donk, 2001). These products are completed based on speculation regarding future customer orders, which means that customers are only involved when products are ready for delivery (Ha, 1997).

Secondly, the MTO context involves products that are engineered but not manufactured before receiving customer orders (Olhager, 2003; Wikner & Rudberg, 2005). The costs associated with finished goods inventory may be a reason for delaying manufacturing until customers place orders.

Thirdly, the ATO context can involve products comprised of modules that are manufactured and stocked before customers place orders (Wemmerlöv, 1984). Assembling these modules based on customer orders allows for product customisation (Wortmann et al., 1997). However, the ATO context can also be conceptualised as a combination of the MTS and MTO contexts (Wikner, 2014).

Fourthly and finally, the ETO context involves products that require customer order-specific engineering (Cannas & Gosling, 2021; Willner et al., 2016). These products range from highly customised products to ones requiring limited order-specific engineering (Gosling et al., 2017; Willner et al., 2016). Moreover, their manufacturing is driven by actual customer orders (Cannas & Gosling, 2021; Gosling & Naim, 2009). Even though there is no clear consensus on the definition of ETO, it is commonly agreed that the ETO context involves:

(1) Products that are ordered in low volumes and are engineering-intensive (Hobday et al., 2000; Willner et al., 2016).
(2) Engineering activities that are, for some parts, performed before receiving orders, and completed according to the specifications of individual customers (Acha et al., 2004; Maffin et al., 1995).
(3) Products that typically address capital goods markets, which tend to be dominated by a few manufacturers due to entry barriers (Willner et al., 2016).
(4) Products that are developed in project-based environments with project-specific demands (Davies et al., 2011; Gosling & Naim, 2009; Hobday, 2000).

These characteristics imply that manufacturers in the ETO context may need to interact with suppliers in the product design stage of NPD (Acha et al., 2004; Hobday, 2000). For example, once customer requirements are specified, offers from different suppliers can be obtained and evaluated (Gosling et al., 2015; Wikner & Rudberg, 2005). This can lead to NPD involving many inputs from suppliers that are globally dispersed or scattered across multiple SC tiers (Hobday et al., 2000).

3 The Theoretical Lens of SAP

The research presented in the dissertation uses the theoretical lens of SAP to conceptualise how manufacturers can engage in sourcing strategy in NPD. The present chapter discusses the SAP lens in terms of its origin, key dimensions, and how it contributes to conceptualising the 'doing of sourcing strategy' in NPD.

3.1 Strategy Research from the 1950s to the 1990s

Strategy research focuses on how firms formulate, implement, and evaluate cross-functional activities that are aimed at achieving competitive advantage and objectives (Hoskisson et al., 1999; Teece et al., 1997). These objectives typically relate to firm performance and how value can be created for stakeholders such as customers and shareholders (Sirmon et al., 2007). During the last few decades, strategy scholars have explored the mechanism through which firms can create value. Against the backdrop of economic developments in the Western world, the remainder of the section discusses the main streams of strategy research that emerged from the 1950s to the 1990s.

In the 1950s – the post-World War II era – Europe and the United States witnessed a period of economic growth. The struggles of years of war and depression were replaced by rising living standards and increased spending power. As explained by renowned economist Paul Krugman (2010, p. 19): *"From an economic point of view World War II was, above all, a burst of deficit-financed government spending, on a scale that would never have been approved otherwise. … Deficit spending created an economic boom – and the boom laid the foundation for long-run prosperity. … And after the war, thanks to the improved financial position of the private sector, the economy was able to thrive without continuing deficits."*

Because of the economic growth and associated growing customer demand for products, firms were mainly concerned with securing the items and services needed to keep production going. For example, Philips – the Dutch manufacturer of consumer lifestyle, healthcare, and lighting products – had internal packaging operations and produced its own toilet seats. Furthermore, the American retailer 7-Eleven delivered its own fuel, produced its own confectionery and ice, and owned the cows that produced the milk it sold. This led to research focusing on vertical integration, which refers to a situation where a firm takes direct ownership of various activities rather than relying on external suppliers (Chandler, 1992).

Towards the end of the 1950s, firms moved away from focusing predominantly on vertical integration – a change reflected in the matrix introduced by Ansoff (1957). This matrix includes four distinct growth strategies that firms can choose from: (1) market penetration, (2) product development, (3) market

development, and (4) diversification. In the 1960s, many firms implemented diversification strategies aimed at introducing new products to new markets. This resulted in a wave of acquisitions, where large firms acquired smaller ones that operated outside the acquirer's main line of business (Shleifer & Vishny, 1991).

During the mid-1960s, the crucial role of strategic planning by top management in achieving a competitive advantage was further highlighted. For example, Ansoff (1965) created a model for strategic decision-making, which links strategic planning to the establishment of objectives, the development of product, market, administrative, and financial strategies, and the development of a strategic budget. Similarly, Berg (1965) advocated the use of strategic planning not only for capital budgeting, but also for identifying new product and project initiatives.

Towards the end of the 1970s, both Europe and the United States experienced an economic recession, making the strongly diversified firms strategically vulnerable. As a result, the business models and competitive positions of firms required re-evaluation. For this purpose, Pfeffer and Salancik (1978) introduced the resource dependence theory (RDT), which argues that firms should change as well as negotiate with their external environment. This secures access to the resources needed for survival and competitiveness. RDT advances three core ideas: (1) social context matters, (2) firms have strategies to increase autonomy and pursue interests, and (3) power is important for understanding internal and external actions of firms (Pfeffer & Salancik, 1978). RDT suggests firms use the least-constraining device to govern supplier relationships. This should allow firms to minimise uncertainty and dependence, while maximising their autonomy.

Also focusing on business models and competitive positions, Porter (1985) introduced the value chain concept. From a microeconomic perspective, value added is the output contribution of an individual economic unit (e.g. a firm) to the national economy. In line with this perspective, the value chain concept enables analyses of two types of value-adding activities of a firm – primary and support. Primary activities include inbound and outbound logistics, operations management, marketing, and after-sales services; support activities include product and technology development, human resources management, procurement, and infrastructure.

In the late 1970s and into the 1980s, research also focused on how firms form and implement strategies (i.e. strategy process). This led to new definitions of strategy. For example, strategy was defined as *"the stream of decisions and activities"* (Mintzberg & McHugh, 1985, p. 6) *"that characterises the match an organisation achieves with its environment ... and that is determinant for the attainment of its goals"* (Hofer & Schendel, 1987, p. 25). Similarly, Evered (1983) defined strategy as a continuous process by which goals are determined, resources are allocated, and a pattern of cohesive activities is promoted by the firm in developing a competitive advantage. Guided by such definitions, scholars provided detailed insights into strategy processes, including, for example, strategy formation (Mintzberg, 1978), corporate venturing (Burgelman, 1983), strategic change (Pettigrew, 1985), and strategic decision-making (Eisenhardt, 1989b).

Research also began to focus specifically on why some firms consistently outperform their competitors (i.e. strategy content). For example, Wernerfelt (1984), Barney (1991), and Rumelt (1991) argued that firms' products or market environments are not the primary determinants of their competitiveness. Instead, a firm's resources and their actual utilisation have a greater effect on competitiveness. In this resource-based view (RBV), resources are both tangible and intangible and include human capital, financial resources, technology, and knowledge. Contributing to the RBV debate, Hamel and Prahalad (1990) and Quinn and Hilmer (1994) suggested firms differentiate between core and non-core competencies. By outsourcing non-core competencies to specialised suppliers, firms can reallocate resources to core competencies and become better at coping with external uncertainties.

In parallel to the RBV, stakeholder theory (ST) was introduced by Freeman (1984). While the RBV is rather abstract concerning what type of value needs to be created, ST argues that there can be different stakeholders with different value metrics. Stakeholders include, for example, employees, customers, suppliers, communities, governmental bodies, and trade associations. Through taking account of stakeholder values, firms may create the proper attitudes and behaviours for satisfying their stakeholders and achieving competitive advantage (Narver & Slater, 1990). For example, strong relationships with stakeholders give firms the resources needed to innovate and cope with environmental changes (Freeman et al., 2007).

Towards the end of the 1990s, Dyer and Singh (1998) extended the RBV debate by focusing beyond the boundaries of individual firms. These scholars introduced the relational view, which argues that a firm's competitiveness is mainly determined by how it manages external resources. Specifically, both complementary resources owned by external suppliers and the relationships with these suppliers are the sources of competitive advantage (Dyer & Singh, 1998).

The preceding discussion shows that from the 1950s to the 1990s, strategy research was rooted in microeconomics (e.g. Porter, 1985) and explored strategy 'as a plan' (e.g. Ansoff, 1957), 'as content' (e.g. Wernerfelt, 1984), or 'as a process' (e.g. Mintzberg, 1978). Scholars such as Bettis (1991) criticised these developments, arguing that strategy research remained at the macro-level of firms, reduced strategy to a few causally related variables, and neglected the role of human action. As a result, the rational and purposeful patterns of decisions and actions promoted in strategy research ignored environmental uncertainty or the practitioners' own characteristics (Johnson et al., 2003). The criticism led to a call for research focusing on the human action in strategy formation (Bettis, 1991).

3.2   The Practice Turn in Strategy Research

Answering the call to 'humanise' strategy research, scholars of the mid-1990s and beyond increasingly linked their strategy research to traditions of theoretical and empirical research in other disciplines (Kohtamäki et al., 2022). Inspired by

practice theorists (e.g. Bourdieu, 1990b; Foucault, 1984), scholars started to formulate practice-based theories of strategy. For example, Richard Whittington introduced the SAP lens in 1996 (Whittington, 1996). This lens takes issue with the more traditional view of strategy as a 'static' property of firms. In this view, strategy is something a firm has – for example, a diversification strategy. Instead, SAP scholars see strategy as something continuous that practitioners do (Jarzabkowski, 2005; Johnson et al., 2003; Whittington, 2006).

This argument is rooted in research on knowing in practice, which perceives knowledge as something that individuals within an organisation *do*, not something that an organisation *has* (Cook & Brown, 1999; Jarzabkowski, 2004). Seeing organisations as owners of knowledge is short-hand in the sense that organisations are collections of individuals (Barney & Felin, 2013). Therefore, knowledge is not possessed by the organisation, but rather by the individuals within it (Felin & Hesterly, 2007; Nelson & Winter, 1982).

In relation to the research streams discussed in the preceding section, SAP is mainly rooted in research that explores strategy 'as a process' (e.g. Mintzberg, 1978). First, SAP research also takes an interest in organisational processes since they resemble the contexts in which strategy work occurs (Kohtamäki et al., 2022). Similarly to 'process' research (e.g. Pettigrew, 1985, 1992, 2012), SAP research (e.g. Jarzabkowski, 2008) draws on structuration theory (Giddens, 1984) to analyse the reciprocal relationship between context and human action and its effect on strategic change. Secondly, SAP research also acknowledges the relevance of 'time', by considering the dynamic nature of strategy work (Jarzabkowski et al., 2007).

However, the focus of SAP research fundamentally differs from that of research following the process tradition. SAP research is distinct in its focus on the activity of individuals or small groups of strategists and their local achievements (MacKay et al., 2021). This micro-level focus starkly contrasts with traditional process research, which mainly focused on the strategic transformation of whole firms (Whittington, 1996).

SAP research also focuses on resolving the dichotomy between 'process' and 'content' in strategy research (Johnson et al., 2003). As discussed in Section 3.1, this dichotomy was common historically, which resulted in separating discussions regarding strategic positions and advantages (e.g. Wernerfelt, 1984) from those regarding how strategic activities are performed (e.g. Mintzberg, 1978). For example, RBV research typically focuses on outcomes such as competitive advantage and disregards the activities that go on in organisations. This may be referred to as a macro-level analysis, which is remote from what the practitioners with whom scholars interact really influence (Johnson et al., 2003).

A more micro-level analysis of strategy facilitates a higher degree of reflexivity amongst practitioners about their work and its effects (Whittington, 1996). Therefore, SAP research dissolves the content-process dichotomy by focusing on the actual activities, behaviours, and processes of strategy (Jarzabkowski et al., 2016). Golsorkhi et al. (2010, p. 1) state that this provides *"a more comprehensive, in-depth analysis of what actually takes place in strategy*

formulating, planning, and implementation and other activities that deal with the thinking and doing of strategy. SAP attempts in-depth analysis of the details of internal strategic processes". Thus, SAP research aims to provide insights into the who, what, and how of strategy in a particular context (Jarzabkowski et al., 2016).

The increased focus on the micro-dynamics of strategy work led to scholars replacing the noun 'strategy' with the verb 'strategising' – the latter referring to the activities through which abstract strategic ideas or objectives are enacted by organisational members who, in turn, shape and develop these ideas (Jarzabkowski et al., 2007; Whittington, 2006).

Since the work of Whittington (1996), SAP research has expanded with the help of special issues in journals such as the *Journal of Management Studies* (2003, 2014), *Human Relations* (2007), *Long Range Planning* (2008), *British Journal of Management* (2014), and *Strategic Management Journal* (2018). The next section discusses several key insights that SAP research provides on strategising.

3.3   Insights from SAP Research

SAP research has provided insights into the practitioners, activities (also referred to as 'praxis'), and practices of strategising (Jarzabkowski et al., 2007; Kohtamäki et al., 2022; Whittington, 2006). The following sections discuss these dimensions, with particular emphasis on insights from SAP research that help achieve the aim of the dissertation.

3.3.1   *Insights into Strategising Practitioners*

Strategising 'practitioners' are the actors who shape the construction of practice through who they are, how they act, and what resources they draw upon (Jarzabkowski et al., 2007; Kohtamäki et al., 2022; Whittington, 2006). They are those who make, shape, and execute strategy and play an important role when performing activities that draw upon socially defined practices (Jarzabkowski et al., 2007).

Practitioners disclose a certain understanding of what constitutes good action when conducting strategy work driven by a particular collective end (Nicolini & Monteiro, 2017; Tsoukas, 2018). This suggests that practitioner characteristics have major implications for the daily strategy work (Jarzabkowski et al., 2016). Specifically, what can be achieved during this work depends on the practical or socio-political skills of practitioners (Rouleau, 2005). For example, they may require cross-functional skills and working knowledge of all areas of the organisation in order to understand the collective end driving strategising.

Furthermore, practitioners from all levels of the organisation (i.e. shop floor employees, middle or senior managers) can make a difference in strategising (Jarzabkowski et al., 2016; Vaara & Whittington, 2012). These practitioners

influence and are influenced by their organisation and their surroundings (Tidström & Rajala, 2016). For example, the work of strategists at one hierarchical level interrelates with that of those at other levels (Tidström & Rajala, 2016). Thus, strategising can be a mixture of top-down and bottom-up approaches (Mintzberg & Waters, 1985) and – formally or informally – involve top management, middle management, and operational employees (Jarzabkowski et al., 2007).

Even though strategising can involve multiple practitioners, Egels-Zandén and Rosén (2015) argue that SAP research tends to focus on top management (e.g. Jarzabkowski, 2005; Jarzabkowski & Spee, 2009). As a result, SAP research mirrors the top management bias present in the streams of research discussed in Section 3.1. A notable exception is the work of Regnér (2003), who shows that practitioners from lower hierarchical levels of the organisation can engage in 'inductive' (i.e. bottom-up) strategising. For example, these practitioners can obtain knowledge from various external actors or industries and transform it into new strategic knowledge.

The top management bias of SAP research is understandable given the methodological challenge of focusing on all potentially relevant practitioners (Egels-Zandén & Rosén, 2015). However, this challenge is worth facing since focusing also on practitioners from lower levels of the organisation promises a more holistic picture of the practitioners involved in strategising (Carter et al., 2008). For example, challenging the top management bias in sustainability research, Egels-Zandén and Rosén (2015) revealed that more types of practitioners can be involved in strategising than previously assumed (e.g. strategic task forces, corporate staff members, and temporary governance members).

Practitioners from beyond the organisational boundaries can also make a difference in strategising (Jarzabkowski et al., 2007). For example, the views and experiences of external consultants, regulators, and customers can steer the direction of strategising (Jarzabkowski et al., 2016; Knight et al., 2020). However, as argued by Knight et al. (2020), SAP research tends to have a bias towards practitioners from the same organisation.

3.3.2   Insights into Strategising Activities

SAP research is rooted in activity theory, which proposes that practitioners do not just think; they act individually or collectively in a world where the object of activity relates to the needs of the individual (Engeström, 2001; Leontiev, 1978; Vygotsky, 1980). It further proposes that human actions should be seen in relation to the historical and cultural contexts in which they are embedded (Engeström, 2001).

Based on this rationale, strategising 'activities' represent human action in the context of strategy (Kohtamäki et al., 2022; Whittington, 2006). Furthermore, the ideal performance of these activities depends on the particular context in which they are embedded (Schwartz & Sharpe, 2010; Shotter & Tsoukas, 2014a, 2014b).

For example, activities should follow certain standards of excellence (Tsoukas, 2018).

The embedding of activity within broader contexts also mirrors the work of practice theorists (e.g. Bourdieu, 1990b; Giddens, 1984). For example, in structuration theory (Giddens, 1984), there is a reciprocal relationship between activity and the structural rules and resources of individuals' social context. In other words, activity affects and is affected by context. Jarzabkowski (2008) uses this insight to show that strategising activities are not only shaped by the structural rules and resources of their specific social contexts but they are also the source of change over time.

The notion of time is also important in SAP research, where the flow of strategising activities is considered dynamic (Jarzabkowski et al., 2007). Furthermore, strategising activities can be planned or unplanned, temporary or long-term, routine or non-routine, and formal or informal (Adams, 2004; Tidström & Rajala, 2016). For example, Tsoukas (2010) explains that strategising activities are often not interpreted as 'strategic'. Practitioners rarely pause to think about strategies or engage in deliberate strategising, indicating that strategy often simply emerges over the course of routine activity (Jarzabkowski et al., 2016). Strategies are often merely the result of organisational activities, instead of the rational decision-making process used by senior managers as they develop a strategic plan (Mintzberg & Waters, 1985). This implies that even though strategising benefits from intention or purposeful goal orientation, it sometimes just happens (Chia & Holt, 2006, 2009).

Due to its multifaceted nature, it is not easy to determine what constitutes a 'strategising activity' (Jarzabkowski, 2005). According to Johnson et al. (2003), an activity is 'strategic' when it produces an outcome that can significantly impact firm performance. Similarly, Jarzabkowski (2005) argues that an activity is 'strategic' when it is strategically important. According to Mantere (2005), this status is achieved when an activity is crucial for an organisation's success, survival, or completion of its mission. Egels-Zandén and Rosén (2015) argue that these broad definitions permit a broad range of activities to be considered as strategising activities.

To derive a manageable set of strategising activities, SAP scholars tend to use definitions that favour the activities performed by top management (Carter et al., 2008; Egels-Zandén & Rosén, 2015). Furthermore, scholars tend to include 'intentionality' in their definition of strategising activity. For example, Jarzabkowski (2005) only regards an activity as strategic when it intends to impact firm performance; Whittington (2006, p. 619) only regards an activity as strategic when it is *"involved in the deliberate formulation and implementation of strategy"*. This intentionality requirement limits the scope of activities that SAP scholars need to cover, since it is impossible to anticipate all the activities that may have a strategic impact (Egels-Zandén & Rosén, 2015).

Egels-Zandén and Rosén (2015, p. 140) criticise the intentionality requirement on two grounds: *"First, we will not know until after the fact whether or not the intended outcome was realised. In other words, activities intended to have*

strategic outcomes might in reality turn out to not have them. Second, and more importantly, previous studies have demonstrated that strategy formation is a process in which deliberate and emergent strategies converge." Thus, the intentionality requirement introduces the risk of disregarding activities that unintentionally produce strategic outcomes.

SAP scholars have recently loosened the intentionality requirement to comprehensively explore specific types of strategies, including, for example, sustainability strategy (Egels-Zandén & Rosén, 2015), coopetition strategy (Tidström & Rajala, 2016), operations strategy (Adamides, 2015), and maintenance strategy (Lundgren et al., 2021):

- Egels-Zandén and Rosén (2015) identify a new type of strategising activities – evaluative activities – that inform and are informed by the strategy intentions.
- Tidström and Rajala (2016) reveal how coopetition develops over different periods of time. In these time periods, there is a focus on how different elements, such as vertical coopetition, emergence, and deliberate strategising and changes, are at play.
- Adamides (2015) interprets operations strategy formation as an ongoing practical, distributed social activity of network formation. This reveals how specific events increase the alignment between operations strategy and corporate strategy.
- Lundgren et al. (2021) propose a process of strategy development for smart maintenance, which includes six activities: (1) benchmarking using a smart maintenance measurement instrument, (2) setting clear goals, (3) setting strategic priority, (4) planning key activities, (5) elevating implementation, and (6) follow-up.

A particular strength of these and similar studies has been the detailed account of how strategising activities are actually carried out. This provides an answer to Johnson et al.'s (2003, p. 3) call for *"the close understanding of the myriad, micro activities that make up strategy and strategising in practice"*. However, Kohtamäki et al. (2022) argue that there is still considerable potential for future research. For example, SAP research has been accused of explaining strategising activities entirely in local terms – a tendency referred to as 'micro-isolationism' (Seidl & Whittington, 2014). Micro-isolationism underemphasises the role of processes at the organisational level and strategising practices, including their interrelationships with strategising activities (Kohtamäki et al., 2022).

Micro-isolationism can be avoided by using the insights into micro-level strategising to add internal detail to larger processes (Kohtamäki et al., 2022). According to Brown and Duguid (2001), this can be achieved by seeing strategising as the activity 'inside' a larger process at the organisational level. Insights into strategising can then be 'slotted' into a higher-level process (Kohtamäki et al., 2022). According to Kohtamäki et al. (2022), this would

provide valuable insights into how strategising unfolds throughout characteristic organisational processes – such as NPD.

3.3.3   Insights into Strategising Practices

Micro-isolationism can also be avoided by focusing on the practices that make strategising activities possible (Kohtamäki et al., 2022). The call to distinguish between practices and activities and focus on their interrelationship is rooted in activity theory (Engeström, 2001), practice theory (Schatzki, 2001), and social theory (Reckwitz, 2002). First, activity theory (Engeström, 2001) argues that particular activities should be seen in relation to the tools and technologies that make them possible. Secondly, practice theory (Schatzki, 2001) suggests that social phenomena are nexuses of human activity and material arrangements. Thirdly, social theory (Reckwitz, 2002) claims that practices are the 'things' guiding activities.

Based on this rationale, SAP research provides definitions for the practices that support the strategising activities of practitioners (Whittington, 2006). According to Jarzabkowski and Whittington (2008, p. 101): *"Practices involve the various routines, discourses, concepts, and technologies through which this strategy labour is made possible – not just obvious ones such as strategy reviews and off-sites, but also those embedded in academic and consulting tools (Porterian analysis, hypothesis testing, etc.) and in more material technologies and artefacts (PowerPoints, flip charts, etc.)."* They are the *"shared routines of behaviour, including traditions, norms, and procedures for thinking, acting, and using 'things', this last in the broadest sense"* (Whittington, 2006, p. 619).

These definitions imply that practices act as instrumental problem solvers, information generators, inspirers of social interaction, or constructors of strategy (Chesley & Wenger, 1999; Jarzabkowski & Kaplan, 2015; Wright et al., 2013). Specific examples of practices include decision-making tools, frameworks, and process models (Jarzabkowski & Kaplan, 2015; Jarzabkowski & Seidl, 2008; Vuorinen et al., 2018; Whittington, 2006).

SAP research has also conceptualised the relationship between practices and strategising activities (Kohtamäki et al., 2022). For example, Dameron et al. (2015) propose three types of relationships: (1) weak, (2) moderate, and (3) strong. The weak relationship assumes that practices may impact activities. For example, the layout of a meeting room may empower or constrain practitioners in their strategising activities (Whittington et al., 2006). The moderate relationship acknowledges the reciprocal relationship between practices and strategising activities. For example, when performing strategising activities, practitioners can use PowerPoint slides to get their point across (Werle & Seidl, 2015). The strong relationship assumes an intertwined relationship between practices and strategising activities, where the two cannot be distinguished from one another.

Furthermore, SAP research has provided the insight that multiple practices or multiple enactments of the same practice (e.g. repeated meetings of cross-functional teams) can be associated with long-term strategising activities

(Kouamé & Langley, 2018). When used, practices facilitate continuity or change of strategy by aligning the strategising activities of different practitioners (Jarzabkowski, 2003; Johnson et al., 2003). While continuity is facilitated by aligning practitioners and activity in the organisation, change is facilitated by identifying and mediating contradictions between past and future activity. Stenfors (2007) adds that practices can be used at individual, interpersonal, and organisational levels and support different practitioners simultaneously.

SAP research has also provided insights into the role of specific types of practices in strategising. For example, Kwayu et al. (2018) explore how social media can be used as a practice for strategising, as well as how it impacts the competitiveness of an organisation. As another example, Knight et al. (2020) explore how the practice of design thinking can enrich strategising by allowing practitioners to better understand their customers.

3.4   Sourcing Strategy through the SAP Lens

As shown in the preceding sections, the last few decades have seen strategy research becoming interested in SAP (e.g. Jarzabkowski, 2005; Johnson et al., 2003; Whittington, 1996, 2006). This 'practice turn' was driven by a call to 'humanise' strategy research (i.e. how do *practitioners* carry out strategy work). Furthermore, global competitive pressures forced firms to leverage those micro-assets enabled, to a large extent, by the strategising process itself (Johnson et al., 2008).

However, as argued in Section 1.2, corresponding interest in the 'doing of sourcing strategy' in NPD remains minimal. This is despite the PSM/sourcing field's practitioner-centric nature (van Weele & van Raaij, 2014) and research suggesting that the development of suitable sourcing strategies is vital to a firm's sustained competitiveness (Jain et al., 2022; Monczka & Trent, 1991).

It should be noted that there is SAP research focusing on NPD. For example, Salvato (2003) suggests that rather than radical change, continuous and repetitive NPD activities can shape the strategic evolution of organisations. Similarly, Salvato (2009) argues that micro, ordinary activities carried out by practitioners from different organisational functions and hierarchal levels can shape strategic NPD capabilities. As a final example, Salvato and Rerup (2018) argue that regulatory activities directed at dealing with specific problems can shape routine performances to constructively deal with conflicting strategic goals in NPD.

However, despite focusing on NPD, current SAP research does not explicitly explore sourcing strategising and its activities and practices in NPD. Therefore, this dissertation constitutes an early attempt to conceptualise sourcing strategising through the SAP lens, with a particular focus on the place it occupies in the NPD process. Following the advice of Kohtamäki et al. (2022), the dissertation applies the SAP lens by combining insights from different scholars. This approach enables learning from different research 'communities' – even those that are paradigmatically opposed (Schultz & Hatch, 1996). Drawing on the insights

presented in the preceding sections, the remainder of this section discusses how the dissertation applies the SAP lens to contribute to the research on sourcing strategy in NPD.

As a starting point, the dissertation uses Whittington's (2006) tripartite SAP framework, which suggests that practitioners, activities, and practices are the three dimensions of strategising. In regard to the first dimension – practitioners – SAP research (e.g. Egels-Zandén & Rosén, 2015; Jarzabkowski et al., 2016) shows that practitioners from all levels of the organisation can influence strategising. Guided by this insight, the dissertation aims to capture the perspectives of the practitioners who play a significant role in sourcing strategising.

In regard to the second dimension – activities – SAP research (e.g. Jarzabkowski, 2005; Johnson et al., 2003) proposes that an activity is 'strategic' when it produces an outcome that can significantly impact firm performance. Following this 'significance' requirement, the dissertation focuses on the sourcing activities that are 'strategic', as well as how they may influence firm performance. Similarly to the work of Lundgren et al. (2021), this involves a crystallisation of fluid activities into entities that are fit for measurement, communication, and accountability.

As for the third dimension – practices – SAP research (e.g. Jarzabkowski & Whittington, 2008; Whittington, 2006) defines strategising practices as the routines, procedures, discourses, concepts, and technologies that empower or constrain practitioners in their strategising activities. Guided by this definition, the dissertation focuses on the practices used during sourcing strategising. This involves a particular focus on how these practices can encourage collaboration between practitioners originating from different organisational functions.

Furthermore, Kohtamäki et al. (2022) propose using insights into strategising to add internal detail to larger processes at the organisational level. This can be done by seeing strategising as the activity 'inside' a larger process (Brown & Duguid, 2001). As argued in Section 1.2, more research is needed on sourcing strategising in the NPD process. Therefore, the dissertation focuses on practitioners' sourcing strategising activities and practices in NPD. Because 'time' plays a key role in strategising (e.g. Jarzabkowski et al., 2007; Tidström & Rajala, 2016), there is a particular focus on sourcing strategising in relation to different time periods (i.e. stages) of the NPD process.

SAP research (e.g. Schwartz & Sharpe, 2010; Shotter & Tsoukas, 2014a, 2014b) also argues that context influences practitioners and their strategising efforts. As shown in Section 1.2, there is a need for research focusing on sourcing strategising in the ETO context. Therefore, the dissertation focuses on manufacturers operating in this context.

It should be repeated that the SAP insights discussed in this chapter are used to address knowledge gaps in the literature on sourcing strategy in NPD, rather than to make explicit contributions to SAP research.

4   Methodology

While the preceding chapters clarified the key concepts and theoretical lens of the dissertation, this chapter discusses its research methodology. To set the stage, it begins with a presentation of the context and philosophical stance of the dissertation research. Then, the focus shifts to the approaches and methods used in the research, as well as the actions taken to improve its quality.

4.1   Research Context

Research can improve its practical relevance by involving industry representatives in its design (Balogun et al., 2003). Following this advice, the dissertation research is grounded in a three-year research project titled 'Design for Responsive Supply Chains' (DesiRe). The project received financial support from the Knowledge Foundation (for more information, see www.kks.se) and concluded in June 2020. It involved four representatives from Jönköping University's School of Engineering and 22 representatives from six industrial partners with headquarters in Sweden – referred to as 'ConsultCo', 'WhitegoodsCo', 'LiftingCo', 'TextileCo', 'PowerCo', and 'AeroCo' for confidentiality reasons. I was one of the university representatives.

'Joint learning' (Nielsen & Svensson, 2006) was a main priority of the project, with a particular emphasis on university representatives creating knowledge *with* industry representatives, rather than only *for* industry representatives. Thus, the project was aimed at creating knowledge with relevance for both the university and industrial partners. In order to ensure this, the project followed a collaborative approach, implying that the university and industry representatives jointly defined and worked on research problems (MacIntosh & MacLean, 2008; Van de Ven & Johnson, 2006). Since the university representatives were not responsible for implementing solutions that could potentially solve the problems of the industrial partners, the DesiRe project should be classified as 'interactive research' rather than 'action research' (Nielsen & Svensson, 2006).

As a first step in the project, the industry representatives highlighted their current SC issues and expected project deliverables, which Table 2 summarises. Guided by the SC issues and expected project deliverables, the university and industry representatives formulated the following project aim: to explore what, when, and how SC activities can be performed during the NPD process. 'SC activities' were defined as activities related to the design of the flow of materials in the upstream, internal, and downstream SC.

Table 2 SC Issues and Expected Project Deliverables

SC Issue	Expected Project Deliverable
ConsultCo, a provider of consultancy services, sees many of its customers struggling with SC activities during NPD.	Acquisition of knowledge and methods that can be applied broadly in the industry. This knowledge should be directly applicable and improve the competitiveness of ConsultCo's customers.
WhitegoodsCo, a manufacturer of laundry systems, rarely considers SC activities in NPD, which increases SC costs.	Acquisition of knowledge of when and how to make SC activities in the NPD process. This knowledge should help improve the efficiency and effectiveness of both the SC and NPD.
LiftingCo, a manufacturer of lifting equipment, wants to increase their ability to create realistic NPD plans and find suitable suppliers.	Acquisition of knowledge of how to find an adequate balance between NPD work and daily work related to SC operations.
TextileCo, a manufacturer of textile climate solutions, believes that SC-related functions are involved too late in major NPD projects.	Acquisition of knowledge of how to create a formal organisational structure that ensures that SC-related functions are adequately involved in NPD.
PowerCo, a manufacturer of gas turbines, has an NPD process that does not adequately cover SC activities, which increases SC lead times.	Acquisition of knowledge of which, when, and why different SC activities have to be considered during NPD. This knowledge should help in adapting the NPD process, so it better covers SC activities.
AeroCo, a manufacturer of aerospace systems, changed to multiple sourcing and believes that the implications of this change should be better considered during NPD.	Acquisition of knowledge of how multiple sourcing affects the NPD process and how SC activities can be integrated into the NPD process.

In order to achieve the project aim, a series of ten workshops was conducted. These workshops were lunch-to-lunch meetings for all project members and took place physically at the premises of the industrial partners or university. Appendix 1 provides an overview of the industry representatives attending the workshops. As shown in the timeline of Figure 4, I joined the DesiRe project two months after its start, missing only the first workshop.

Together, the university representatives organised the workshops, which mainly involved planning, leading, and summarising theoretical and practical discussions. Before the workshops, steering group meetings and work meetings were organised, both involving university and industry representatives. The steering group meetings focused on making decisions regarding the content and organisation of the DesiRe project. The work meetings took place individually with the industrial partners and served as a platform for exchanging and implementing research ideas. This was aimed at ensuring that the project would create results relevant to each industrial partner.

In the DesiRe project, I conducted conceptual and empirical research, with the support and guidance of the other university representatives (Figure 4). The conceptual research involved reviewing the literature pertaining to SC activities in NPD. Based on the insights gained during the literature review, the empirical research involved interviewing the industry representatives about how SC activities are performed in their organisation's NPD process. Research results were continuously shared with the industry representatives.

Even though the DesiRe project officially ended in June 2020, the research continued until June 2022 (Figure 4). The main reasons for continuing were the need to collect and analyse additional data and write this dissertation's four appended papers. Sections 4.3 and 4.4 will provide more detail on the approaches and methods used in my research during and after the DesiRe project.

The conceptual research resulted in Papers 1 and 2, and the empirical research resulted in Papers 3 and 4. As shown in Figure 4, the former papers are biased towards high-volume, standardised manufacturing contexts, and focus on a manufacturer's upstream, internal, and external SC (SC strategising). The latter papers focus on the ETO context and a manufacturer's upstream SC (sourcing strategising). The remainder of this section explains this difference in focus.

During the DesiRe project, a discrepancy surfaced between the findings of the conceptual research and the manufacturing context of PowerCo and AeroCo. The findings were based on a review of the literature. The review revealed that this literature is biased towards high-volume, standardised manufacturing contexts. The industry representatives of PowerCo and AeroCo suggested that findings from these contexts may not hold in the ETO context, which involves a significantly higher degree of product complexity, unpredictability, and customisation.

Project DesiRe*[b]

Recruitment process

Conceptual research

Paper 1*[b]

Empirical research

Paper 2*[b]

Paper 3**[E]

Paper 4**[E]

Kappa**[bE]

2017/4   '18   '19   '20   '21   '22   '22/10

Notes: * Focuses on the upstream, internal, and downstream SC; ** Focuses on the upstream SC; [b] Biased towards high-volume, standardised contexts; [E] Focuses on the ETO context
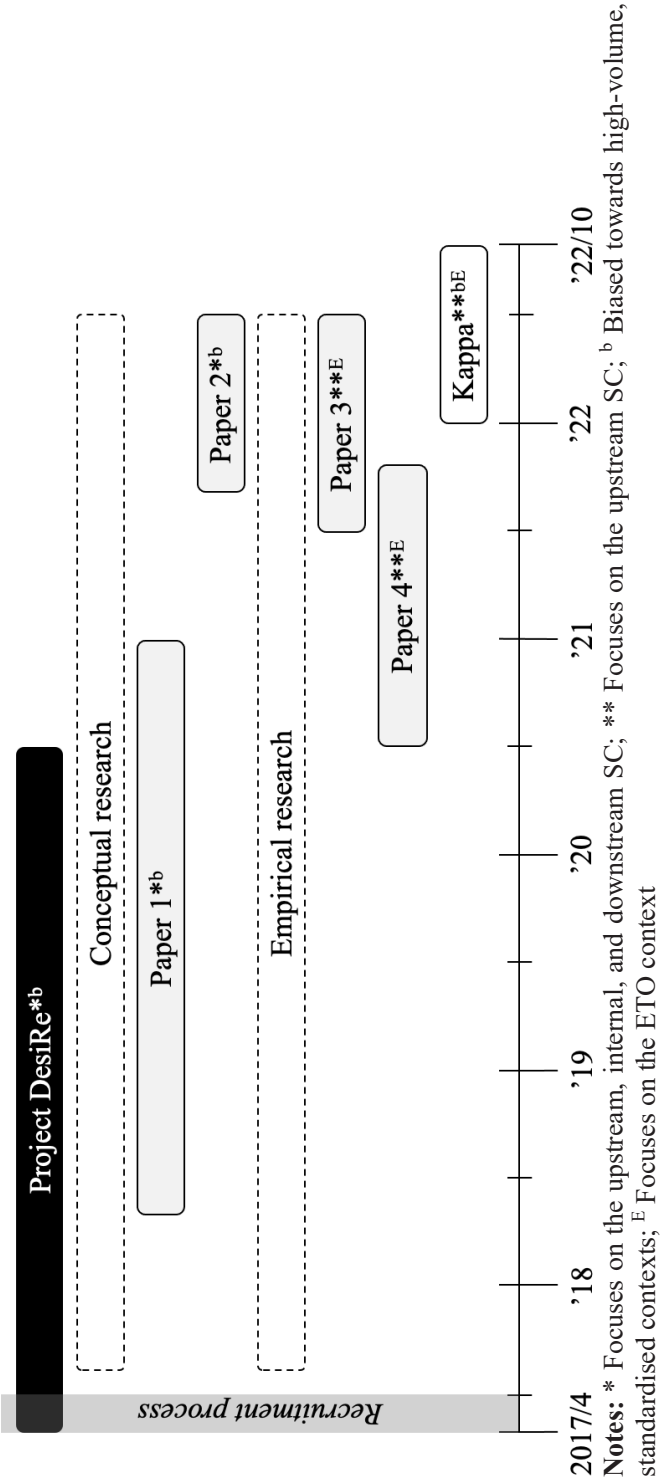
Figure 4 Timeline of the Dissertation Research

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For example, when I presented the findings of the conceptual research to the industrial partners, a procurement engineer from PowerCo stated: *"We are different from companies such as IKEA. We mostly use known materials that are readily available in the supply market ... and we design products in such a way so we can get the most out of these materials. We need to spend a lot of time on R&D in order to come up with a design that can be used to ask suppliers: 'I want you to machine this shape for me or press this shape for me.' This is a different situation than that of IKEA, who invest heavily in new materials and have much simpler product designs. ... IKEA focuses more on material development with simple designs, whereas we are using more known materials with extremely high tolerances and fabrications build around it."*

This and similar statements motivated me to build on and enrich the conceptual research with insights drawn from the ETO context of PowerCo and AeroCo. As a result, Papers 3 and 4 are empirical in nature and focus on the ETO context. Because of the difficulty of empirically exploring a manufacturer's entire SC (Melnyk et al., 2014), the papers focus on a manufacturer's upstream SC. This is a change from Papers 1 and 2, which focus on the upstream, internal, and downstream SC.

When summarising the four appended papers for this dissertation's kappa (i.e. summary and discussion), I decided to also limit the focus to only the upstream SC (Figure 4). This decision was made to create a scope (Section 1.4) and narrative that clearly connect the papers. Sections 4.3.6 and 4.4.4 will specify the relationship between the papers and the kappa.

4.2   Research Philosophy

Before discussing the approaches and methods used in the research presented in the dissertation, this section discusses its research philosophy, which comprises ontological and epistemological positions (Burrell & Morgan, 1979; Morgan & Smircich, 1980).

4.2.1   Ontology

Ontology refers to assumptions about the nature of reality (Bryman, 2016). Choosing an ontological position involves deciding whether reality is created by objects external to the actors involved in it, or if it is socially constructed by actors and their understandings and actions (Burrell & Morgan, 1979). This dissertation adopts the ontological position of critical realism, which insists that reality has an objective existence. Specifically, it argues that reality consists of three overlapping domains, namely (1) the empirical, (2) the actual, and (3) the real (Bhaskar, 1975). First, the empirical domain comprises the direct and indirect experiences of actors. Secondly, the actual domain comprises outcomes (also known as 'events') that are distinct from those observed empirically (i.e. phenomena), and therefore can include unobserved outcomes. Thirdly, the real

domain – the deepest layer of reality – comprises the mechanisms that can generate outcomes.

These mechanisms decide whether causal potentials of objects are activated (Bhaskar, 1975). For example, even though a car has the potential of driving, a mechanism has to activate this potential. Furthermore, although an object has a causal potential and a mechanism attempts to activate it, the right conditions must be met in order to create an effect (Bhaskar, 1975). This means that conditions are higher-level mechanisms that presuppose ones at lower levels. For example, a combustion engine of a car cannot ignite without oxygen. Thus, critical realism deals with a reality that includes objects with causal potentials, which are activated by mechanisms under certain conditions (Buch-Hansen & Nielsen, 2020).

4.2.2   *Epistemology*

Epistemology refers to assumptions about the nature of knowledge (Bryman, 2016). Choosing an epistemological position involves deciding how knowledge of reality can be understood and created (Bryman, 2016; Burrell & Morgan, 1979). While critical realism is realist about ontology, it does acknowledge that knowledge is a social product, dependent on the actors who produce it (Bhaskar, 1975). Critical realism also believes that reality is only partially accessible. This is caused by reality having mechanisms that are only indirectly experienced by their ability to generate outcomes (Bhaskar, 1975). Thus, even though reality has an objective existence, absolute knowledge of its working does not exist (Bhaskar, 1975). There is no God's-eye view that guarantees a single true view of reality; there are only the different points of view of actors with different interests and purposes. This makes knowledge *"socially produced, transient, and fallible"* (Collier, 1994, p. 90).

This epistemological position implies that research has transitive and intransitive dimensions (Bhaskar, 1975). While the transitive dimension comprises knowledge about reality that is available at a particular point in time, the intransitive one comprises objects of reality that research aims to create knowledge about. In line with critical realism (Bhaskar, 1975), this dissertation holds the belief that the intransitive dimension is more fundamental than the transitive one. This belief holds that the proper role of research is to explain the mechanisms and conditions that generate outcomes, rather than the outcomes themselves (Easton, 2010). The next section discusses the approaches and methods used to fulfil this role.

4.3   Systematic Literature Review

'Clarity of concepts' is a core principle of critical realism (Bhaskar, 1975). As stated by Sayer (1992, p. 5), *"in order to be able to explain and understand social phenomena we have to evaluate them critically"*. Without conceptual clarity,

knowledge about reality cannot be created. In agreement with this view, the first aim of the dissertation research is to use the theoretical lens of SAP to develop a conceptual framework of sourcing strategising in NPD (Section 1.3).

The conceptual research of the dissertation uses the systematic literature review (SLR) method, as it is important for creating an understanding of theoretical concepts and identifying directions for future research (Rowley & Slack, 2004). Specifically, it is a method that *"locates existing studies, selects and evaluates contributions, analyses and synthesises data, and reports the evidence in such a way that allows reasonably clear conclusions to be reached about what is and is not known"* (Denyer & Tranfield, 2009, p. 671).

In this dissertation, application of the SLR method involved completing the six-step procedure of Durach et al. (2017), which is discussed in the remainder of this section.

4.3.1   Step One: Define the Research Question

The SLR was conducted to answer the first research question of the dissertation:

How can sourcing strategising in the NPD process be conceptualised through the theoretical lens of SAP?

Guided by Section 3.4, the answer to this question should explain three dimensions of sourcing strategising in NPD:

- The *practitioners* who can play an important role in sourcing strategising in NPD.
- The *activities* that practitioners can perform when engaging in sourcing strategising in NPD.
- The *practices* that practitioners can adopt when performing sourcing strategising activities in NPD.

4.3.2   Step Two: Craft Inclusion/Exclusion Criteria

To identify potentially relevant articles, the SLR applied the inclusion/exclusion criteria of Newbert (2007, p. 125):

- Search for articles in peer-reviewed scientific journals in English.
- Ensure substantive relevance by requiring that selected articles contain at least one keyword in their title or abstract.
- Eliminate substantively irrelevant articles by excluding articles related to very narrow aspects or contexts.
- Ensure substantive and empirical relevance by reading all remaining abstracts.

- Further ensure substantive and empirical relevance by reading all remaining articles in their entirety.

4.3.3   Step Three: Retrieve a Baseline Sample

In this step, I and another researcher conducted an ad hoc review of the literature on sourcing strategy in NPD to create a set of keywords. This involved identifying influential articles (e.g. Dowlatshahi, 1992, 1998; Fine, 2000; Fine et al., 2005; Lee & Sasser, 1995) and using them to create keywords such as 'design for x', 'concurrent engineering', 'supply chain', 'procurement', 'purchasing', and 'product development'. Afterwards, the set of keywords was validated by a third researcher.

Then, a university librarian was approached to transform the keywords into search strings for three academic databases: (1) Web of Science, (2) Scopus, and (3) EBSCOhost. These three databases were used because they allow access to a wide variety of journals over a long period of time, and are commonly used in the field of OM/SCM/PSM (Fischl et al., 2014; Igarashi et al., 2013; Maloni et al., 2017; Zimmermann et al., 2016).

The search strings were limited to peer-reviewed journal articles written in English and comprised two groups of keywords. The first group was aimed at finding articles using NPD-oriented terminology (e.g. Design for X, concurrent engineering); the second group was aimed at gathering articles using sourcing-oriented terminology (e.g. SC, procurement).[1]

Afterwards, the search strings were applied at the title, abstract, and keyword levels, without specifying journals, disciplines, or publication dates. This resulted in the creation of a baseline sample of potentially relevant articles. The third SLR step was concluded by setting database alerts. This was done to ensure that future potentially relevant articles would also be subjected to review.

4.3.4   Step Four: Apply the Inclusion/Exclusion Criteria

In this step, two researchers individually applied the inclusion/exclusion criteria from step two. This was done to remove irrelevant articles from the baseline sample. The criteria were applied by screening the titles, abstracts, and keywords of articles. Then, if needed, full texts of articles were retrieved to examine their relevance in answering the research question of the SLR.

Throughout this process, the two researchers' inclusion/exclusion decisions were compared to ensure a shared understanding of what constitutes 'a relevant article'. This involved using Cohen's (1960) kappa coefficient (κ) to measure the level of agreement between the researchers. When 'almost perfect agreement' ($\kappa \geq 0.81$) (Landis & Koch, 1977) was measured, the remaining disagreement was resolved by discussion and the inclusion of a third researcher.

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[1] The appended Paper 1 presents the two search strings in their entirety.

Application of the inclusion/exclusion criteria resulted in a sample of relevant articles. Afterwards, database alerts and the process of screening the reference lists of relevant articles further increased the sample. The additional articles followed the same screening process as any other article part of the sample.

4.3.5   Step Five: Synthesise the Articles

The fifth step started by using Microsoft Excel to create a data extraction form. Afterwards, 'emergent thematic coding' (Denyer & Tranfield, 2009) was applied to synthesise relevant data from the articles part of the sample. This involved identifying, categorising, and summarising how the articles contribute to explaining the practitioners, activities, and practices of sourcing strategising in NPD. Three researchers continuously interacted with each other throughout this process.

4.3.6   Step Six: Present the SLR Findings

This step involved presenting the findings of the data analysis. These findings answer the second research question of the dissertation (Section 1.3) by conceptualising sourcing strategising in NPD through the SAP lens. Since the dissertation comprises a 'kappa' (i.e. summary and discussion) and four appended papers, Table 3 shows in which kappa and paper sections the SLR findings are presented.

Table 3 Presenting the SLR Findings

SLR Findings	Kappa	Appended Papers
Conceptualisation of sourcing strategising practitioners in NPD	• Sections 5.1.1 and 5.1.4	• Paper 1: Sections 4.1.1 and 4.2
Conceptualisation of sourcing strategising activities in NPD	• Sections 5.1.2 and 5.1.4	• Paper 1: Sections 4.1.2 and 4.2 • Paper 2: Sections 4.1.1, 4.1.2, and 4.2.1 • Paper 3: Section 2.3
Conceptualisation of sourcing strategising practices in NPD	• Sections 5.1.3 and 5.1.4	• Paper 1: Sections 4.1.3 and 4.2 • Paper 4: Section 2.3

4.4   Case Study

As discussed in Section 4.2.2, the role of critical realist research is to explain the mechanisms that generate outcomes and how they are affected by contextual

conditions (Easton, 2010). This role can be fulfilled by looking for causal explanations and using qualitative methods that focus on actors in a particular context (Sayer, 1992). Therefore, guided by the SAP lens and the conceptual research discussed in the preceding section, the dissertation research also empirically explores sourcing strategising in NPD. Because the empirical research is aimed at comparing the literature on sourcing strategy in NPD with findings from the ETO context (Section 1.3), it focuses on manufacturers operating in this context.

The empirical research uses the case study method, which is powerful in identifying and disentangling a set of mechanisms and conditions that generate outcomes, albeit only in one or a few instances (Bhaskar, 1975; Easton, 2010). For the purpose of the dissertation research, a 'case' is defined as the NPD process of a manufacturer operating in the ETO context. Given that a single NPD process is associated with several NPD projects, each involving several instances of sourcing strategising, this constitutes an adequately rich context for studying the phenomenon in question.

When using the SAP lens, one case can be associated with multiple units of analysis – practitioners, practices, and activities (Barney & Felin, 2013). Since the case study focuses on how sourcing strategising can unfold in the NPD process of manufacturers operating in the ETO context (Section 1.3), it includes two primary units of analysis:

- The sourcing strategising *activities* performed by practitioners in NPD (e.g. their content, sequence, timing, and outcomes in the NPD process).
- The sourcing strategising *practices* used by practitioners in NPD (e.g. their characteristics; how they can be engaged with in the NPD process).[2]

The sourcing strategising *practitioners* are not a primary unit of analysis in the case study, since, as dictated by the dissertation's scope (Section 1.4), the research is not interested in providing insights into practitioners only. Instead, their sourcing strategising activities and practices in NPD are of interest.

Case studies can have different sample sizes. A small sample size is suitable if knowledge in a research field is limited and the case study is exploratory in nature (Dubois & Araujo, 2007; Dyer & Wilkins, 1991). Sections 1.2 and 1.3 show that the dissertation research meets these requirements. Therefore, the method advocated by Dyer and Wilkins (1991) and Dubois and Araujo (2007) is used, which focuses on a few cases and their contexts. This contrasts with the case study method of Eisenhardt (1991), which requires a larger sample size – four to ten cases – and focuses primarily on construct development and empirical generalisation.

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[2] As mentioned in Section 4.3, the conceptual research of the dissertation is aimed at providing comprehensive definitions of sourcing strategising activities and practices. By discussing the conceptual research findings, Sections 5.1.2 and 5.1.3 provide these definitions, which constitute the primary units of analysis in the case study.

4.4.1 Case Selection

The case study includes two 'instrumental' cases, meaning that *"a particular case is examined mainly to provide insight into an issue or to redraw a generalisation"* (Stake, 2003, p. 137). While selecting instrumental cases increases the potential for analytical generalisation (Stake, 2003), selecting two such cases allows the findings to be replicated in a second case (Yin, 2018).

Following the advice of Easton (2010) and Flyvberg (2006), case selection was guided by the dissertation's research objectives and a case's suitability for uncovering mechanisms, conditions, and outcomes. Specifically, this dissertation applied five selection criteria: (1) manufacturer of physical products, (2) having an NPD process, (3) operating in the ETO context, (4) recognising the need for sourcing strategising in NPD, and (5) having the motivation and resources to contribute to the research.

The NPD processes of PowerCo and AeroCo – two industrial partners involved in the DesiRe project discussed in Section 4.1 – met these criteria and therefore form the empirical basis for the study. This type of 'convenience' sampling (Patton, 2002) was deemed appropriate given the demanding nature of the study in terms of preparation and time requirements. For example, random sampling or selection of additional cases would have required finding other industrial partners and forming entirely new relationships (including contracts).

Section 4.4 showed that the cases can include two units of analysis, one focusing on sourcing strategising activities and one focusing on sourcing strategising practices. While sourcing strategising activities and practices constitute the units of analysis in the case of PowerCo's NPD process, sourcing strategising practices constitutes the unit of analysis in the case of AeroCo's NPD process. The COVID-19 pandemic is the reason for the cases having a different unit of analysis. I originally planned a case study that was different from the one discussed in this chapter. However, due to the pandemic, the original case study was delayed by a couple of months and ultimately cancelled.

Before discussing the data collection and analytical methods, the remainder of the section describes the NPD process of PowerCo and AeroCo.

4.4.1.1 PowerCo's NPD Process

PowerCo is headquartered in Sweden ($\approx$ 2600 employees) and designs and manufactures gas turbines that customers use for power generation or industrial applications. Customers include utilities, independent power producers, and companies in the oil and gas industry. NPD of a gas turbine can take up to ten years and involves considering customer-specific operating conditions (e.g. pressure, temperature). For example, application-oriented designs of items (e.g. blades) are needed for optimal gas turbine performance. To meet demanding customer requirements, NPD mainly involves representatives from the R&D function.

Apart from a gas turbine meeting technical requirements at the right cost, lead time is a major order winner for PowerCo. This leads to NPD involving strict

promises regarding customer delivery dates. These dates are fixed, making lead time reduction, on-time deliveries, and proactive quality assurance important focus areas. To manage these challenges, PowerCo has a cross-functional NPD process with five stages. Table 4 summarises this process as well as how the sourcing function is supposed to be involved in it.

Sourcing strategising has become increasingly important in PowerCo's NPD process. While the manufacturer traditionally single-sourced items or services from small, local suppliers, it now also promotes multiple sourcing from remote suppliers located in low-cost regions. Despite being a large manufacturer, PowerCo is a relatively small customer for these suppliers. Therefore, suppliers may not be equally interested in lead time reduction, on-time deliveries, and quality. As another challenge, a single gas turbine consists of around 5000 items. Changing one of these can have many knock-on effects. For example, setting new tolerance requirements for one of them may require new tooling, materials, or suppliers.

Table 4 PowerCo's NPD Process

NPD Stage	The Sourcing Function's Involvement
Pre-study. Identification and analysis of market and customer requirements, based on which product requirements are specified. Afterwards, the main NPD targets are set, and detailed NPD budgets and plans formulated.	• Align supplier technology road maps with product technology road maps. • Determine a sourcing strategy and identify potential suppliers.
Concept design. Design and evaluation of alternative product concepts (regarding market, technology, financial considerations). After choosing the preferred concepts, essential product specifications are documented. Then, these specifications are reviewed and approved.	• Decide whether to use existing or new suppliers, based on the scope of the project and customer requirements. • Gather information from prospective suppliers. • Conduct risk assessments and establish non-disclosure agreements with suppliers. • Propose necessary product design changes in order to meet target costs.

Table 4 (continued)

Basic design. Definition of the fundamental technical approaches and product parameters, which are subjected to several reviews. During these reviews, experiences gained from operational services and previous non-conformances should be considered.	• Complete the supplier qualification process, which serves to demonstrate the ability of a supplier to satisfy requirements.
Detail design. Creation of detailed documentation required for manufacturing and sourcing of items that are part of the product. Afterwards, this documentation is reviewed.	• Conduct negotiations with selected suppliers to start the sourcing of items. • Establish documents, data, and specifications required for sourcing. • Complete supplier contracts and monitor supplier performance.
Manufacturing and assembly. Manufacturing and sourcing of items according to the documentation created in the previous stage.	*No involvement in this stage.*
Validation. Assessment of actual product performance to provide technical support during operation and service. This provides technical data concerning improvement opportunities, life cycle costs, and prediction of service outcomes. After product validation, NPD formally ends.	*No involvement in this stage.*

4.4.1.2 AeroCo's NPD Process

AeroCo is headquartered in Sweden (≈ 2100 employees) and designs and manufactures advanced high-precision products for commercial and military aircraft engines, space rockets, and industrial gas turbines. These products require leading-edge technology and are engineering-intensive and customised for individual customers, which include manufacturers of aircraft and engines. Therefore, AeroCo develops new products in close cooperation with customers and faces long NPD lead times (up to 20 years).

Customisation further leads to high demands on manufacturing processes and the SC, especially since AeroCo's products have to comply with strict quality requirements. If products fail quality tests, engineering changes are required until

customer requirements are met. To manage these challenges as effectively and efficiently as possible, AeroCo has a cross-functional NPD process with six stages. Due to the complex nature of products, this process mainly involves representatives from the R&D function. Table 5 summarises the NPD process as well as how the sourcing function is supposed to be involved in it.

Sourcing strategising plays an important role in AeroCo's NPD process. Most notably, many key items and services have to be sourced from at least two suppliers, certified by aerospace authorities, and approved by the final customer. However, it is difficult to find enough suitable suppliers and create a competitive supplier base. For example, AeroCo is dependent on a large supplier that almost has a monopoly position in the market. Despite AeroCo being one of its largest customers, the supplier has the power to dictate the terms on which it will do business. As an additional challenge, when the ownership structure of a supplier changes, it potentially becomes a competitor of AeroCo. This leads to needing to select a new supplier, which is demanding in terms of time and cost.

Table 5 AeroCo's NPD Process

NPD Stage	The Sourcing Function's Involvement
Pre-study. Completion of sufficient R&D activities is needed before entering this stage. This ensures that technologies are mature enough for NPD. During the pre-study stage, technical and commercial possibilities are investigated. Furthermore, functional product requirements are identified, and an overview of the resources needed for NPD is created.	*No involvement in this stage.*
Concept design. Customers provide technical requirements related, for example, to interfaces, cost, and reliability. These requirements are assessed in terms of, for example, their risks and feasibility. Afterwards, product concepts are designed and assessed. Contracts with customers are signed once a satisfactory concept has been designed.	• Create a plan for each class of item (e.g. lead-times, quantities, potential suppliers, target costs). • Estimate preliminary costs in relation to target costs. • Propose necessary product design changes in order to meet target costs.
Preliminary design. A preliminary product design is established, verified, and used for prototype production. The main product specifications are then frozen and cannot be modified without customer approval.	• Update the sourcing plan. • Initiate the sourcing of long-lead-time items. • Identify key items within different product concepts.

Table 5 (continued)

Detail design. A detailed product design is established, verified, and used for prototype production. More product specifications are frozen, which are then reviewed for certification by aerospace authorities.	• Identify and estimate the costs, schedule, and quantity of items for prototype production. • Issue purchase orders for prototype production. • Identify potential suppliers for serial production.
Final design. A final product design is established, verified, and used for production ramp-up. Furthermore, documentation for product maintenance and usage is created.	• Identify and estimate cost, schedule, and quantity of items for serial production. • Select suppliers for serial production. • Place purchase orders for all items for serial production.
Industrialisation and validation. Final product validation based on results from flight testing, engine testing, and production. Afterwards, the product transitions to full-scale production.	*No involvement in this stage.*

4.4.2   Data Collection

The case study of the dissertation is based on qualitative data, an appropriate type when research is exploratory in nature and the phenomenon under investigation is not well understood (Edmondson & McManus, 2007; Eisenhardt, 1989a). The data were collected through interviews and documents.

Interviews have the benefit of delving deep into social actors' life worlds (Yin, 2018). Interviewees included practitioners with expert knowledge about sourcing strategising in NPD. Only using 'key informants' as interviewees enabled purposive selection of individuals with the ability to provide insights into the phenomenon under investigation (Cassell & Symon, 1994; Churchill & Iacobucci, 2006).

The initial interviewees were selected in collaboration with the case companies. SAP research (e.g. Egels-Zandén & Rosén, 2015; Jarzabkowski et al., 2016) argues that practitioners from all levels of the organisation can influence strategising. Therefore, the case study aimed to capture the perspectives of all the practitioners that play a significant role in sourcing strategising. In order to ensure this, 'snowball' sampling was also used, which involved asking the interviewees to identify other potential interviewees (Scarbrough et al., 2004, p. 1586).

The interviewees were guided as to the nature of the research objectives being addressed to facilitate the identification of other interviewees. Additional

interviewees were then progressively identified and approached once the case study had commenced. Table 6 provides an overview of the interviewees involved in the case study, which include individuals from the R&D function (e.g. chief engineers), the sourcing function (e.g. procurement managers), and more general managers or project managers.

Interviewees were asked how they engage in sourcing strategising in NPD to identify related challenges, the process context of challenges, and possible ways of overcoming them to achieve the various goals (Appendix 2). The interviews were semi-structured to allow interviewees to expand on unexpected topics and issues or provide more details on challenges important to them (O'Leary, 2017). The key advantage of semi-structured interviews is that they are highly flexible (Easton, 2010).

Guided by critical realism (Easton, 2010), the interviews focused on mechanisms and conditions that generate outcomes, rather than only outcomes. Mechanisms and conditions are not directly accessible to observation but can be inferred from outcomes (Bhaskar, 1975). Therefore, the interviews were retrospective, encouraging interviewees to reflect on, and make sense of, past instances and outcomes of sourcing strategising.

The interview process started when I joined the DesiRe project – two months after its first workshop (Figure 4) – and ended two years after completion of the project. Before four of the project workshops, group interviews were conducted separately with representatives of AeroCo and PowerCo. During the workshops, seven group interviews were conducted, each involving representatives of AeroCo and PowerCo. After the DesiRe project, I conducted ten interviews with representatives of PowerCo in order to collect additional data for Paper 3. This included a mixture of group (6) and individual (4) interviews.

In total, 11 interviews were conducted with AeroCo, and 21 with PowerCo. The interviews ranged from 30 to 60 minutes each, involved one to five interviewees at a time, and were audio-recorded and transcribed. For ethical reasons, all interviews were voluntary, and interviewees were assured anonymity, asked for permission to be recorded, and informed about the research objective.

The documents collected for the case study mainly described the NPD and sourcing processes of AeroCo and PowerCo (e.g. stage-gate models, process charts, work procedures, sourcing descriptions) and were used for data triangulation to increase internal validity (Yin, 2018). Most of these documents were provided by the industrial partners during the workshops of the DesiRe project. Section 4.5 will discuss the data triangulation process in more detail.

Following the advice of Kvale (1983), the collected data were continually reported to, and verified with, the interviewees. For example, during the data collection process, I attended nine of the ten project workshops. These workshops constituted an opportunity to report the data collection progress, identify gaps and flaws in the collected data, and discuss future data collection plans with the case companies.

Table 6 List of Interviewees

Interviewee (Number of interviews involved in; Number of interview hours)	Case: PowerCo's NPD Process		Case: AeroCo's NPD Process
	Unit of analysis: Sourcing strategising activities	Unit of analysis: Sourcing strategising practices	Unit of analysis: Sourcing strategising practices
	• Chief Engineer (3; 2.5) • R&D Manager (2; 1.5) • Project Manager R&D (2; 1.5) • Manager Order Execution (2; 2) • Supply Chain Developer (2; 2) • Global Demand Planner (3; 2.5) • S&OP Manager (3; 2.5) • Strategic Buyer (3; 1.5) • Head of Production Technology (4; 4) • Procurement Engineer I (5; 4.5) • Procurement Engineer II (4; 3) • Procurement Manager (3; 2.5) • Manager Manufacturing Support (2; 2)	• Chief Engineer (4; 4) • R&D Manager (2; 1.5) • Project Manager R&D (2; 1.5) • Manager Order Execution (2; 1.5) • Supply Chain Developer (2; 1.5) • Global Demand Planner (6; 6) • S&OP Manager (6; 6) • Strategic Buyer (2; 2) • Head of Production Technology (6; 6) • Procurement Engineer I (6; 5.5) • Procurement Engineer II (3; 2.5) • Procurement Manager (3; 2.5) • Manager Manufacturing Support (2; 2)	• Logistics Specialist (5; 5) • Procurement Lead (5; 4.5) • Project Manager (4; 3.5) • R&D Engineer (4; 3.5) • Quality Manager (4; 3.5) • NPI Lead (4; 3.5) • Supply Chain Manager (4; 3.5) • Head of Logistics and MPC (4; 3.5) • Material Control (3; 2.5) • Procurement Manager (2; 1.5) • Chief Manufacturing Engineer (5; 4.5)

After the DesiRe project, the process of feeding back and checking the collected data with the interviewees continued in two ways. First, the interviewees reviewed data collection reports. Secondly, data collection progress was orally presented and discussed with the interviewees. This made it possible to check for any omissions and factual inaccuracies, which ultimately increased the internal validity of the research findings (Miles & Huberman, 1994).

It should also be noted that real-life observations were initially intended to be a data collection source. Observations would have provided me with a better contextual understanding of the practical conditions of the phenomena under investigation by visiting and observing the workplaces of the case companies (Bourdieu, 1990a, 1998; Schatzki, 2005). In light of this potential benefit, it is unfortunate that the COVID-19 pandemic made it not feasible to conduct observations.

4.4.3   *Data Analysis*

The data analysis was aimed at providing insights into practitioners' sourcing strategising activities and practices in NPD. In line with the research philosophy of the dissertation (Section 4.2), it involved a focus on mechanisms, conditions, and outcomes. The process began by reading the interview transcripts several times and writing summary reports (Miles & Huberman, 1994). Afterwards, a data extraction form was created using Microsoft Excel, and the three-step procedure of Gioia et al. (2013) was followed.

The first step focused on reporting relevant understandings of the interviewees regarding the phenomenon under investigation (Gioia et al., 2022). This involved identifying potentially relevant parts of the interviews, transforming data into first-order concepts, and importing data into the created template (Gioia et al., 2013). This reduced the interviews to short paragraphs, sentences, and words. The findings of the conceptual research of the dissertation, which the next chapter discusses, guided this step. The second step focused on reporting research-based understandings of the data (Gioia et al., 2022). This involved organising the first-order concepts into higher-level themes by searching for similarities and differences among the concepts (Gioia et al., 2013). In the third step, the themes were grouped into aggregate dimensions (Gioia et al., 2013). Paper 4's Table 5 and Appendix 1 exemplify how the data analysis procedure was carried out.

Mechanisms, conditions, and outcomes should be understood in relation to one another in a coherent whole or configuration (Dubois & Araujo, 2007). This requires *"a continuous moving back and forth between the diverse stages of the research project"* (Verschuren, 2003, p. 132). Therefore, after grouping the interview data into 'aggregate dimensions' (Gioia et al., 2013), the interview summary reports were revisited to explore how the data dimensions relate to one another.

In a recent article (Gioia et al., 2022, p. 233), Gioia argues: *"Simply put, I view the purpose of (especially interpretive) research not as aimed at generating a 'correct' answer to a research question (that's what positivist/functionalist*

research does), but rather at generating a plausible, defensible (abductive) explanation of how and/or why a phenomenon occurs."* In line with this view, the exploration of interrelations between data dimensions involved abductive reasoning towards the 'most likely' explanation (Mantere & Ketokivi, 2013).

4.4.4   Presenting the Case Study Findings

To answer the second research question of the dissertation (Section 1.3), the data analysis was followed by interpreting its findings in the context of the literature on sourcing strategy in NPD. This provided an understanding of practitioners' sourcing strategising activities and practices in ETO NPD. The findings relate to two cases and two units of analysis, while the dissertation comprises a kappa (i.e. summary and discussion) and four appended papers. Therefore, Figure 5 shows in which kappa sections and papers the case study findings are presented.
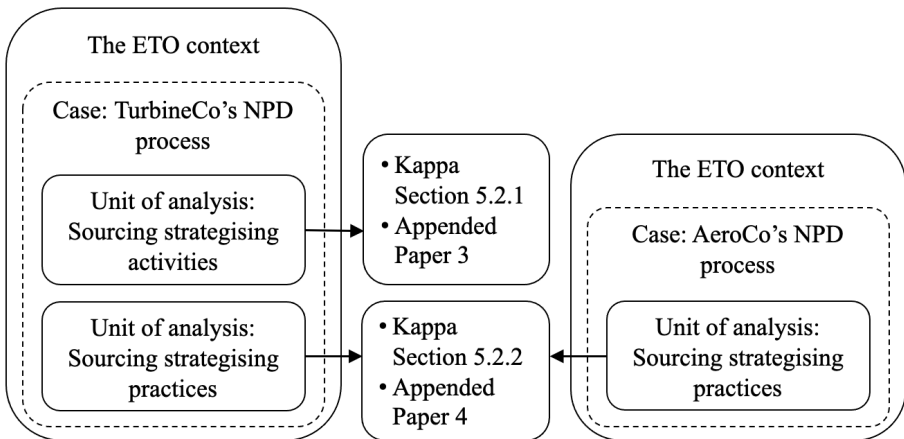
Figure 5 Presenting the Case Study Findings

4.5   Quality of the Research

This section discusses the actions taken to improve the quality of the dissertation research. First, the conceptual research of the dissertation uses the SLR method, which is associated with four biases: (1) sampling bias, (2) selection bias, (3) within-study bias, and (4) expectancy bias (Cooper, 2015; Durach et al., 2017; Felson, 1992). Table 7 describes these biases and the actions taken to minimise their effects.

Secondly, the empirical research of the dissertation uses the case study method. The quality of such research can be assessed using four 'trustworthiness' criteria: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability (Lincoln & Guba, 1985). Based on these criteria, the remainder of

the section discusses the actions taken to improve the quality of the empirical research.

The first criterion, credibility, refers to the extent to which research findings represent plausible information drawn from the original data and is a correct interpretation of the research participants' original views (Lincoln & Guba, 1985). Following the advice of Korstjens and Moser (2018), the credibility of the dissertation research was improved by prolonged engagement, persistent observation, triangulation, and participant check. Table 8 lists and describes these actions.

The second criterion, transferability, refers to the extent to which research findings may be applicable to other contexts (Lincoln & Guba, 1985). Transferability requires describing the context (including assumptions) of the research (Korstjens & Moser, 2018). Therefore, guided by Alvesson and Sköldberg (2017) – instead of focusing on statistical generalisation – the empirical research of the dissertation focuses on the conditions under which practitioners' sourcing strategising activities or practices in NPD may influence outcomes. The contextualised research findings should enable readers to judge for themselves whether the findings may have resonance in other contexts.

The third criterion, dependability, refers to the extent to which the research process is logical, traceable, and clearly documented (Korstjens & Moser, 2018; Tobin & Begley, 2004). The present chapter improved the dependability of the dissertation research by describing the steps taken from the start of the research to the development and reporting of its findings. To further increase dependability, the appended Papers 3 and 4 provide detailed analyses of the data collected for the empirical research.

The fourth and final trustworthiness criterion, confirmability, refers to the extent to which research findings are shaped by the research participants and not researcher bias, motivation, or interest (Lincoln & Guba, 1985). According to Guba and Lincoln (1989), confirmability is established when credibility, transferability, and dependability are all achieved. The confirmability of the empirical research findings of the dissertation, which are discussed in the next chapter, can only be judged by the reader of this text.

Table 7 Actions Taken to Reduce Biases in the Conceptual Research

Bias	Description	Potential Effect	Action
Sampling bias	Failing to create an adequate or complete search string.	Potentially relevant articles are not found, harming the creation of a representative sample.	Inclusion of three researchers with expert knowledge and an experienced university librarian.
Selection bias	Failing to select proper inclusion/exclusion criteria or subjective application of these criteria.	Relevant articles are excluded, harming the development of findings.	Inclusion of three researchers with expert knowledge, and usage of Cohen's (1960) κ.
Within-study bias	Failing to be consistent in coding the selected articles.	Data from articles are falsely coded, harming the review outcome.	Inclusion of three researchers with expert knowledge, and creation of data extraction templates.
Expectancy bias	Failing to capture information that does not confirm to expectations.	Synthesis of data from articles is subjective, harming the review outcome.	Inclusion of three researchers with expert knowledge.

Table 8 Actions Taken to Improve the Credibility of the Empirical Research

Action	Description
Prolonged engagement	Throughout the three-year DesiRe project, I engaged with the research participants during workshops, steering group meetings, work meetings, and interviews. This enabled learning about the research participants' work context, building trust, and testing the concepts used in the research.
Persistent observation	Throughout the three-year DesiRe project, I met with the research participants – both online and at their workplace. Furthermore, I received guided tours through the manufacturing facilities of PowerCo and AeroCo. The meetings and tours uncovered the characteristics and elements most relevant to the research topic.
Triangulation	Three levels of triangulation were employed: (1) data, (2) researcher, and (3) method. First, data triangulation involved collecting data from research participants from different organisational levels and functions. This level of triangulation was most widely employed. Secondly, researcher triangulation involved using at least two researchers to make decisions related to data collection and analysis. Thirdly, method triangulation involved using interviews and documents for data collection.
Participant check	The results of the data analysis were shared and discussed with the research participants and, if necessary, modified.

5 Discussion of Findings

The aim of the research presented in this dissertation is twofold: (1) using the SAP lens to develop a conceptual framework of sourcing strategising in NPD, and (2) using the framework to compare the literature on sourcing strategy in NPD with findings from the ETO context. These aims prompted an examination of two research questions:

- RQ1: How can sourcing strategising in the NPD process be conceptualised through the theoretical lens of SAP?
- RQ2: How can sourcing strategising unfold in the NPD process of manufacturers operating in the ETO context?

In order to answer these research questions and achieve the research aims, the dissertation appends four papers – two conceptual and two empirical. Figure 6 indicates the relation between the appended papers and the research questions. Furthermore, Sections 4.3.6 and 4.4.4 specified the relationship between the papers and the kappa. The present chapter proceeds by first discussing the conceptual research findings of Papers 1 and 2. Then, the empirical research findings of Papers 3 and 4 are discussed.
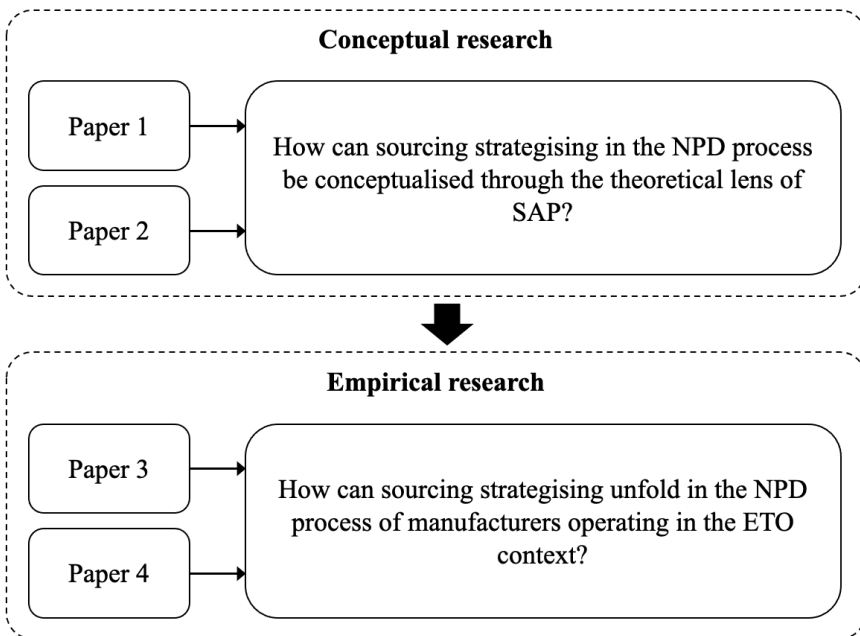

Figure 6 Relation between the Appended Papers and Research Questions

5.1 Conceptual Research Findings

Manufacturing SCs ideally 'match' the characteristics of their new products (Fisher, 1997). This matching requires engaging in sourcing strategy in NPD (Dowlatshahi, 1996; Fine et al., 2005; Melnyk et al., 2014). Drawing on an SLR, Papers 1 and 2 conceptualise how manufacturers can engage in sourcing strategy in NPD. The SLR method facilitates creating an understanding of theoretical concepts and identifying directions for future research (Rowley & Slack, 2004).

Guided by the theoretical lens of SAP (e.g. Whittington, 2006), the SLR focuses on 'sourcing strategising' and its three dimensions: (1) practitioners, (2) activities, and (3) practices. The SLR constitutes an early attempt to conceptualise sourcing strategising in NPD through the SAP lens. It does so by taking stock of the literature on sourcing strategy in NPD because – even though the SAP lens is absent from this literature (Section 1.2) – it provides insights that help explain the three dimensions of sourcing strategising in NPD.

The following sections present the conceptual research findings of Papers 1 and 2 by first discussing each of the dimensions, and then their interplay. This provides an answer to the first research question of the dissertation (How can sourcing strategising in the NPD process be conceptualised through the theoretical lens of SAP?).

5.1.1 *Sourcing Strategising Practitioners in NPD*

SAP research (e.g. Egels-Zandén & Rosén, 2015; Jarzabkowski et al., 2016) argues that practitioners from all levels of the organisation can influence strategising. Practitioners are those who make, shape, or execute strategy and play an important role when they perform activities that draw upon socially defined practices (Jarzabkowski et al., 2007; Jarzabkowski & Spee, 2009). Following these SAP insights, a diverse set of practitioners can play an important role in sourcing strategising in NPD. Therefore, the SLR first takes stock of the literature on the practitioners who can play a role in sourcing strategising in NPD.

The literature argues that practitioners originating from both the sourcing and R&D functions can be involved in sourcing strategising in NPD (Dowlatshahi, 1992; Mikkelsen & Johnsen, 2019; Wynstra et al., 1999). Therefore, practitioners from the R&D function need to take a broader perspective than that of product functionality in NPD (Lee & Schmidt, 2017). They also need the capability to link product design with sourcing-related challenges such as the availability of capable suppliers as well as their willingness to contribute to NPD. However, such a broad perspective may not be one that practitioners from the R&D function are trained to use (Lee & Schmidt, 2017).

In turn, practitioners from the sourcing function are not always trained to fully grasp the implications of product designs for sourcing strategy (Lee & Schmidt, 2017). This is despite the fact that they ideally possess a broad set of skills, including behavioural skills, business acumen, and the appropriate engineering

knowledge (Anderson Jr et al., 2007; Lee & Schmidt, 2017). These skills require training, coaching, possible tag teaming with peers, or even job rotation.

Van Hoek and Chapman (2007, p. 243) suggest that this expanding knowledge scope should ultimately enable practitioners to:

(1) Refrain from using jargon and technical language unnecessarily.
(2) Move towards using shared business language that expresses initiatives in terms of shared output objectives and in terms of benefits and priorities in other organisational functions.
(3) Communicate the case for initiatives up front, and frequently update peers on progress and results against the shared output objectives.
(4) Come to the table proactively with constructive questions and solutions to enhance NPD effectiveness and value.
(5) Avoid being perceived as a showstopper for innovation.
(6) Ensure that the starting point of discussions related to sourcing strategy is founded on corporate objectives.
(7) Inform about considerations and opportunities related to sourcing strategy and advance the relevant thinking.
(8) Be positive and have expertise about relevant themes (e.g. product design, sourcing, production) that can contribute to NPD.

Thus, the literature argues that practitioners from different organisational functions need to share their situated knowledge during sourcing strategising in NPD. This knowledge sharing is challenging and requires practitioners with different backgrounds, knowledge, and interests to understand each other and pursue an effective approach to communication. These insights are echoed in SAP research, which argues that the practical or socio-political skills of practitioners affect strategising outcomes (Rouleau, 2005).

The SLR also reveals that there are few other similarities between SAP research and the literature on sourcing strategising practitioners. For example, Section 3.3 discussed three SAP insights that are absent from the literature. First, strategising can be a mixture of top-down and bottom-up approaches (Mintzberg & Waters, 1985) and – formally or informally – involve top management, middle management, and operational employees (Jarzabkowski et al., 2007). This SAP insight opens the door to future research on the power balance between practitioners from different levels in the organisational hierarchy and how it affects sourcing strategising outcomes. Secondly, specific types of practitioners – such as strategic task forces, corporate staff members, and temporary governance members – can be involved in strategising (Egels-Zandén & Rosén, 2015). Therefore, future research can identify different types of practitioners and their role in sourcing strategising. Thirdly and finally, SAP research argues that practitioners from beyond the organisational boundaries can make a difference in strategising (Jarzabkowski et al., 2007; Knight et al., 2020). This insight reveals the opportunity to conduct research on how external practitioners such as consultants or suppliers can influence sourcing strategising in NPD.

5.1.2 Sourcing Strategising Activities in NPD

Practitioners do not just think, they act individually or collectively in a world where the object of the activity is related to the needs of the individual (Leontiev, 1978; Vygotsky, 1980). Following this rationale, SAP research argues that strategising 'activities' represent human action with regard to the formation of strategy (Whittington, 2006). SAP research (e.g. Jarzabkowski, 2005; Johnson et al., 2003) further proposes that an activity is 'strategic' when it produces an outcome that can significantly impact firm performance. Strategising activities are situated (Whittington, 2006), which means that their ideal performance depends on the particular context in which they are embedded (Schwartz & Sharpe, 2010; Shotter & Tsoukas, 2014a, 2014b). For example, activities should follow certain standards of excellence (Tsoukas, 2018).

Guided by these SAP insights, the SLR explores the literature on sourcing strategy in NPD to identify which sourcing activities are 'strategic' as well as the place they occupy in NPD. Similarly to the work of Lundgren et al. (2021), this involves crystallisation of fluid activities into concrete entities that are fit for measurement, communication, and accountability.

The SLR reveals that even though the SAP lens is absent from the literature on sourcing strategy in NPD, it often focuses on sourcing strategising activities. These activities typically relate to a manufacturer's supplier base, supplier relationships, or inbound material flows (e.g. Fine, 2000; Min & Zhou, 2002). Furthermore, they have two aims. The first is to identify the desired level of responsiveness to customer needs; the second is to develop and implement the resources, processes, and relationships with suppliers that seek to make the attainment of the desired level of responsiveness inevitable over time (Melnyk et al., 2014).

The SLR crystallises three sourcing activities that are of strategic importance in the NPD process: (1) make-or-buy analysis, (2) supplier selection, and (3) supplier relationship formation (Chiu & Kremer, 2014; Dowlatshahi, 1996; Fine, 2000; Lee & Sasser, 1995; Min & Zhou, 2002; Ülkü & Schmidt, 2011; Wynstra et al., 1999). These activities are essential for the formation of any type of sourcing strategy, including, for example, supplier integration (Section 2.1).

Following the advice of Kohtamäki et al. (2022), the following sections take stock of the literature on the three sourcing strategising activities in order to add internal detail to the NPD process. Because 'time' plays a key role in strategising (e.g. Jarzabkowski et al., 2007; Tidström & Rajala, 2016), there is a particular focus on the activities in relation to different time periods (i.e. stages) of the NPD process.

5.1.2.1 Make-or-Buy Analysis

A make-or-buy analysis is concerned with balancing internal and external sourcing (Fine, 2000; Fine et al., 2005). It concerns items (e.g. components, modules) and services (e.g. research and technology development, manufacturing operations) associated with an item (Fine et al., 2005; Wynstra et al., 1999, 2003).

During a make-or-buy analysis, consideration should be given to the criticality (e.g. competitive importance, lead time) of an item or service and the risk of supplier dependency (Noori & Georgescu, 2008; Wynstra et al., 1999). For example, 'buying' is favourable when items or services are non-critical and can be sourced from many different suppliers. Alternatively, 'making' is favourable when items or services are critical for achieving a competitive advantage and involve intellectual property rights (Noori & Georgescu, 2008).

The availability of internal capabilities and those of candidate suppliers should also be considered (Fine, 2000; Noori & Georgescu, 2008; Wynstra et al., 1999, 2003). For example, a make-or-buy analysis can consider whether overall NPD costs or lead times can be reduced by buying items or services from suppliers (Fine, 2000; Nepal et al., 2011). Similarly, Noori and Georgescu (2008) propose that the analysis should compare the availability of internal capabilities with the responsiveness, capacity flexibility, and expertise of potential suppliers. For example, when NPD involves tough deadlines or totally new items or services, a manufacturer may need to rely on suppliers with superior technological expertise (Ülkü & Schmidt, 2011; Wynstra et al., 1999, 2003).

The literature provides alternative perspectives on when to complete the make-or-buy analysis in the NPD process. For example, Wynstra et al. (1999) recommend completing the analysis before the concept design stage of NPD, as this saves time and effort in subsequent stages. Alternatively, others suggest completing the analysis when creating and evaluating new product concepts, which occurs in the concept design stage of NPD (Chiu & Kremer, 2014; Chiu & Okudan, 2014; Noori & Georgescu, 2008). A final proposed timing of the make-or-buy analysis is in the detail design stage of NPD, when the product bill-of-material (BOM) becomes available (Fine et al., 2005; Nepal et al., 2011).

5.1.2.2   Supplier Selection

Supplier selection entails determining which suppliers to involve in NPD (Fine, 2000; Fine et al., 2005). During supplier selection, there should be an evaluation of whether supplier capabilities align with characteristics of the outsourced items or services (Petersen et al., 2005; Song & Di Benedetto, 2008). For example, when items or services are critical for achieving a competitive advantage, suppliers should be innovative and technologically capable (Brewer & Arnette, 2017; Di Benedetto et al., 2003; Noori & Georgescu, 2008). This means that suppliers should be selected according to their ability to deliver best-value solutions – not the lowest price (Gosling et al., 2020a). Suppliers should also have a suitable geographic location (Fine et al., 2005). For example, suppliers are ideally located close by when they are responsible for critical items or services (Fine et al., 2005; van Hoek & Chapman, 2007).

The literature further suggests that cost, quality, and delivery performance are common supplier selection criteria (e.g. Chiu & Kremer, 2014; Claypool et al., 2014; Fine et al., 2005). Cost refers to attributes such as the price of products, exchange rates, and price fluctuations. Quality includes attributes such as conforming to customer requirements and defect and rejection rates. Delivery

performance considers attributes such as meeting delivery lead times and delivery reliability.

Manufacturers can have several suppliers in their existing supplier base to choose from (Wynstra et al., 1999). Since new suppliers typically need to pass a sequence of quality assessments before receiving access to NPD, it is favourable to select suppliers from the existing supplier base when the duration of NPD is expected to be short (Lau et al., 2018; Simms & Trott, 2014). With such suppliers, manufacturers have often gained trust and experience (Cousins et al., 2006) or made investments (Song & Di Benedetto, 2008).

During supplier selection, the potential benefit of selecting multiple suppliers for a specific item or service should also be considered (Wynstra et al., 2003). This involves comparing the costs and benefits obtained from the use of economies of scale associated with selecting a single supplier, with the costs and benefits of selecting multiple suppliers (Claypool et al., 2014; Dowlatshahi, 1996; Krikke et al., 2003; Noori & Georgescu, 2008).

Suppliers can be selected at different times of the NPD process. First, Wynstra et al. (1999) propose selecting suppliers before the concept design stage of NPD. This enables early identification of suppliers that may contribute to NPD with, for example, new ideas or technologies (Wynstra et al., 1999). Another recommended timing of supplier selection is in the concept design stage of NPD (Chiu & Kremer, 2014; Noori & Georgescu, 2008). This introduces higher flexibility and more time to prepare and respond to potential supply challenges (Chiu & Kremer, 2014).

A final proposed timing of supplier selection is in the detail design stage of NPD (Fine et al., 2005; Graves & Willems, 2005; Nepal et al., 2011; Pham & Yenradee, 2017). This allows the creation of an optimal match between the characteristics of suppliers and the structure of the product design(s) listed in a BOM (Fine et al., 2005; Graves & Willems, 2005). For example, the BOM can be used to decide which design alternative to manufacture for each item and which supplier to select, based on the impact of a potential supplier on lead times and costs (Claypool et al., 2014; Gokhan et al., 2010).

5.1.2.3   Supplier Relationship Formation

Supplier relationship formation entails establishing ties with suppliers that are to be involved in NPD (Fine, 2000; Fine et al., 2005). Forming supplier relationships may require openness and swiftness in sharing information (Wynstra et al., 2003). Furthermore, efforts may be devoted to motivating or convincing suppliers to be interested in NPD (Wynstra et al., 1999). This increases the likelihood of suppliers unlocking their resources and listening and adapting to the manufacturer's needs (Wynstra et al., 1999).

Manufacturers should also set expectations with suppliers regarding, for example, responsibilities, communication, and documentation (Wynstra et al., 1999, 2003). This involves aligning the objectives of a manufacturer with the rewards and incentives of a supplier, as well as establishing and articulating governance frameworks (Gosling et al., 2020a).

When suppliers are responsible for critical items or services, the formation of close supplier relationships is advisable (Fine et al., 2005; Noori & Georgescu, 2008; Ülkü & Schmidt, 2011). For example, when products are highly innovative, a manufacturer may need to rely heavily on suppliers for knowledge or know-how (Picaud-Bello et al., 2019; Song & Thieme, 2009). Close supplier relationships are especially advisable when suppliers have superior technical, engineering, and design capabilities (Monczka & Trent, 1991). In such situations, suppliers can share innovation and ideas (Gosling et al., 2020a, 2020b), which can be facilitated by cross-functional teams, integrated IT systems, a common culture, or a common or interlocking ownership (Fine et al., 2005).

However, close supplier relationships are not always needed in NPD. For example, arm's-length supplier relationships may suffice when suppliers are responsible for non-critical items or services (Gosling et al., 2020b; Picaud-Bello et al., 2019). In this scenario, a manufacturer and its suppliers can be culturally different, and have few close organisational ties, or modest electronic connectivity (Fine et al., 2005; Noori & Georgescu, 2008; Ülkü & Schmidt, 2011).

Supplier relationships can be formed at various times during the NPD process. For example, Wynstra et al. (1999) propose approaching suppliers before the concept design stage of NPD. This provides early clarity regarding the extent and point in time of supplier involvement in NPD (Wynstra et al., 1999). Another recommended timing of supplier relationship formation is when creating product concepts, which occurs in the concept design stage of NPD (Chiu & Kremer, 2014; Monczka & Trent, 1991; Noori & Georgescu, 2008). This ensures early supplier input, potentially leading to more cost-effective design choices, the development of alternative conceptual solutions, selection of the best items or services, and appropriate assessment of alternative product designs (Ellram & Carr, 1994; Gosling et al., 2020a; Monczka et al., 1993).

A final proposed timing of supplier relationship formation is in the detail design stage of NPD (Fine et al., 2005; Noori & Georgescu, 2008). At this point, the presence of the product BOM enables the forming of relationships based on known product characteristics, including, for example, the level of modularity or innovativeness (Fine et al., 2005; Noori & Georgescu, 2008).

5.1.3   Sourcing Strategising Practices in NPD

SAP research (e.g. Jarzabkowski & Whittington, 2008; Whittington, 2006) argues that practices empower or constrain practitioners in their strategising activities. Whittington (2006, p. 619) defines practices as *"shared routines of behaviour, including traditions, norms, and procedures for thinking, acting, and using 'things', this last in the broadest sense"*. This implies that practices act as instrumental problem solvers, information generators, inspirers of social interaction, or constructors of strategy (Chesley & Wenger, 1999; Jarzabkowski & Kaplan, 2015; Wright et al., 2013). Guided by these SAP insights, the SLR takes stock of the literature on practices that can be used during sourcing strategising in NPD. This involves a particular focus on how these practices can

encourage collaboration between practitioners originating from different organisational functions.

The SLR reveals that the practices supporting practitioners during sourcing strategising in NPD fall under the umbrella practice of 'Design for Supply Chain' (DFSC) (Claypool et al., 2014; Gokhan et al., 2010; Lee, 1993; Lee & Sasser, 1995). DFSC is a specific type of 'Design for X' (DFX) practice. DFX practices can be used to design a product simultaneously with X or to explore how the design of a product affects X (Huang, 1996). 'X' can represent many different activities depending on a manufacturer's objectives; the 'D' in DFX refers to (product) design. DFX may not only stand for designing a product for X, it can also stand for the simultaneous design of the product and X. This means that DFX practices can be used to perform activities and make improvements related to a product and X (Huang, 1996). Since a manufacturer can have various objectives, it is possible to use two or more DFX practices simultaneously for multiple purposes (for overviews of DFX practices, see Kuo et al. (2001) and Arnette et al. (2014)).

DFSC is an important DFX practice for manufacturers because considering sourcing strategy only after NPD can result in a lengthier time to market and suboptimal overall product profitability (Claypool et al., 2015). Lee (1993) was one of the first scholars to demonstrate the benefits of DFSC, and since then, many others have recognised the importance of this DFX practice (e.g. Appleyard, 2003; Gokhan et al., 2010; Hillebrand & Biemans, 2004; Hult & Scott Swan, 2003; Hundal, 1993; Joglekar & Rosenthal, 2003; Petersen et al., 2003). For example, Gokhan et al. (2010) argue that DFSC can reduce the cyclic procedure of designing a product, generating the SC, evaluating the SC, and redesigning the product to a single iteration.

The SLR deduced four practices that comprise DFSC, which are discussed in the next section.

5.1.3.1 DFSC and its Constituent Practices

As a first DFSC practice, the R&D function (e.g. industrial designers, mechanical design engineers, CAD engineers) can consider sourcing strategy in the product design stage (i.e. concept and detail design) of NPD (e.g. Chiu & Kremer, 2014; Gokhan et al., 2010; Lee & Sasser, 1995). This facilitates achieving the full benefits of DFSC (Dowlatshahi, 1999; Lee & Sasser, 1995). For example, it allows the anticipation and management of potential supplier selection constraints (e.g. limited supplier availability) when designing or selecting product concepts (Chiu & Kremer, 2014).

As a second DFSC practice, the sourcing function can be represented in NPD (e.g. Arnette & Brewer, 2017; Dowlatshahi, 1996). Arnette and Brewer (2017) argue that an increased role for the sourcing functions in NPD allows manufacturers to better utilise internal resources, as well as increasing supplier involvement, and ultimately improving product performance. For example, the sourcing function knows how to build a strong supplier network and which suppliers can contribute when brought into NPD (Brewer & Arnette, 2017).

Dowlatshahi (1996, 1999) even argues that the sourcing function should be given an essential role as the key player in NPD. This requires delegation of legitimate authority and power to the sourcing function, and top management should genuinely encourage its involvement (Dowlatshahi, 1996, 1999).

As a third DFSC practice, there can be substantial collaboration between the R&D and sourcing functions (e.g. Dowlatshahi, 1996; Gokhan et al., 2010). This can be supported with well-defined information requirements and exchanges, allowing the sourcing function to communicate the potential benefits or risks of sourcing strategies to the R&D function on a timely, accurate, and relevant basis (Dowlatshahi, 1996, 1999). As DFSC aims to balance the activities of the R&D and sourcing functions, trade-offs between functional interests may also prevail (Dowlatshahi, 1996, 1999). For example, trade-offs may occur between the R&D function's preferences regarding product functionality and the sourcing function's regarding, for example, supplier availability, cost, quality, or lead times (Dowlatshahi, 1996, 1999).

As a fourth and final DFSC practice, methods for considering sourcing strategy can be adopted (e.g. Dowlatshahi, 1996; Lee, 1993). Most of the DFSC methods include analytical models that support the R&D function in considering sourcing strategy during product design (van Hoek & Chapman, 2006). These models typically quantify the benefits (e.g. lower costs, lower inventory, shorter lead times) of changing a product design based on sourcing constraints (e.g. supplier availability) (Lee, 1993), which ultimately provides valuable input to decision-making processes (Lee et al., 1993). For example, Yadav et al. (2011) propose a model aimed at minimising supplier costs and product design complexity while maximising the sales profits of the end products (for more DFSC models, see Yao and Askin (2019)). DFSC models – explicitly or implicitly – define the new product by using the BOM and describe the SC as a network comprising the connections among supplier, manufacturing, distribution, and customer nodes (Yao & Askin, 2019).

5.1.4 Interplay among Sourcing Strategising Dimensions in NPD

The SLR shows that even though the literature on sourcing strategy in NPD has neglected the SAP lens, it can be used to explain the practitioners, activities, and practices of sourcing strategising in NPD. The SLR further reveals that the literature has not yet explicitly investigated the interplay of these dimensions. Therefore, the remainder of this section uses Whittington's (2006) SAP framework to conceptualise the possible interplay among the dimensions of sourcing strategising in NPD. Then, the section suggests how future research can further explore the interplay by reflecting the SAP insights discussed in Section 3.3.

Using Whittington's (2006) SAP framework, Figure 7 shows that sourcing strategising practices (i.e. DFSC practices) at one level interact with sourcing

strategising activities in NPD at another.[3] As suggested by de Waal and Knott (2010), a key distinction between these levels is that sourcing strategising practices are to some extent generic, whereas the type and number of sourcing strategising activities depend on the specific NPD process under consideration.
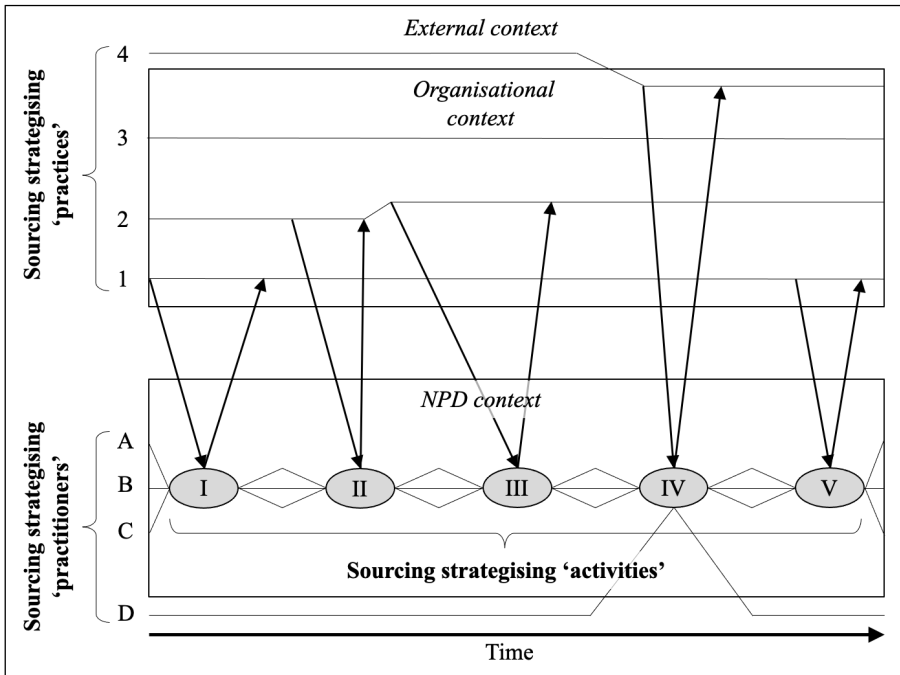
Figure 7 Interplay among Sourcing Strategising Practitioners, Activities, and Practices in the NPD Process (adapted from Whittington, 2006)

Within a manufacturer's organisational context, the drivers for institutionalising practices are potential improvements in terms of efficiency and legitimacy (Westphal et al., 1997). Within a manufacturer's NPD process, practitioners (e.g. procurement engineers) tend to select and apply existing or emerging practices (e.g. DFSC models) based on their knowledge and how suitable the practices are for performing sourcing strategising activities (e.g. supplier selection).

The bottom rectangle in Figure 7 represents the context of a manufacturer's NPD process, which includes a set of sourcing strategising activities (I, II, III, IV, V). These activities are performed by three sourcing strategising practitioners from the same organisation (A, B, C), and one external practitioner (D) in the case of activity IV. Practitioner D can be a partner or consultant from a manufacturer's

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[3] This dissertation replaces Whittington's (2006) concept of 'praxis' with that of 'activities'. This change was made to better reflect the vocabulary of the literature on sourcing strategy in NPD.

external context. Figure 7 simplifies reality since NPD can include more than five activities and more than four practitioners.

The top rectangle in Figure 7 includes the set of accepted and institutionalised practices that are drawn upon by practitioners as they engage in sourcing strategising activities in NPD. Figure 7 simplifies reality by only showing four practices. These practices can be generated locally (within a manufacturer's organisational context) or originate from the external context (e.g. introduced by outside partners or consultants) (de Waal & Knott, 2010). Practices can be used at individual, interpersonal, and organisational levels and support different practitioners simultaneously (Stenfors, 2007). Moreover, multiple practices or multiple enactments of the same practice may be used for long-term strategising activities (Kouamé & Langley, 2018).

Sometimes practitioners want to modify existing practices in order to perform their activities optimally (Jarzabkowski, 2004), which is depicted by the kink at practice 2 in Figure 7. On other occasions, practitioners may need to adopt practices that are new to a manufacturer (practice 4) to successfully perform a certain activity (activity IV) in NPD. These newly adopted practices can be reapplied and amended in the future. Finally, it is also possible that an institutionalised practice is not relevant in NPD (practice 3).

These insights invite future research to explicitly investigate the interplay of the practitioners, activities, and practices of sourcing strategising in NPD. For example, guided by the SAP insights discussed in Section 3.3, there are at least two main directions for future research.

First, Dameron et al. (2015) argue that three types of relationships between strategising practices and activities exist: weak, moderate, and strong. The weak relationship refers to situations where practices may impact strategising activities (Whittington et al., 2006). The moderate relationship refers to situations where there is an interplay between practices and strategising activities (Werle & Seidl, 2015). The strong relationship refers to situations where practices and strategising activities are deeply entangled and cannot be separated from each other (Kohtamäki et al., 2022). Guided by these insights, future research can explore the interplay between the practices and activities of sourcing strategising in NPD. For example, this could reveal that some practices constrain or even prohibit the performance of sourcing strategising activities, whereas others have limited influence.

Secondly, Section 3.3 showed that SAP research (e.g. Knight et al., 2020) has become increasingly concerned with the role of external practitioners in strategising. Future research on sourcing strategising in NPD can follow this trend by exploring the interplay of, for example, suppliers, consultants, or customers and sourcing strategising activities and practices. Such research has the potential to reveal how external practitioners constrain or enable sourcing strategising activities. It may also reveal how such practitioners modify existing, or introduce new, sourcing strategising practices.

5.1.5   *Summary of the Conceptual Research Findings*

By discussing the findings of Papers 1 and 2, the preceding sections showed the usefulness of the theoretical lens of SAP in presenting a common framework that allows for a systematic recollection of existing contributions from research on sourcing strategy in NPD. The sections further showed that the SAP lens is able to create an understanding of the phenomenon of 'sourcing strategising in NPD'. Specifically, the SAP lens made it possible to conceptualise the phenomenon as the interplay of practitioners, activities, and practices. It was possible to define these dimensions by drawing from the literature on sourcing strategy in NPD, since – even though the SAP lens is absent from this literature – it provides insights explaining the three dimensions of sourcing strategising in NPD.

First, sourcing strategising practitioners were defined as those who perform sourcing strategising activities by drawing upon sourcing strategising practices. It was proposed that these practitioners can originate from different organisational functions and levels. Secondly, sourcing strategising activities were defined as practitioner activities with regard to the formation of sourcing strategy. Three sourcing strategising activities were crystallised and discussed in relation to different stages of the NPD process: (1) make-or-buy analysis, (2) supplier selection, and (3) supplier relationship formation. Thirdly and finally, sourcing strategising practices were defined as any shared routines of behaviour – including traditions, norms, and procedures – for performing sourcing strategising activities. It was concluded that these practices can be referred to as 'DFSC', which has four constituent practices, namely: (1) consideration of sourcing strategy during product design, (2) representation of the sourcing function in NPD, (3) collaboration between the R&D and sourcing functions, and (4) adoption of BOM-based models for considering sourcing strategy.

The preceding sections also used the SAP lens to show that the three dimensions of sourcing strategising in NPD do not exist in isolation. Most notably, sourcing strategising practices (i.e. DFSC) can support or limit practitioners in their ability to perform sourcing strategising activities in NPD. In turn, when practitioners perform sourcing strategising activities, there may be a need to modify existing practices or adopt new ones. The literature on sourcing strategy in NPD has not yet explicitly investigated the interplay of these dimensions, which constitutes a major opportunity for future research.

The conceptual research findings, which Figure 8 summarises, provide an answer to the first research question of the dissertation (How can sourcing strategising in NPD be conceptualised through the theoretical lens of SAP?). In general, the findings show that the SAP lens can strengthen the literature on sourcing strategy in NPD from both an academic and a practical perspective. It provides a common language, which in turn facilitates systematic generation, accumulation, extension, and dissemination of knowledge on the 'doing of sourcing strategy' in NPD. For example, the findings provide the conceptual clarity needed for the empirical research of the dissertation, which the next section discusses.
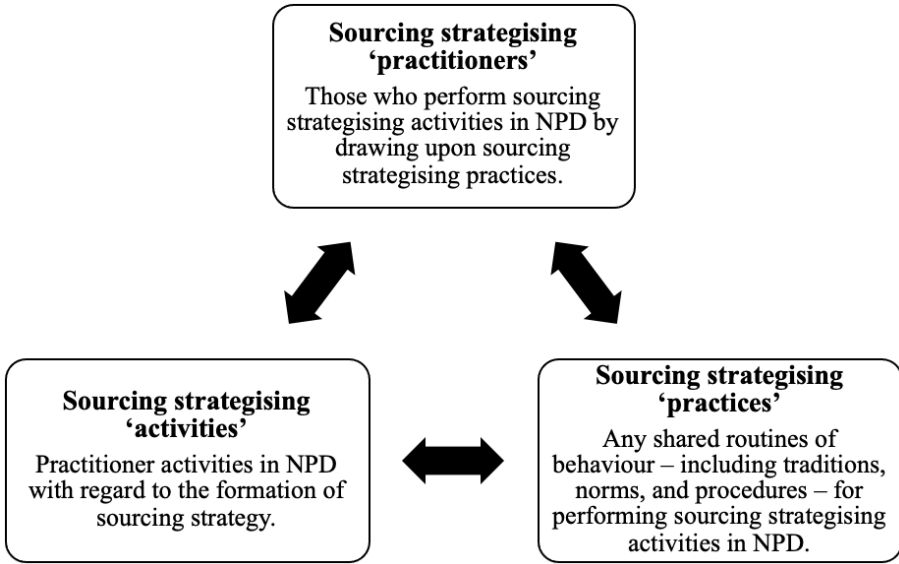
Figure 8 Conceptual Framework of Sourcing Strategising in NPD

5.2 Empirical Research Findings

Section 3.4 suggested that the 'right' approach to sourcing strategising depends on the particular NPD context in which it occurs. Furthermore, Section 1.2 argued that literature on sourcing strategy in NPD has often neglected the ETO context. This context deserves careful examination due to involving high levels of complexity, uncertainty, and customisation (Cannas & Gosling, 2021; Gosling & Naim, 2009; Hobday et al., 2000). Therefore, Papers 3 and 4 use the case study method to empirically explore how sourcing strategising can unfold in the NPD process of manufacturers operating in the ETO context.

Guided by the SAP lens and the conceptual research findings discussed in the preceding section, the papers focus on practitioners' sourcing strategising *activities* (Paper 3) and *practices* (Paper 4). The following sections discuss the findings of the papers to answer the second research question of the dissertation (How can sourcing strategising unfold in the NPD process of manufacturers operating in the ETO context?).

5.2.1 Sourcing Strategising Activities in ETO NPD

Informed by the SAP lens (e.g. Whittington, 1996, 2006), Paper 3 focuses on how practitioners can engage in sourcing strategising *activities* in ETO NPD. This focus differs from that of previous research, which conceptualises sourcing strategy as something that manufacturers *have*, such as a single sourcing strategy, rather than as something that practitioners *do*. Following the conceptual research

findings discussed in Section 5.1.2, Paper 3 empirically explores three activities: (1) make-or-buy analysis, (2) supplier selection, and (3) supplier relationship formation.

Because 'time' plays a key role in strategising (e.g. Jarzabkowski et al., 2007; Tidström & Rajala, 2016), Paper 3 explores the three activities in relation to different time periods of the NPD process. Section 5.1.2 showed that practitioners can complete sourcing strategising activities early or late in the NPD process. While 'early' refers to before or in the concept design stage of NPD (e.g. Chiu & Kremer, 2014; Wynstra et al., 1999), 'late' refers to when the product BOM becomes available in the detail design stage of NPD (e.g. Fine et al., 2005; Graves & Willems, 2005).

Following the distinction between 'early' and 'late' completion of the sourcing strategising activities, Paper 3 proposes and empirically explores five approaches to sourcing strategising in ETO NPD. These approaches are summarised in Table 9 and subsequently discussed with regard to their conditions and intended outcomes. It should be noted that this section does not aim to identify the 'best' approach sourcing strategising approach, but rather to compare and assess different sourcing strategising approaches. Furthermore, while the approaches are explored through a case study involving only manufacturers operating in the ETO context (Section 4.4), they may also be applicable to high-volume, standardised manufacturing contexts.

5.2.1.1   The EEE Approach

The EEE approach entails completing all sourcing strategising activities early in the NPD process. Three conditions may justify this approach in the ETO context. First, the EEE approach can occur when the level of product uncertainty is relatively low. In the absence of this condition, early initiation of sourcing strategising is unattainable, due to the inability to anticipate the items needed throughout NPD. Secondly, the EEE approach is appropriate when NPD success relies on a few suppliers that are difficult to replace. This condition encourages selecting these suppliers as early as possible in order to ensure their commitment to NPD. Thirdly and finally, the EEE approach occurs when early supplier input is essential to managing high levels of product complexity or meeting customer requirements. This condition legitimises forming supplier relationships already in the early stages of NPD. When the three conditions are met, the EEE approach may promise early supplier commitment and input.

Table 9 Five Approaches to Sourcing Strategising in ETO NPD

#	Sourcing Strategising Approach			Abbreviation	Conditions Promoting the Approach	Intended Outcome
	Make-or-buy analysis	Supplier selection	Supplier relationship formation			
1	Early	Early	Early	EEE	• Low level of product uncertainty • Low number of suitable suppliers • Early supplier input is needed	Early supplier commitment and input
2	Early	Late	Early	ELE	• Low level of product uncertainty • High level of supplier motivation • Early supplier input is needed	Early supplier input and increased supplier competition
3	Early	Early	Late	EEL	• Low level of product uncertainty • Low number of suitable suppliers • Early supplier input is not needed	Early supplier commitment and reduced supplier dependency
4	Early	Late	Late	ELL	• Low level of product uncertainty • High number of suitable suppliers • Early supplier input is not needed	Early clarity regarding supplier responsibilities
5	Late	Late	Late	LLL	• High level of product uncertainty • High number of suitable suppliers • Early supplier input is not needed	In-house control of the early stages of NPD

5.2.1.2 The ELE Approach

The ELE approach differs from that of EEE by delaying supplier selection until late in NPD. Three conditions may justify this approach in the ETO context. First, the ELE approach requires a low level of product uncertainty. However, the approach can accommodate more uncertainty than the EEE approach. This is caused by not needing to select suppliers until the product design is almost finalised. Secondly, the ELE approach requires suppliers that are motivated to contribute to NPD. This condition makes it possible to invite multiple suppliers to NPD and have them compete for the same order. In the absence of motivation, suppliers may refrain from dedicating resources to NPD, due to the risk of not being selected. Thirdly and finally, the ELE approach is appropriate when early supplier input is important, but not as essential as with the EEE approach. This condition allows relationships to be formed with suppliers early in NPD, even though some of them may lack the ability to provide desirable input, and thus not receive orders. When the three conditions are met, the ELE approach may promise increased competition among suppliers, while still forming relationships to receive their input early in NPD.

5.2.1.3 The EEL Approach

The EEL approach differs from that of EEE by delaying supplier relationship formation until late in NPD. Three conditions may justify this approach in the ETO context. First, the EEL approach requires the early NPD stages to involve a level of product uncertainty similar to the ELE approach. This condition is a prerequisite for anticipating and selecting the suppliers needed in NPD. Secondly, the EEL approach assumes the presence of a few suitable suppliers that are difficult to replace. In such a situation, it may be necessary to lock in suppliers early in NPD, even though the formation of supplier relationships is delayed until late in NPD. Thirdly and finally, the EEL approach is appropriate when there is no need for early supplier input. In such situations, early relationship formation with suppliers unnecessarily increases supplier dependency. When the three conditions are met, the EEL approach may promise reduced dependency on suppliers, while still ensuring their commitment through placing purchase orders early in NPD.

5.2.1.4 The ELL Approach

The ELL approach entails completing the make-or-buy analysis early in NPD, while delaying supplier selection and relationship formation until late in NPD. Three conditions may justify this approach in the ETO context. First, the ELL approach requires a level of product uncertainty low enough to be able to conduct the make-or-buy analysis early in NPD. More uncertainty is allowed than with the EEE, ELE, and EEL approaches, due to not selecting and forming relationships with suppliers early in NPD. Secondly, the ELL approach requires the availability of suitable suppliers. Without this condition, there is too much risk in approaching

suppliers only toward the end of NPD. Thirdly and finally, similarly to the EEL approach, the ELL approach is appropriate when the benefits of approaching suppliers late in NPD – such as reduced supplier dependency – outweigh the risks. When the three conditions are met, the ELL approach may promise early clarity regarding supplier responsibilities in NPD.

5.2.1.5   The LLL Approach

The LLL approach entails completing sourcing strategising activities late in NPD. Three conditions may justify this approach in the ETO context. First, the LLL approach is appropriate when the early stages of NPD involve a high level of product uncertainty. This condition assumes the inability to anticipate which items or services are needed throughout NPD, making early sourcing strategising counterproductive. Secondly, similarly to the ELL approach, the LLL approach assumes the availability of suitable suppliers. In the absence of this condition, postponing sourcing strategising until late in NPD involves too much risk. Thirdly and finally, similarly again to the ELL approach, the LLL approach is only desirable when there is no need to approach suppliers early in NPD. This condition naturally assumes the availability of the in-house resources required early in NPD. When the three conditions are met, the LLL approach may promise in-house control of the early stages of NPD.

5.2.2   *Sourcing Strategising Practices in ETO NPD*

As discussed in Section 3.3.3, the SAP lens proposes exploring strategising activities in relation to their associated practices. This implies that a distinction should be made between strategising activities and practices. While strategising *activities* represent human action with regard to the formation of strategy, strategising *practices* are the routines, procedures, discourses, concepts, and technologies that empower or constrain practitioners in their strategising activities (Jarzabkowski & Whittington, 2008; Whittington, 2006). Based on this distinction, Paper 4 empirically explores the practices practitioners draw upon during sourcing strategising in ETO NPD. Following the conceptual research findings discussed in Section 5.1.3, this includes a focus on DFSC and its four constituent practices, which are: (1) consideration of sourcing strategy during product design, (2) representation of the sourcing function in NPD, (3) collaboration between the R&D and sourcing functions, and (4) adoption of BOM-based models for considering sourcing strategy.

Since the literature (e.g. Claypool et al., 2014; Gokhan et al., 2010; Lee, 1993; Lee & Sasser, 1995) mainly focuses on manufacturing contexts involving standardised products targeted at consumers (Gosling et al., 2015), this section proceeds by first discussing the extent to which the four DFSC practices hold in the ETO context, and then the relationships among the practices.

5.2.2.1   DFSC and its Constituent Practices in the ETO Context

Paper 4 identifies four DFSC practices in the ETO context: (1) consideration of sourcing strategy in NPD, (2) representation of the sourcing function in NPD, (3) collaboration between the R&D and sourcing functions, and (4) adoption of methods for considering sourcing strategy. A comparison of the identified practices with the literature reveals three types of contributions: (1) extension (adding to the literature), (2) straight replication (verifying the literature), or (3) replication and extension (verifying and adding to the literature by providing context-based insights). This is shown in Table 10 and discussed in the remainder of the section.

The first identified DFSC practice indicates that the ETO context may require the consideration of sourcing strategy by the R&D function before and during product design. This finding partially overlaps with prior literature (e.g. Arnette & Brewer, 2017; Gokhan et al., 2010; Lee & Sasser, 1995; Yadav et al., 2011), which also argues for the R&D function to consider sourcing strategy in the product design stage of NPD (i.e. from concept until detail design). However, the finding extends the literature by proposing that, in the ETO context, sourcing strategy may also need to be considered before the product design stage. During ETO NPD, cost and lead-time commitments are made to a customer when making the business case before the product design stage (Davies et al., 2011; Hobday, 2000). When sourcing strategy is properly considered during these planning activities, more realistic cost or lead-time targets may be set and, in turn, the sourcing function becomes less restricted in its activities (e.g. supplier selection).

The second identified DFSC practice suggests that the sourcing function may need to assign sufficient and suitable representatives and clarify their responsibilities in ETO NPD. This finding supports the literature (e.g. Arnette & Brewer, 2017; Brewer & Arnette, 2017; Dowlatshahi, 1996), which argues for proper representation of the sourcing function in NPD. However, the finding also complements the literature in two ways. First, it specifies that, in the ETO context, it may be crucial that the sourcing function assigns sufficient and suitable representatives to NPD. Since ETO NPD is engineering-intensive and mostly involves many people originating from the R&D function (Hobday et al., 2000; Willner et al., 2016), assigning sufficient and suitable representatives avoids representatives from the sourcing function not understanding or being completely outnumbered by the R&D function. Second, the finding specifies that the sourcing function may need to clarify the responsibilities of its representatives. This may be needed since ETO NPD takes many years, involves many stakeholders, and consists of multifunctional activities that require different skills and competencies (Davies et al., 2011; Hobday, 2000; Willner et al., 2016).

Table 10 The Identified DFSC Practices and their Contribution to the Literature

DFSC Practice	Theme	Type of Contribution	Description
Consideration of sourcing strategy in NPD	The R&D function considers sourcing strategy before product design.	Extension	Before the product design stage of ETO NPD, the R&D function often makes cost and lead-time commitments to a customer. To avoid unrealistic commitments and restricting the sourcing function in its work, sourcing strategy (e.g. ideal supplier profiles) may require consideration during such planning activities.
	The R&D function considers sourcing strategy during product design.	Straight replication	In the ETO context, the R&D function may need to consider sourcing strategy in the product design stage of NPD (i.e. from concept until detail design).
Representation of the sourcing function in NPD	The sourcing function assigns sufficient and suitable representatives to NPD.	Replication and extension	NPD of ETO products is engineering-intensive and mostly involves people from the R&D and sourcing functions. To create a balance between the R&D and sourcing functions, the sourcing function may need, first, to ensure it is represented by enough people, and second, by those who understand the R&D function's work.
	The sourcing function clarifies the responsibilities of its representatives in NPD.	Replication and extension	Since NPD of ETO products takes many years and includes many different types of meetings that require different attendees, the sourcing function may need to clarify the responsibilities of its representatives in NPD.

Table 10 (continued)

Collaboration between the R&D and sourcing functions	The R&D function informs the sourcing function about its activities.	Replication and extension	The R&D function tends to have most of the decision-making authority and power in NPD of ETO products. However, the R&D function can at least involve the sourcing function in decision-making processes.
	The sourcing function provides feedback on the R&D function's activities.	Replication and extension	In NPD of ETO products, the sourcing function is encouraged to provide feedback on the R&D function's activities. This avoids these activities being optimised for an individual project.
Adoption of methods for considering sourcing strategy	The sourcing function adopts procedures for considering sourcing strategy.	Extension	Since NPD of ETO products is associated with high levels of complexity, procedures can support and guide the consideration of sourcing strategy. Furthermore, the ETO context mainly involves engineering-oriented people and, consequently, engineering-oriented procedures. Therefore, the sourcing function may need to champion the adoption of sourcing-oriented procedures.
	The sourcing function adopts BOM-based models for considering sourcing strategy.	Straight replication	To ensure that the many items (e.g. components) that are part of ETO products effectively address sourcing constraints, the sourcing function may need to adopt BOM-based models for considering sourcing strategy.

The third identified DFSC practice indicates that, in the ETO context, the R&D function may need to inform the sourcing function about its activities. In turn, the sourcing function may need to provide feedback on these activities. This finding supports the literature (e.g. Dowlatshahi, 1996, 1999; Gokhan et al., 2010; Lee, 1993), which argues that DFSC requires substantial collaboration between the two functions. Even though the literature (e.g. Dowlatshahi, 1996, 1999) argues for a delegation of legitimate authority and power to the sourcing function, the ETO context is usually R&D dominated (Hobday et al., 2000; Willner et al., 2016). Therefore, the finding also nuances the literature by showing that, in the ETO context, the R&D function can at least adequately involve the sourcing function in its activities. The finding further confirms the literature (e.g. Dowlatshahi, 1996, 1999) by showing the importance of the sourcing function providing feedback on the R&D function's activities. Since ETO NPD is typically organised with projects (Davies et al., 2011; Hobday, 2000), the R&D function may otherwise optimise activities for an individual project, disregarding the long-term goals of the sourcing function.

The fourth and final identified DFSC practice suggests that the ETO context may require the adoption of procedures and BOM-based models for considering sourcing strategy. This finding partially overlaps with the literature (e.g. Arntzen et al., 1995; Chiu & Kremer, 2014; Lee & Sasser, 1995), which also argues for the adoption of BOM-based models. However, the finding also extends the literature by demonstrating the potentially vital role of procedures in the ETO context. Since ETO NPD involves high levels of uncertainty and complexity (Davies et al., 2011; Hobday, 2000; Willner et al., 2016), formal procedures can support and guide the consideration of sourcing strategy. The finding further extends literature by suggesting that the sourcing function may need to take the lead in ensuring the adequate adoption of such procedures. Since the ETO context mainly involves representatives from the R&D function (Hobday et al., 2000; Willner et al., 2016), NPD otherwise mainly includes engineering-oriented procedures.

5.2.2.2   Relationships among DFSC Practices in the ETO Context

The literature generally focuses on individual DFSC practices without considering their relationships (e.g. Arnette & Brewer, 2017; Brewer & Arnette, 2017; Gokhan et al., 2010; Lee & Sasser, 1995; Yadav et al., 2011). Therefore, apart from identifying DFSC practices in the ETO context, Paper 4 contributes by providing new insights into their relationships. The identified relationships are shown in Figure 9 and described in this section.
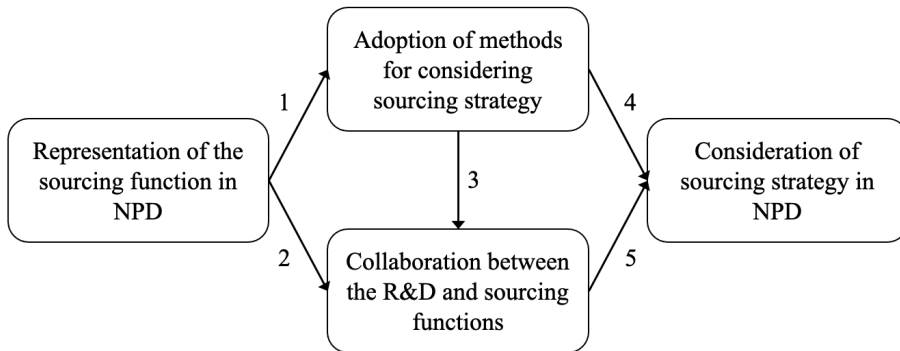
Figure 9 Relationships among DFSC Practices in the ETO Context

(1) The representation of the sourcing function in NPD can increase the adoption of methods for considering sourcing strategy. For example, representatives of the sourcing function can be made responsible for revising existing NPD methods.

(2) The representation of the sourcing function in NPD can improve collaboration between the R&D and sourcing functions. For example, when taking part in NPD meetings, it becomes possible for representatives of the sourcing function to ask questions to representatives of the R&D function.

(3) The adoption of methods for considering sourcing strategy can improve collaboration between the R&D and sourcing functions. For example, the sourcing function can champion the adoption of a BOM-based model that enables communication of sourcing constraints to the R&D function.

(4) The adoption of methods for considering sourcing strategy can increase the consideration of sourcing strategy in NPD. For example, the sourcing function can ensure that sourcing strategy is covered in procedures that guide the R&D function's work.

(5) The collaboration between the R&D and sourcing functions can increase the consideration of sourcing strategy in NPD. For example, by providing feedback on activities, the sourcing function can help the R&D function to consider sourcing strategy.

Based on the five identified relationships, Figure 10 shows a process for engaging with DFSC practices in the ETO context. Although this process suggests a sequence of four main steps, they may overlap. For example, in parallel to clarifying the responsibilities of the sourcing function's representatives in NPD (Step 1.2), the sourcing function can start the adoption of procedures for considering sourcing strategy (Step 2.1). It should also be noted that while the process is based on a case study involving only manufacturers operating in the ETO context, it may also be applicable to high-volume, standardised manufacturing contexts.

Step 1	**1.1^S** Assign sufficient and suitable representatives of the sourcing function to NPD
	1.2^S Clarify the responsibilities of representatives of the sourcing function in NPD

Step 2	**2.1^S** Adopt procedures for considering sourcing strategy
	2.2^S Adopt BOM-based models for considering sourcing strategy

Step 3	**3.1^R** Inform the sourcing function about activities
	3.2^S Provide the R&D function with feedback on activities

Step 4	**4^R** Consider sourcing strategy before and during product design

Notes: ^{S} The sourcing function's responsibility; ^{R} The R&D function's responsibility

Figure 10 Process for Engaging with DFSC in the ETO Context

5.2.3   Summary of the Empirical Research Findings

Guided by the SAP lens and the conceptual research findings discussed in Section 5.1, the preceding sections empirically explored sourcing strategy as something that practitioners *do*, rather than as something that manufacturers *have*. This included a focus on practitioners' sourcing strategising *activities* and *practices* in ETO NPD. Consequently, the preceding sections provided an answer to the second research question of the dissertation (How can sourcing strategising unfold in the NPD process of manufacturers operating in the ETO context?).

First, findings of Paper 3 were discussed to focus the attention on the possible timing of three sourcing strategising activities: (1) make-or-buy analysis, (2) supplier selection, and (3) supplier relationship formation. By distinguishing between early and late timing of these activities in the NPD process, five approaches to sourcing strategising were identified and discussed. This included

a focus on their conditions and intended outcomes. The findings from Paper 3 thus show that the SAP lens is powerful in discovering distinct patterns of sourcing strategising as well as the factors (e.g. conditions, intended outcomes) promoting the presence of these patterns in a manufacturer's NPD process.

After discussing Paper 3, the findings of Paper 4 were discussed to shift the focus to sourcing strategising practices, which, as discussed in Section 5.1.3, may be referred to as 'DFSC'. The SAP lens suggests distinguishing practices from activities and investigating these practices in their embedding context. Furthermore, the literature on DFSC often neglects the ETO context. Therefore, the preceding sections discussed four empirically grounded DFSC practices in this context, namely: (1) consideration of sourcing strategy in NPD, (2) representation of the sourcing functions in NPD, (3) collaboration between the R&D and sourcing functions, and (4) adoption of methods for considering sourcing strategy.

Although these practices overlap with prior literature, it was demonstrated that their characteristics differ in the ETO context. Most notably, it was argued that this context requires consideration of sourcing strategy before the product design stage of NPD and procedures for considering sourcing strategy. Finally, through discussing relationships among the DFSC practices, a process for engaging with DFSC in the ETO context was proposed.

In general, the empirical findings from Papers 3 and 4 show that – as suggested by the SAP lens – activities and practices as well as their embedding context play a crucial role in understanding how sourcing strategising can unfold in NPD.

6   Contributions and Conclusions

The aim of the research presented in this dissertation is twofold: (1) using the SAP lens to develop a conceptual framework of sourcing strategising in NPD, and (2) using the framework to compare the literature on sourcing strategy in NPD with findings from the ETO context. In order to achieve these aims, the preceding chapter used the findings of the appended papers to answer the research questions formulated in Section 1.3. This chapter proceeds by first discussing how the dissertation contributes to both the literature and practice. Hereafter, the dissertation is concluded by discussing its limitations, and offering directions for future research.

6.1   Contributions to the Literature

The dissertation responds to two knowledge gaps in the literature on sourcing strategy in NPD: (1) the lack of a widely accepted, comprehensive conceptualisation of how manufacturers can engage in sourcing strategy in NPD, and (2) the lack of empirical insights into manufacturers operating in the ETO context (Section 1.2).

Addressing the first knowledge gap, this dissertation uses the theoretical lens of SAP (e.g. Whittington, 2006) to conceptualise how manufacturers can engage in sourcing strategising in NPD. By doing so, the dissertation constitutes an early attempt at using the SAP lens to explore sourcing strategising (see Giunipero et al. (2019) for a recent overview of the theoretical lenses applied in the literature). The use of the SAP lens is a contribution to the literature, in that it brings the 'doing of strategy' to research on sourcing strategy in NPD. Specifically, it guided the creation of a conceptual framework that defines sourcing strategising in NPD as the dynamic interplay of three key dimensions: (1) practitioners, (2) activities, and (3) practices.

By distinguishing among these dimensions, the dissertation provides a detailed understanding of sourcing strategising in NPD. First, the dissertation showed that sourcing strategising practitioners can originate from different organisational functions or levels and are those who perform sourcing strategising activities in NPD. Secondly, sourcing strategising activities were defined as practitioner activities with regard to the formation of sourcing strategy in NPD, which include: (1) make-or-buy analysis, (2) supplier selection, and (3) supplier relationship formation. Therefore, the dissertation also contributes to the literature by crystallising sourcing strategising activities that are suitable for measurement, communication, and accountability. Thirdly and finally, the dissertation showed that sourcing strategising practices fall under the umbrella practice of DFSC,

which includes any shared routines of behaviour for performing sourcing strategising activities in NPD.

Through discussing these dimensions and their interplay in the NPD process, the dissertation provided reflexive knowledge. Most notably, the SAP lens enabled the discussion of sourcing strategising as a multidimensional, dynamic concept and the place it occupies in the NPD process of a manufacturer. This contributes to the literature on sourcing strategy in NPD by breaking away from the traditional focus on structural invariants, normative rules of conduct, or predetermined cognitive schemata (Ellram et al., 2007).

As a more general contribution, the dissertation shows the applicability and promise of the SAP lens in providing theoretical guidance for exploring sourcing strategising. Specifically, the SAP lens provides a common language that facilitates systematic generation, accumulation, extension, and dissemination of knowledge on the 'doing of sourcing strategy' in NPD. Ultimately, this can help in overcoming the fragmented nature of the literature. As indicated, the dissertation constitutes an early attempt at using the SAP lens for this purpose. Therefore, there is still considerable untapped potential, and Section 6.4 suggests how future research on sourcing strategising in NPD can continue to reflect the priorities raised in SAP research.

The second knowledge gap addressed by this dissertation regards the lack of empirical research on sourcing strategising in the NPD process of manufacturers operating in the ETO context. Most of the literature focuses on manufacturers from automotive (e.g. Aoki & Staeblein, 2018; Clark, 1989; Kamath & Liker, 1994; Takeishi, 2001) and computer (e.g. Eisenhardt & Tabrizi, 1995; Graves & Willems, 2005; Lee & Sasser, 1995; van Echtelt et al., 2008) industries. However, the ETO context deserves special attention, due to involving high levels of product uncertainty, complexity, and customisation (Cannas & Gosling, 2021). The SAP lens (e.g. Whittington, 2006) suggests that sourcing strategising activities are situated, meaning that their ideal performance depends on the particular context in which they are embedded. Therefore, in an attempt to begin remedying the second knowledge gap, the dissertation empirically explores three sourcing strategising activities – make-or-buy analysis, supplier selection, and supplier relationship formation – in ETO NPD.

Guided by insights from SAP research (e.g. Tidström & Rajala, 2016), the activities are explored in relation to stages of the NPD process. This involved using the literature on sourcing strategy in NPD to show that the activities can be completed in the early or late stages of the NPD process. Based on this distinction, five approaches to sourcing strategising were proposed and empirically explored in the ETO context. These approaches aid the understanding of how sourcing strategising can unfold. Most notably, they deepen the traditional conception of sourcing strategising activities in NPD, which focuses on a single NPD stage, such as concept design (e.g. Chiu & Kremer, 2014; Fine et al., 2005).

The five approaches to sourcing strategising are also discussed with regard to their potential conditions and intended outcomes in the ETO context. This contributes to the literature in two ways. First, while the dissertation does not

claim to prove a causal relationship between sourcing strategising and subsequent organisational outcomes, it does reveal relationships between particular sourcing strategising approaches and outcomes. Secondly, the dissertation suggests what may cause a shift from one sourcing strategising approach to another, under what conditions such a shift may be desirable, and what outcomes may be achieved. Thus, the dissertation specifies the context in which a particular approach to sourcing strategising may be appropriate. This provides an understanding of why a particular approach to sourcing strategising in NPD 'makes sense' in a manner that may be unique to that time and place.

The SAP lens (e.g. Whittington, 2006) also suggests that practitioners draw upon a set of situated practices as they engage in sourcing strategising. Therefore, the dissertation further addresses the second knowledge gap by empirically exploring how practitioners can engage with the practice of DFSC in the ETO context. This provides two contributions to the literature on sourcing strategy in NPD.

First, since most of the literature focuses on manufacturers of standardised products targeted at consumers (Gosling et al., 2015), the dissertation contributes by distilling four empirically grounded DFSC practices in the ETO context: (1) consideration of sourcing strategy in NPD, (2) representation of the sourcing function in NPD, (3) collaboration between the R&D and sourcing functions, and (4) adoption of methods for considering sourcing strategy. Although these practices overlap with the literature, this dissertation suggests – in line with Cannas and Gosling (2021) – that their characteristics differ in the ETO context. Most notably, this context may require the consideration of sourcing strategy before the product design stage of NPD and procedures for considering sourcing strategy.

Secondly, the dissertation further contributes to the literature by identifying relationships among DFSC practices that are traditionally treated in isolation. For example, the literature (e.g. Arntzen et al., 1995; Lee & Sasser, 1995) tends to study one DFSC practice at a time; and if more than one DFSC practice is studied, there is no particular emphasis on their interrelation.

6.2   Contributions to Practice

Apart from contributing to the literature, the insights provided by the dissertation also contribute to practice. For example, they can be of interest to practitioners involved in sourcing strategising in NPD. As shown in the dissertation, such practitioners can originate from different organisational functions and hierarchal levels.

As a first practical contribution, the dissertation uses the SAP lens to conceptualise how sourcing strategising may unfold in NPD. Due to its reflexive nature, usage of the SAP lens provides knowledge that is conceptually relevant to practitioners. Despite not being 'actionable' (Jarzabkowski & Wilson, 2006) in the sense of constituting detailed guidelines for acting, this knowledge can be – if

needed – capable of actually helping practitioners do their work differently (Johnson et al., 2003).

This implies that the conceptual research of the dissertation provides practitioners with resources to look at their work in a different light, which may enable them to create new or alternative routes of action (Nicolai & Seidl, 2010; Sandberg & Tsoukas, 2011). For example, if practitioners have access to the insights generated by this dissertation, they can learn to see sourcing strategising through the multidimensional lens of SAP. This would allow them to focus attention precisely on what is easily taken for granted in their daily work (Vaara & Whittington, 2012). Ultimately, the dissertation may contribute to the creation of 'reflective practitioners' (Schön, 2017), who will hopefully become more subtle and sensitive during sourcing strategising in NPD.

The dissertation also discusses how practitioners perform three sourcing strategising activities – make-or-buy analysis, supplier selection, and supplier relationship formation – in ETO NPD. By distinguishing between early and late completion of these activities in the NPD process, five distinct approaches to sourcing strategising were discussed. These approaches can support practitioners in ETO NPD. For example, their conditions and intended outcomes can be compared when there is a need to source items or services. When a sourcing strategising approach is proposed, a clear strategy discussion should take place on its advantages. This can create a fit between a sourcing strategising approach, overall organisational goals, and changing market conditions.

Furthermore, suitable sourcing strategising approaches may be integrated into the stage-gate model of Cooper and Kleinschmidt (2001), which manufacturers typically use to manage NPD. The first three stages in this five-stage model determine the scope of the new product, its business case, and a detailed product design. The gates at the end of each stage filter out work that does not meet predetermined criteria. The identified sourcing strategising approaches can enrich the stage-gate model by integrating sourcing strategising activities into the first three stages and gates of the model. This helps in ensuring that apart from product design activities, sourcing strategising activities are also formalised and systematically performed by practitioners in ETO NPD.

Finally, the dissertation suggests that during sourcing strategising in NPD, there is plenty of room for practitioners from the R&D function to promote its interests as taking priority over those of the sourcing function. In order to discourage such behaviour, practitioners may need to engage with DFSC, which is a practice that facilitates collaboration during sourcing strategising. Therefore, as a final practical contribution, this dissertation proposes a process for engaging with DFSC in the ETO context.

6.3   Limitations

As with all research, this dissertation has limitations that should be considered when interpreting its findings. First, the conceptual research is supported by the

SLR method, which, despite its systematic nature, has four inevitable biases: sampling bias, selection bias, within-study bias, and expectancy bias (Cooper, 2015; Durach et al., 2017; Felson, 1992). Although actions were taken to minimise the effects of these biases (Table 7), it remains unclear to what extent biases have influenced the conceptual research findings of the dissertation.

Other notable limitations relate to the case study of the dissertation. While its strength lies in the ability to capture subjective human experiences and interpretations of phenomena, similarly to the SLR method, bias cannot be completely avoided in a case study. For example, the interviewees who contributed to the case study of the dissertation may be biased for reasons such as impression management or workplace frustration (Scheibe & Blackhurst, 2018). The use of retrospective interviews is another limitation of the case study. 'Retrospective' implies that reactions might be biased as a result of retrospective sensemaking of situations (Eisenhardt & Graebner, 2007). Researcher bias may further affect the case study (Clark et al., 2010). These biases were, however, reduced through prolonged engagement, persistent observation, triangulation, and participant check (Table 8).

Furthermore, the multidimensional nature of sourcing strategising may be difficult to capture through interviews. For example, interviewees may take daily sourcing strategising too much for granted for explicit discussion, and its complexity may be too high to describe fully. Therefore, even better insights could possibly have been obtained by using longitudinal, real-life observations of sourcing strategising. However, for the present study, such a data collection approach was not feasible, since the empirical context of the dissertation – ETO – involves sourcing strategising processes that can run parallel and take many years to complete.

As a final limitation, a case study cannot produce findings that are statistically generalisable. Thus, although many of the findings of this dissertation's case study may be relevant for other manufacturers of ETO products, it is not possible to support this claim with empirical evidence. This was, however, not the aim of the case study, which rather sought to provide an in-depth account of sourcing strategising in ETO NPD. Its findings are presented in such a way that readers can interpret their relevance in other contexts. Therefore, the notion of 'transferability' (Lincoln & Guba, 1985) rather than 'external validity' becomes more relevant in assessing the generalisability of the findings presented in the dissertation, including their contribution to knowledge.

6.4   Future Research Directions

Based on the limitations and scope of the dissertation, this section opens up several avenues for future research on the topic of sourcing strategising in NPD. First, future research is encouraged to continue reflecting the trends and priorities of SAP research. The preceding section highlighted that it may be hard to capture the multidimensional nature of sourcing strategising in NPD through interviews

only. Therefore, future research can take inspiration from SAP research (e.g. Burke & Wolf, 2021) and use real-life observations and ethnographic methods to provide detailed insights into sourcing strategising. For example, photographs or videos can be taken when practitioners engage in sourcing strategising during NPD meetings (e.g. project kick-offs, business case meetings, design reviews). This may provide rich insights into matters that are often taken for granted by practitioners or scholars during interviews.

SAP research (e.g. Dameron et al., 2015) proposes that three types of relationships exist between practices and strategising activities: weak, moderate, and strong. The weak relationship refers to situations where practices may impact strategising activities (Whittington et al., 2006). The moderate relationship refers to situations where there is an interplay between practices and strategising activities (Werle & Seidl, 2015). The strong relationship refers to situations where practices and strategising activities are deeply entangled and cannot be separated from each other (Kohtamäki et al., 2022). Future research on sourcing strategising in NPD can use these insights to explore the interrelations between practices and activities. For example, this could reveal that some practices constrain or even prohibit the performance of sourcing strategising activities, whereas others have limited influence.

SAP research has become increasingly concerned with how practitioners external to the firm influence strategising, thereby going beyond what is already known about the role of practitioners from within the firm (Knight et al., 2020). Future research on sourcing strategising in NPD can follow this trend by exploring the role of, for example, suppliers, consultants, or customers in sourcing strategising. Such research has the potential to reveal how external practitioners constrain or enable sourcing strategising.

SAP research also proposes that strategising can be based on activities that are not interpreted as 'strategic' by practitioners (Tsoukas, 2010). Practitioners rarely reflect on strategies or engage in more planned strategising (Jarzabkowski et al., 2016). Instead, strategising is likely to be grounded in past actions and experiences and does not require intention and purposeful goal orientation (Chia & Holt, 2006, 2009). This means that strategising often emerges inductively from daily activities, not from the deliberate planning of a corporate entity (Mintzberg & Waters, 1985). These activities can result in realised or unrealised manifestations of strategy (Mintzberg & Waters, 1985; Mirabeau & Maguire, 2014). Therefore, future research can focus on creating a longitudinal understanding of how sourcing strategising unfolds throughout the NPD process. Such research can explore the very ways in which planned and unplanned sourcing strategising activities unfold and whether they result in realised or unrealised manifestations of sourcing strategy. This promises the identification of incoherence, inconsistency, conflict, and dilemma (Blackler, 1993), which are phenomena that offer major contributions to both the literature and practice.

In addition to reflecting the trends and priorities of SAP research, future research can benefit from additional theoretical diversity. For example, contingency theory (Ginsberg & Venkatraman, 1985) can be used to explore how

sourcing strategising is contingent (dependent) on, and shaped by, a manufacturer's internal and external conditions. For example, a manufacturer with an environmental focus may engage differently in sourcing strategising to a manufacturer with a cost focus. Similarly, sourcing strategising may be affected by different types of innovation (e.g. radical, incremental). External conditions such as crisis situations (e.g. the COVID-19 pandemic) may further influence sourcing strategising. Other than contingency theory, there are many more theoretical lenses to choose from; and the handbook of Tate et al. (2022) is a helpful starting point for future research aimed at theorising about sourcing strategising in NPD.

Future research can also build on and enrich the empirical findings of this dissertation, which include distinct sourcing strategising approaches and DFSC practices in the process of ETO NPD. For example, additional qualitative studies can be conducted to derive testable hypotheses based on these findings. Hereafter, these hypotheses can be subjected to empirical verification through quantitative methods such as surveys.

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Appendices

Appendix 1: Workshop Attendees

Company	Industry Representative[1]	Workshops Attended (WS0-9)
ConsultCo	*Business Unit Manager*	0 1 2 - - - - - - 9
	Quality Consultant	0 1 2 - - - - - - -
	Export Control Consultant	- 1 2 - 4 - - 7 8 9
	Product Buyer Consultant	- 1 2 - - 5 6 - - -
	Engineering Consultant	- 1 2 3 4 - - - - -
	Operations Developer	- - - - - 5 6 - 8 9
PowerCo	*S&OP Manager*	0 1 2 - 4 5 - - - 9
	Global Demand Planner	0 1 2 3 4 5 6 7 8 9
	Head of Production Technology	- - 2 3 - 5 6 7 - 9
	Chief Engineer	- 1 2 3 - - - - - -
	Procurement Engineer	- 1 2 3 - 5 6 - 8 9
	Procurement Manager	- 1 - - - 5 - - - -
WhitegoodsCo	*Director Global R&D*	0 - 2 3 4 - 6 - 8 -
	Innovation and Technology Manager	- 1 - - - - - - - -
	Global Transportation Manager	- - 2 3 - - - - - -
AeroCo	*Procurement Manager*	0 1 2 - 4 5 6 - - -
	Logistics Specialist	- 1 2 3 4 5 - 7 8 9
	Procurement Lead	- - - - - - 6 7 8 9
LiftingCo	*Project Manager*	- - 2 3 4 5 6 7 8 9
	CEO	- - - - 4 - 6 - - -
TextileCo	*Supply Chain Manager*	- - - 3 - - - 7 8 9
	R&D Manager	- - - 3 4 - 6 7 - -

Note: [1] The main contact persons at each industrial partner are highlighted in italics. The contact persons are members of the steering group for the DesiRe project.

Appendix 2: Interview Guide

Interview Questions for Papers 3 & 4

- In what type of industrial context does your organisation operate?
- What type of products does your organisation design and manufacture?
- What is a typical customer of your organisation's product?
- What trends impact or will impact your organisation?

- What is your organisation's overall strategy and vision?
- What is your organisation's overall sourcing strategy?
- What are your organisation's role and responsibilities in the supply chain?
- What are your role and responsibilities in the organisation?
- What are your role and responsibilities in your organisation's NPD process?
- What are your background and areas of interest?
- How does your organisation organise NPD?
- What are the main stages and gates of your organisation's NPD process?
- What are the main activities that are performed in the NPD stages and gates?
- How do the main activities unfold throughout the NPD process?
- What are the role and responsibilities of suppliers in NPD?
- What are the role and responsibilities of customers in NPD?

Interview Questions for Paper 3

- How is the make-or-buy analysis performed in your organisation's NPD process?
- How are suppliers selected in your organisation's NPD process?
- How are relationships formed with suppliers in your organisation's NPD process?
- What are the intended outcomes of, and conditions for, completing the make-or-buy analysis, supplier selection, and supplier relationship formation early in the NPD process?
- What are the intended outcomes of, and conditions for, completing the make-or-buy analysis and supplier relationship formation early in NPD, while delaying supplier selection until late in NPD?
- What are the intended outcomes of, and conditions for, completing the make-or-buy analysis and supplier selection early in NPD, while delaying supplier relationship formation until late in NPD?
- What are the intended outcomes of, and conditions for, completing the make-or-buy analysis early in NPD, while delaying supplier selection and supplier relationship formation until late in NPD?
- What are the intended outcomes of, and conditions for, completing the make-or-buy analysis, supplier selection, and supplier relationship formation late in the NPD process?

Interview Questions for Paper 4

- What are the main sourcing challenges in NPD?
- How is the sourcing function involved in NPD?
- What are the responsibilities of the R&D function in NPD?
- What are the responsibilities of the sourcing function in NPD?
- How do the R&D and sourcing functions collaborate in NPD?

- When do the R&D and sourcing functions collaborate in NPD?
- What practices are used to ensure collaboration between the R&D and sourcing functions in NPD?
- What are the main challenges related to collaboration between the R&D and sourcing functions in NPD?
- What are examples of situations during which sourcing strategising activities were adequately considered in NPD?
- What are examples of situations during which sourcing strategising activities were inadequately considered in NPD?
- How do you ensure that the R&D function considers sourcing strategising activities in NPD?
- How do you ensure that the sourcing function considers sourcing strategising activities in NPD?

Appended Papers

Paper 1
Supply chain strategizing in new product development: an interplay of practitioners, activities, and practices
Ewout Reitsma & Per Hilletofth

Paper 2
Supply chain design during product development: a systematic literature review
Ewout Reitsma, Per Hilletofth, & Eva Johansson

Paper 3
Conceptualisation of five sourcing strategising approaches in the engineer-to-order context
Ewout Reitsma

Paper 4
Engaging with 'Design for Supply Chain' in the engineer-to-order context: insights from two manufacturers
Ewout Reitsma

Sourcing Strategising in the New Product Development Process

Insights from the Strategy-as-Practice Lens and Engineer-to-Order Context

This dissertation uses the theoretical lens of 'strategy-as-practice' (SAP) and a systematic literature review to conceptualise sourcing strategising in new product development (NPD) as three interrelated dimensions: (1) practitioners, (2) activities, and (3) practices. Through discussing these dimensions and their potential interplay throughout NPD, the dissertation demonstrates the potential of the SAP lens in providing a common framework and reducing the fragmented nature of the literature. By using the SAP lens, the dissertation also contributes to practice. Despite not being 'actionable' in the sense of constituting detailed guidelines for acting, the SAP lens produces insights that can help practitioners to become more reflective. For example, they can learn to see sourcing strategising as a multidimensional, dynamic concept and the place it can occupy in the NPD process.

Due to a lack of empirical research focusing on the 'engineer-to-order' (ETO) context, the dissertation also includes a case study of practitioners' sourcing strategising activities and practices in this context. First, five approaches to performing sourcing strategising activities in NPD are explored in terms of their conditions and intended outcomes. Secondly, four practices that can support sourcing strategising in NPD are identified. These practices – referred to as 'Design for Supply Chain' (DFSC) practices – are also examined in terms of their interrelations. Practitioners can use the case study findings to compare the advantages of the five sourcing strategising approaches when sourcing items or services. Furthermore, the findings allow practitioners to assess how the four interrelated DFSC practices can support sourcing strategising in NPD.

EWOUT REITSMA is employed at the Department of Supply Chain and Operations Management at the School of Engineering, Jönköping University. He holds a MSc degree in Business Administration from Jönköping International Business School, Jönköping University. His main research interests include supply chain operations management and sourcing strategy, specifically in the context of manufacturers' new product development process. He conducts research in close cooperation with the manufacturing industry and has published in international journals and books.