THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Organising Purchasing and Supply Management Across Company Boundaries

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Göteborg, Sweden 2014

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ISBN 978-91-7597-017-2

Doktorsavhandlingar vid Chalmers tekniska högskola
Ny serie nr 3698
ISSN 0346-718X

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Chalmers Reproservice
Göteborg, Sweden 2014

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ABSTRACT

This thesis deals with the organising of purchasing and supply management. Many researchers claim that organising is an important determinant of purchasing and supply management performance. However, previous research focuses more on other aspects than on organisational arrangements. Existing organising research adopts a mainly firm internal focus. Several authors have called for research on the link between internal organising and the organising of the relationships with suppliers. However, these two areas have been studied separately.

The research aim is to analyse the organising of purchasing and supply management to explicate 'what' is organised across company boundaries, and 'who' is organising. The study is based on the theoretical foundation of the industrial network approach.

A single case study was conducted, focusing on the purchasing and supply management of a manufacturing company and its organising efforts in relation to three supplier relationships. This was studied and analysed, focusing on four purchased systems that cover a range of organising issues. Data collection included 84 interviews at seven companies, internal documents and observation of buyer's and suppliers' production facilities.

The study shows that 'who' is organising involves several departments in the buying firm: purchasing, product development, product and project management. These organising entities have different roles in cross-functional and cross-corporate arrangements. The most significant aspects of 'what' concerned the organising of system boundaries and project boundaries that are important in linking design and manufacturing activities across company boundaries. Network effects were also identified because they impact on the opportunities for combining of resources and coordination of activities in relation to individual buyer-supplier relationships.

These findings have theoretical and managerial implications. In relation to theory, this study constitutes a bridge between two separate bodies of literature. The managerial implications involve two key considerations in organising across company boundaries. The first deals with managing of project and product contexts while the second addresses the interplay between technical and commercial aspects.

Keywords: Purchasing, supply management, organising, relationships, boundaries

ACKNOWLEDGEMENTS

On Sunday 26 January 2014 at exactly 13:05, between a bowl of rice pudding and a visit to IKEA, the penny finally dropped. It was the first time I could see and believe that I would be able to make all the pieces of my puzzle fit together. Although the puzzle envisaged then did not turn out to be the final one, it was a euphoric moment that I had been waiting and longing for. The road has been long and winding, with many missing puzzle pieces but also a few too many. I have not made this journey alone. I am grateful for many people that helped me solve this puzzle.

I would like to thank my main supervisor Lars-Erik Gadde, for taking me in and believing in me as a PhD student. Thank you for supporting me along the way, while still making me feel that this thesis is truly my own product. When I started here, you encouraged me by saying that *"all big trees have grown from small trees"*. I still feel like a pretty small tree, but I have grown a little, haven't I? I also want to express gratitude to my assistant supervisors, Anna Dubois and Ann-Charlott Pedersen who helped me during the final stages of my PhD process. A special thanks to Finn Wynstra whose constructive feedback at the final seminar gave me the energy to reach the finish line. Many colleagues in the division and department supported me throughout this process and I am thankful for everything from research advice to (a lot of) IT support to gluten-free cookies. To all my brothers and sisters of PhD studies, our conversations helped me remain sane even in times of trouble. I will miss you! Yvonne, without your assistance with practical matters, I would have needed another year!

This thesis could not have been written without the participations of six companies and 61 individuals. Thank you to each and every one of you for lending me your valuable time. I hope that I have repaid and done you justice in the findings. Special thanks to Johan Sehlstedt. In one way, you are responsible for (or guilty of) my ending up in this research process. Johan Ström, thank you for being the door-opener to many interesting interviews.

I would also like to thank three special people that have been instrumental to my research process. Bernie, wherever you are, know that I learnt from you in one semester more than I could have learned in a lifetime at school. Your words are forever imprinted on my heart. Oddly, I am also grateful to someone who treated me really bad. Thank you for making me realise that I had to do something about my fear of presentations, in order to never again be a victim of someone like you. Annika, heartfelt gratitude for holding my hand on that specific journey (and other journeys too). Without your assistance, I would never have been capable of defending my thesis before all these people today.

My deepest thanks go to my parents, brothers and sister, for being my family and for believing in me. You taught me to stay true to myself and never to give up, skills that have been much needed during these challenging years. I am also grateful to my extended family, my circle of friends. A special thanks to Linda and Liza - you make it feel okay to be me. Maybe this is surprising, but it was not always obvious to me.

Andreas, my closest friend and life companion. You were right (and now you have it in writing): "*There is only one way to eat an elephant*!" I don't know who is most relieved that this is over, but the elephant is finally eaten. And we are still here. I love you.

Freja, my little rascal. You have been a handful since before you were born and you continue to amaze me with your resourcefulness every day. Thank you for providing much needed perspective and forcing me to take my mind off things. When you grow up you will come to understand what an accomplishment it was for mummy to write this thesis. Then know that when I look back on this period, you are the accomplishment that I treasure most.

Writing a thesis is a roller-coaster ride and I must say that I have enjoyed it, in spite of moments of despair and frustration. In parallel with this amazing journey, I have faced a few bumps in the road of life. I am truly not the same person today as I was six years ago. I am older, wiser and a bit worn around the edges. But most importantly, I feel a bit more prepared to face whatever is around the corner.

"Ur kaoset hördes en röst
Le, det kunde vara värre
Och jag log
Och det blev värre"

Ingrid Hessel

Göteborg, April 2014

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1 INTRODUCTION

Consider a company that purchases items for its manufacture of cars. The nature of these purchased items differs, from simple components such as nuts and bolts, to advanced systems such as instrument panels and airbags. Now, imagine that the services provided by suppliers in relation to these purchased items also differ, from manufacturing responsibilities and assembly activities to design responsibilities and system integration. In addition, envisage some of the purchased items being completely standardised and others including different levels of customisation. Now take a moment to reflect on the vast number of aspects that require consideration when purchasing an item, regardless of its characteristics. First, there are technical considerations to assure that the purchased item fulfils both physical and functional requirements. For example, an instrument panel needs physically to fit within the chassis of the vehicle and in relation to surrounding items. In terms of functionality, the instrument panel provides the user interface for the driver, thereby bringing together many functions of the car, such as ignition, impact protection, climate system, media player and sound system. Second, the design of the purchased item provides opportunities for manufacturing and subsequent assembly, in terms of cost, lead times and quality. An important consideration, therefore, is to try to manage the simultaneous requirements of design, manufacturing and assembly. Third, the physical flows of purchased items need consideration to assure timely delivery or inventory solutions. For example, an instrument panel cannot be assembled into the vehicle before the chassis is in place. Similarly, the climate system cannot be assembled without the instrument panel. Finally, the price of the purchased item is important since it contributes to the overall cost of the manufactured car.

The situation described above is one that many companies face in their efforts to supply their operations with goods and services. In this thesis, the considerations portrayed are addressed, in terms of organising purchasing and supply management, the research phenomenon of interest. Section 1.1 introduces organising purchasing and supply management. Thereafter, Section 1.2 explains the significance of this phenomenon by pointing to the evolution of purchasing and supply management over past decades, and the role played by organising in these developments. Section 1.3 discusses previous research on the organising of purchasing and supply management and identifies opportunities for contributions. On the basis of these opportunities, Section 1.4 introduces the preliminary research aim of the study. Section 1.5 concludes the chapter with a thesis outline.

1.1 ORGANISING PURCHASING AND SUPPLY MANAGEMENT

The illustration above highlighted a number of considerations that are relevant for all buying companies. The example embodies many issues that are important for purchasing and supply management, the area of research in this thesis. First, an important challenge is to ensure that the purchased items fit within the product offering of which they form a part. Second, it is important that the purchased items are designed taking account of manufacturability, to provide cost-efficient and time efficient operations. Third, it is necessary to ensure physical flows that assure timely availability of purchased items. Fourth, it is essential to secure supply on beneficial commercial terms, including favourable purchase price and satisfactory total costs. These considerations are reflected in descriptions of purchasing and supply management in the literature. They describe purchasing and supply management as being concerned with the management of external resources to obtain the goods and services necessary to manage the primary and support processes of a company in the most timely and cost-efficient manner (van Weele, 2005; Quayle, 2006). Although 'purchasing and supply management' are generally used to refer to the formal research area, 'supply side' and 'purchasing function' are also used in the thesis to refer to the same functions.

To manage parallel considerations simultaneously requires communication. There are several different stakeholders, both internal and external, whose sometimes conflicting interests in relation to purchased items have to be addressed. As described in the car example above, there is immense variety in the characteristics of purchased items and in the division of responsibilities between buyer and supplier. This diversity implies that purchasing and supply management need to cope with huge variety in relation to purchased items. The phenomenon studied in this research, organising purchasing and supply management, manages the interaction necessary to cope with the many considerations and interests. Organising is a frequently used concept whose meaning ranges from broader and more all-encompassing strategy synonyms to specific issues related to organisational design. In this thesis, organising is used to describe the formal and informal communication systems that bring about interaction and knowledge exchange in order to coordinate technical, physical, commercial and administrative matters related to purchasing and supply management (Gadde et al., 2010; Trent, 2004). Furthermore, since there are both internal and external stakeholders, these organisational arrangements refer to managing internal arrangements as well as organising supplier relationships (Gadde et al., 2010).

1.2 SIGNIFICANCE OF THE RESEARCH PROBLEM

Purchasing and supply management have been rising up the management agenda for some time, due to developments in the business landscape that have resulted in the increasing importance of the supply sides of companies. These trends include specialisation and partnering, causing purchasing and supply management to account

for larger and larger shares of both costs and value for companies (see e.g. Andersen and Rask, 2003; Humphreys et al., 2000; Johnson and Leenders, 2004; Johnson and Leenders, 2006; Tassabehji and Moorhouse, 2008; Zheng et al., 2007). These trends can be explained by the faster pace of technological development, increasingly complex products, fluctuating demand and global competition all of which are forcing companies to specialise in some areas and outsource others (Gadde et al., 2010). However, the increasing importance of purchasing and supply management is not just a result of larger purchasing shares, but also depends on the increased complexity of purchased items; calling for new forms of coordination between buyer and seller (Gadde and Persson, 2004). Finally, new managerial principles, such as Just-in-Time, are changing the scene of purchasing and supply management (Gadde et al., 2010). Altogether, these changes on the supply side of companies have resulted in increased interrelatedness, both between internal company functions and among buyers and suppliers. Traditionally viewed as a supporting or administrative function, the purchasing function is increasingly being perceived as a strategic area of the business. This development is summarised by Ivens et al. (2009a: 852), stating that the function has evolved ”from a passive, reactive and supportive function to an integrated one that is an active element of the firms competitive strategy”.

Despite these developments, the renowned management consulting firm, McKinsey & Company, in a report based on a review of purchasing and supply management improvements, claimed that none of the high performing companies studied had reached its full potential (Hardt et al., 2007). According to Schneider and Wallenburg (2013), lack of attention to organising purchasing and supply management can explain the unexploited potential in strategic transformation. The criticality of organising, for opportunities in purchasing and supply management, was recognised long ago (Axelsson and Håkansson, 1984), and, more recently, the importance of organising purchasing and supply management for firms’ competitive advantage was highlighted again (Axelsson et al., 2005a).

Despite the significance of organising purchasing and supply management, Trent (2004: 4) argues that outsourcing and supplier development have remained at the top of the management agenda, “while organisational design has received limited attention in supply management”. Trent (2004: 4) claims also that, while other supply management issues “may generate more excitement than does organisational design, managers should not overlook the role that an effective design can play in enhancing supply management performance”. Gadde et al. (2010: 197) support this claim, stating that organising “is a crucial step in any attempt to enhance performance on the supply side” and expressing the opinion that “for most companies organising represents untapped potential for significant improvements”. The limited attention to organising issues is demonstrated by the fact that only one out of five extensive literature surveys used by van Weele and van Raaij (2014) to

map previous research on purchasing and supply management, mentions organising as a research theme. Driedonks (2010) calls for more research on organising as an explanatory factor in the effectiveness of cross-functional sourcing teams. Similarly, Schneider and Wallenburg (2013) highlight the need for research on how to use more effective and efficient organising to support the growing importance and enlarged set of responsibilities related to purchasing and supply management.

1.3 PREVIOUS RESEARCH

Previous research on the organising of purchasing and supply management mostly examines internal organising. Internal organising centres on issues related to resource and task allocation within the purchasing department, as well as between the purchasing department and other internal departments (see e.g. Fearon, 1988; Giunipero and Monczka, 1990; Pearson et al., 1996; Trent, 2004). In this respect, it is important to distinguish between organising of the purchasing department and organising of the purchasing function (Dubois and Wynstra, 2005; Axelsson et al., 2005a). The purchasing function includes the activities related to purchasing and supply management, whether conducted within the purchasing department or in several departments across the entire company. Because of the many departments that can be involved in purchasing and supply management, it is important also to realise that there are other company functions involved in the purchasing function. Van Weele and van Raaij (2014) emphasise the need to integrate purchasing and supply management with other functional domains within the firm. The distinction between the purchasing department, the purchasing function and the other business functions influencing the purchasing function, provides a rather complex picture of internal organising. This complexity is emphasised by Schneider and Wallenburg (2013). Based on a literature review of the organising of the purchasing function, the auhtors conclude that there are many organising aspects that interplay in internal organising, and that this interrelatedness is an important issue in the organising of purchasing and supply management.

Previous research also acknowledges that purchasing and supply management activities transcend company borders. Relationship organising focuses on the nature of the relationship between buyer and supplier, in terms of for example division of labour, relationship atmosphere and contact patterns (Dubois and Pedersen, 2002; Dyer et al., 1998; Gadde and Snehota, 2000; Kraljic, 1983; Olsen and Ellram, 1997). Compared to the research on internal organising, literature on relationship organising is less abundant. Based on the increasing reliance on suppliers, Schneider and Wallenburg (2013) call for research on how to adjust organising of purchasing and supply management to the growing need for stakeholder management. Similarly, van Weele and van Raaij (2014) call for more relational views on purchasing and supply management. They claim that more attention should be paid to the value-added of suppliers in order to complement research on the internal purchasing function, and

emphasise the need to investigate how to organise effective linkages with outside parties.

Figure 1-1 illustrates internal interaction and inter-organisational interaction, which, together comprise the organising of purchasing and supply management. There are a few aspects of previous research that should be highlighted, in order to identify opportunities for research contributions.

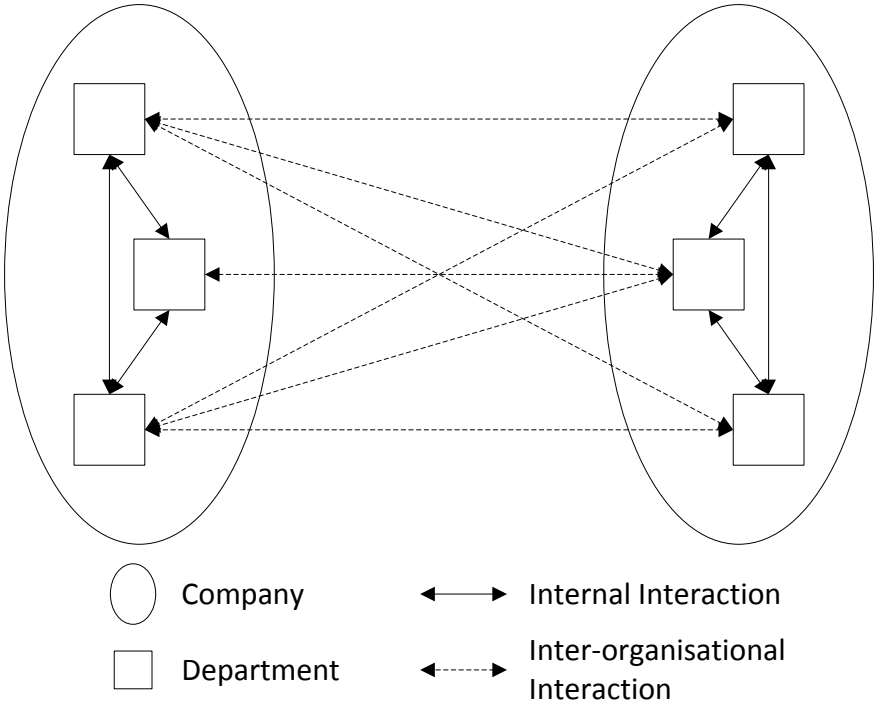


Figure 1-1: Organising as internal interaction and inter-organisational interaction.

First, Woodward (1965), in her empirical study of industrial organisations, concludes that the outcomes of organising depend on the match between organising and the characteristics of production systems. In terms of production systems, Woodward (1965) distinguishes between large scale manufacturing, unit-based or small scale manufacturing, and process-based production systems. She claims that the context in which organising takes place is crucial for effects of organising. In light of the production systems portrayed by Woodward, the literature on purchasing and supply management is dominated by studies focusing on large scale manufacturing contexts in general, and the automotive industry in particular. For example, Brandes (1993) claims that purchasing and supply management research is overly focused on the automotive industry, to the detriment of other engineering industries. He explains that purchasing and supply management practices develop differently depending on the circumstances, and calls for comparisons across industry contexts. Ten years later, Andersen and Rask (2003) discussed how many current procurement practices follow from the development of supply chain management and lean principles

originating in the automobile industry. In their empirical study of developments in the organising of purchasing and supply management, Andersen and Rask find that organising can be explained by the larger context. On the basis of this finding, they conclude that many contextual factors affect organising of purchasing and supply management, and suggest more work on such factors as the role of production technology, pace of technological change and distribution of power between buyer and supplier. In line with this last factor, Holmen et al. (2003) claim that managing suppliers is more challenging in for example the construction industry, where buying firms are less dominant than in large scale manufacturing industries. These authors also mention the heavily researched automotive industry as a context where purchasing practices are the most developed. These statements emphasise the importance of the context in which organising purchasing and supply management takes place.

Second, the literature mostly provides a one-sided view of purchasing and supply management. It predominantly focuses on the buyer's perspective at the expense of supplier needs and constraints (Gadde et al., 2010; Persson and Håkansson, 2009). In this inside-out perspective, the focal starting point is the buyer, its internal resources and operations, and how to organise in relation to them. This perspective implies that the buying firm is assumed to make independent decisions concerning its operations. However, companies are becoming increasingly reliant on supplier skills and capabilities and other resources beyond company boundaries. Therefore, it cannot be assumed that suppliers are unconditionally willing to comply with conditions proposed by buyers. On the contrary, suppliers impose their own requirements on buyers, depending on their own interests, interests that are reflected by the fact that each supplier needs to relate to numerous other counterparts simultaneously. Holmen and Pedersen (2010) describe how each supplier can affect a buyer's initiatives by intensifying, weakening or even ending relationships in order to support its own interests. In spite of the important role of suppliers, a review of purchasing and supply management literature carried out by Spina et al. (2013), identifies only 54 out of 1,055 articles focusing on supplier perspectives.

Third, and maybe most importantly, internal organising and relationship organising are treated separately in the literature. However, Axelsson and Håkansson (1984) describe the role of purchasing and supply management as the connection between internal and external matters, thereby emphasising the need to relate the two. Researchers have long emphasised the interdependencies that cut across company boundaries and called for attention to integration and coordination across organisational boundaries (see e.g. Cunningham and Homse, 1986; Larsson, 1993; van Weele and Rozemeijer, 1996). These authors claim that the ways in which the purchasing function is organised internally, has an impact on opportunities for supply management and vice versa. A few contributions directly address the link between

internal and relationship organising. For example, Dubois and Wynstra (2005) link internal organising with relationship organising by developing a matrix that combines the role of the purchasing function internally with the role of the purchasing function in relation to suppliers. By combining these two roles, the authors describe nine different ways of combining internal and relationship organising. The paper also includes examples of purchasing and supply management strategies that are applicable to these organising principles. Also, Persson and Håkansson (2009) analyse the impact of internal organising on the interaction with suppliers by taking the starting point in three types of interdependencies that govern buyer-supplier relationships and how to organise in relation to these. Their recommendations are based on the assumption that some organising forms are more costly than others. Finally, Bocconcelli and Håkansson (2008) provide a strong empirical case for the need to link internal and relationship organising. When studying the case of purchasing and supply management transformation at Ducati, they found that the company needed to make substantial reorganisations internally in order to facilitate changes in the way that it interacted with suppliers. However, despite these contributions, few studies investigate the relationship between internal organising and relationship organising. Therefore, research on this link is requested (see e.g. Cunningham and Homse, 1986; Gadde et al., 2010; Ivens et al., 2009a).

1.4 PRELIMINARY RESEARCH AIM

As explained above, purchasing and supply management is becoming more and more important due to increasing purchasing volumes, higher complexity in purchased items, and new managerial principles. The changing nature of purchasing and supply management calls for new forms of organising, not only internally but also between buyers and suppliers. In this respect, researchers report untapped potential for significant improvements in the organising of purchasing and supply management.

Meanwhile, it was described that literature on purchasing and supply management is scattered because internal organising and relationship organising are addressed independently of each other. This fragmentation is not helpful for how to carry out effective and efficient purchasing and supply management. In order to reflect the concurrent roles of purchasing and supply management in both internal matters and relationship issues, there is a need to search for links between the two. It then becomes important to supplement the inside-out view of purchasing and supply management with an outside-in perspective which acknowledges that purchasing and supply management cannot be determined solely from the point of view of the buying company. As outlined above, researchers also point out that there is little contextualisation in the previous purchasing and supply management literature. Although many authors recognise the importance of contextual characteristics for organising, much current research is limited to large scale manufacturing industries. Because of the distinct characteristics of the production systems governing these

contexts, there is a risk of missing findings regarding the role of organising purchasing and supply management in other contexts.

The preliminary research aim is therefore to explicate the link between internal and relationship organising and to analyse the context in which this organising takes place.

As described in Chapter 2 on research methodology, the research aim developed throughout the study. A meaningful explanation of the research aim that eventually unfolded, requires additional building blocks. This is the reason for presenting a preliminary research aim here. The revised research aim is presented in Chapter 3.

1.5 THESIS OUTLINE

The thesis is structured as follows. Following this introductory chapter, the research methodology is outlined in Chapter 2. The positioning of this chapter is explained by the research approach applied in which the theoretical framework evolved over time. Therefore, it is important to explain the research methodology before presenting the rest of the study. The theoretical framework is introduced in Chapter 3. As a result of the framing of organising, the preliminary research aim is revised in this chapter. Chapter 3 ends by formulating the three research questions addressed in the empirical study. Chapters 4 to 7 comprise the empirical enquiry and include the related empirical analyses. These four chapters are devoted to organisational arrangements within a buying company and in relation to three supplier relationships. In Chapter 8, three analytical themes are discussed, and compared with previous research. These themes were identified as important for organising purchasing and supply management on the basis of the empirical study. The thesis ends with conclusions, implications and future research in Chapter 9.

2 RESEARCH METHODOLOGY

This chapter aims to describe, discuss and reflect upon the research methodology. First, the research context in which the study was carried out is described in Section 2.1. Thereafter, Section 2.2 discusses the research process including the main turning points and difficulties. Section 2.3 describes and motivates the research approach applied and Section 2.4 outlines data collection and analysis. The chapter concludes with a discussion of the quality of the study in Section 2.5.

2.1 RESEARCH CONTEXT

According to Weick (1995), researchers interpret what they observe through the lenses of previous knowledge. It is argued that in this way, we impose what we believe on the world that we see and, thus, frame our research interests depending on our experience and theoretical knowledge. These influences that are imposed on a study provide both opportunities and constraints.

The theoretical context in which my research interest developed is dominated by a view of industrial markets developed by the IMP Group. This theoretical perspective focuses on interaction and interdependencies in business relationships. I was first exposed to these ideas as an undergraduate student at the university, when I first encountered topics related to business relationships, purchasing and supply management. This theoretical foundation contributed to my predilection for inter-organisational phenomena and a view of industrial settings as embedded networks. To illustrate, although my empirical enquiry originated as an internally focused Master's thesis assignment, I found this scope insufficient as I uncovered signs that this internal organising was substantially influenced by events outside the company boundaries. Without my education profile, I am not certain that I would have paid attention to these indications. On the basis of these signs, I adapted the research focus to include external matters for my PhD studies. My doctoral research has continued within the research community that originally spurred the initial formulation of my research interest. The division where I am employed, the members of my supervising committee and the majority of the workshops and conferences that I have attended, are all characterised by the research traditions of the IMP Group. As a result, my research has developed within a research context where most communication and feedback centres on the network interdependencies that I consider intrinsic to business life.

A similar reasoning applies to the methodology. The methodological approach in the research community to which I belong is geared towards case study research, governed by the principles of systematic combining (Dubois and Gadde, 2002). Obviously, my methodological preference for case studies is inspired by these traditions. However, I would emphasise that the characteristics of this

methodological approach were intuitive to me even before I was employed as a PhD student. Already during my Master's thesis work, it was natural for me to approach the task with an open mind and gradually redirect the study in order to solve the assignment. This approach seems to resonate well with the way I understand business life as an interactive and interconnected landscape, since complex research phenomena necessitate flexible research approaches. It is my strong belief that this methodological approach has become strong within my research community because of its appropriateness in relation to the research problems that are pursued within our theoretical foundation. This interrelatedness between theory, empirical enquiry and research methodology is further discussed in Section 2.3. If my research interest was inspired by the theoretical foundation of my research context, I would argue that it is natural that this influence should extend to also include my methodological choices.

2.2 RESEARCH PROCESS

For pedagogical purposes, this thesis follows a deductive structure. However, the research process leading to it was far from deductive. Van Maanen et al. (2007: 1149) contemplate that the research process "is often messy, idiosyncratic, and difficult to articulate". These words resonate well with my PhD journey. In this section, the objective is to shed some light on the twists and turns hidden by the deductive thesis design. Following a description of the starting point of the study, five important turning points are reflected upon. Although not detailing the totality of the research process, this outline represents the most important crossroads and problems faced.

2.2.1 STARTING POINT OF THE STUDY

This study has its roots in a Master's thesis on change management at a manufacturing company referred to as Signal Solutions. While developing an implementation plan for a new purchasing strategy, the empirical enquiry resulted in some interesting findings beyond the scope of the assignment. First, while initially anticipating a thesis focusing on transformation within the purchasing department, it soon became clear that the purchasing function is not limited to one single department. Secondly and as mentioned above, although the Master's thesis was internally bounded, I realised that these internal purchasing activities were dependant on external matters. Not only did the motives for the purchasing transformation derive from changes in the surrounding business context, but also I found that the success of the new purchasing strategy was reliant on changed supplier behaviour. Third, several company representatives pointed to what I interpreted as the contextual embeddedness of purchasing and supply management. They expressed frustration regarding how 'best practice' within the purchasing discipline was difficult for them to adopt. Their technology intensive and project like business environment differed substantially from the large scale manufacturing contexts where mainstream purchasing practices have developed.

I entered my PhD studies with this newly established knowledge in mind. These empirical insights directly influenced the starting point of my research. In order to explore these matters further, the initial research focus centred on how internal reorganising is influenced by external issues. I set out to study this connection by analysing interdependencies across company boundaries during purchasing transformation, with the theoretical foundation of the industrial network approach (see e.g. Håkansson, 1982). This theoretical starting point emerged naturally since I had encountered it previously and it was well suited to the purpose of my study. At this initial stage, change and dynamics were a core issue. In order to capture dynamics, I reasoned that it would be useful to study ongoing change in purchasing and supply management activities. Signal Solutions, the case company in my Master's thesis, was involved in purchasing transformation. Since I had already invested time in familiarising myself with this company, and its activities were the inspiration for my new found research interest, I decided to continue this study, although with a broader scope in order to capture external issues.

2.2.2 FROM REORGANISING TO ORGANISING

The initial stages of my study were explorative in nature. I set out to follow up the status of the transformation efforts and relate them to business developments in the context of Signal Solutions. However, it soon became apparent that the transformation effort I wanted to study had faded away. The initiators had left the company or assumed other tasks, and the changes to organisational arrangements had been partly reversed. As an alternative, I identified a number of change efforts that were more incremental in nature and where it was possible to relate internal reorganising to the changing nature of buyer-supplier relationships. In parallel with these developments, I was approached by a representative from another company after a presentation at the IPSERA conference. This representative had recently initiated a major purchasing transformation and I was invited to study its efforts. Having lost the opportunity to study major change in my first case company, I decided that it would be wise to increase my options. Also, this company was active in the service sector, which constituted a potentially interesting variation from Signal Solutions. After some initial interviews with the company representative, I visited the corporation for a first data collection series. The interviews provided valuable insights regarding the general interplay between internal and external matters in the organising of purchasing and supply management. However, because of more promising potential developing in relation to Signal Solutions, I subsequently discarded this second case from the study.

During this exploratory stage of the research process, matching empirical findings with theory was a frustrating experience. The empirical enquiry had resulted in scattered albeit interesting content, which it was difficult to make sense of without drawing on very different bodies of literature. To exemplify, as a reminder of my

previous change management focus, I continued to reveal change barriers, and issues of a more behavioural nature. The theoretical lenses needed to make sense of these data differed fundamentally from the literature streams that centred on the inter-organisational issues of primary interest to me. Resuming these parallel tracks did not seem realistic, and I realised that I had to narrow the scope of the study in order to achieve some analytical depth.

I decided to change direction away from social processes and change management issues and focus more on the embeddedness of a buying company in its wider network context, and the consequences for organising. Early in my follow up work based on the Master's thesis research, I had identified an interesting pilot project that had survived the purchasing transformation. This pilot project consisted of redesign and outsourcing of a system which I refer to as the data processor. This particular change was rooted in differences in the lifetimes of components and systems, which required innumerable system updates because of component obsolescence. Also, in order to fulfil the redesign, the buying company had to adapt its internal organising and how it related to suppliers. This pilot project constituted the perfect opportunity to study the link between internal organising and external matters. Reflecting upon this later, I realised that it had been possible to identify this data collection opportunity only because of the initial aim to study change. At this point, the scope of the study changed from studying reorganising towards studying organising. However, studying change remained a useful methodological tool throughout the research process in order to reveal physical and organisational connections extending beyond company boundaries.

2.2.3 FOCUSING ON PURCHASED SYSTEMS

Two years into the study, I had identified numerous connections spanning across company boundaries. However, the nature of these connections and the way they related to each other differed. Up to this point, these interdependencies had been identified via rather general interviews asking about the nature of the buyer-supplier relationships, the role of purchasing internally, and current issues and opportunities. The resulting data, although rich in content, were incomplete. I needed to focus and structure the data collection.

Inspired by the interesting findings related to the data processor redesign, and the emphasis on physical resource interdependencies of the industrial network approach, I decided to take as a starting point a number of purchased systems. I considered that this would allow me to trace how the physical resource connections in these purchased systems related to the internal organising as well as the buyer-supplier relationships. In retrospect, I think that the technology intensive characteristics and project-like environment of Signal Solutions' operations contributed to my intuition regarding arranging data collection around physical resources.

Four purchased systems were selected. These systems had figured previously and frequently in the data because of various interesting issues related to them. However, they had so far acted only as illustrations of general issues in buyer-supplier relationships and internal organising. One of the systems had appeared mostly in relation to another supplier brand than I later decided to focus on. The supplier brand I selected represented a buyer-supplier relationship that had the potential to provide more variety in my data. I started to systematically collect data regarding (i) the physical properties of these systems, (ii) the way that they related to the offerings of Signal Solutions, (iii) the characteristics of the buyer-supplier relationships that managed them and how these relationships were organised, internally as well as in the buyer-supplier interfaces. Meanwhile, my connections at Signal Solutions started to approach the suppliers of these systems in order to encourage them to take part in my study.

Theoretically, a more explicit starting point in purchased systems influenced the choice of the literature I consulted to guide the study and make sense of my findings. First, the system sourcing literature was a natural starting point to provide knowledge on key purchasing issues related to systems. This work provided more understanding of the many alternatives available regarding division of labour and the design-manufacturing interface. The works of Gadde and Jellbo (2002) and Brandes (1993) contributed with valuable insights on these matters. Second, these works guided me towards system design theory where I discovered the modular and integral design principles of Ulrich (1995). These literature streams have been important for the development of my findings, and provided complementary perspectives on physical resources compared to concepts from the industrial network approach. Also, a deeper review of the literature on modularity in purchasing and supply management provided a much needed link to the relationship between technology and organisation. The conference paper by Araujo (2006) was an important first piece of this puzzle.

2.2.4 Losing One Purchased System – Gaining Another One

About six months into this more focused data collection, I hit a bump in the road related to one of the purchased systems. This system, referred to as the body, had recently been insourced as a result of supplier bankruptcy. I was in the process of studying the organising of this insourcing procedure as well as the process of identifying a new supplier. However, during data collection it was decided to break down the system into subsystems that could be outsourced individually. This made it difficult for me to identify a suitable supplier to interview. In addition, discussion at Signal Solutions went back and forth, making it difficult to identify interviewees and get an overview of current events. I was also uncertain about whether there would be a supplier to interview before the end of the data collection. Although intrigued by

what was unfolding, I judged the situation too volatile for me to invest more time in studying this system.

Around the same time, I was invited to accompany two company representatives on a supplier visit related to another purchased system. This supplier was High Tech Structures, and the structural frame that they supplied had so far not appeared in my data collection because of limited use of this system across the different product platforms. However, some tension had arisen in this relationship because of escalating prices, and the supplier visit was aimed to finalise negotiations and settle a revised frame agreement. Also, the representatives from Signal Solutions wanted to inspect a system before final delivery. This was a unique opportunity for me to observe the interaction between buyer and supplier, and it was the first invitation to visit a supplier after several anxious months of waiting. Furthermore, the problems in this relationship seemed to represent Signal Solutions' general issues with costs and lead times, while the role of this particular system in relation to the offerings of Signal Solutions was similar to that of the body. For these reasons, I decided to abandon data collection on the body and focus on the structural frame. This decision and subsequent supplier visit turned out to be a much needed accelerator for the other supplier visits. When the other Supplier Account Managers at Signal Solutions realised that I had visited suppliers, my study became more legitimate, and other suppliers were easier to persuade to be part of the study when they knew another supplier had welcomed me.

2.2.5 BACK TO BASICS

Being very enthusiastic about the connection between technology and organisation that was addressed in relation to modularity, the system sourcing literature occupied me for some time. I wrote a few conference papers on the organising of system sourcing which was somewhat of a diversion from my more general research aim. When I had finalised the data collection and tried to analyse the data, I realised that the system sourcing scope was not sufficient. Although I managed to identify a few crucial relationships between the design principles applied and the organising of these physical resource characteristics, I was not able to capture the complexity of my empirical enquiry based only on this literature.

At this stage, I returned to the industrial network approach and the three network layers of activities, resources and actors (see e.g. Håkansson and Snehota, 1995; Håkansson et al., 2009). Previously, I had embraced the underlying assumptions of the industrial network approach. However, I had not found the three network layers very helpful. I perceived them to be too general to help me analyse organisational arrangements. The actor dimension puzzled me. I had long since identified actors as crucial ingredients in organisational arrangements. Nevertheless, the theoretical content of the actor layer was at a different level and did not offer much help for my analysis of organising. When returning to these network layers with more data I

realised that although not central to the actual organising of purchasing and supply management, the network layers helped me to capture the network context in which this organising takes place. The system sourcing literature could be integrated into the activity dimension in the emerging framework, since the design logic applied could be argued to have consequences for activity configurations. The other two network layers constituted the missing pieces of the analytical framework needed to analyse the complexity of the case.

2.2.6 Capturing the Link Between the Internal and the External

Having developed the emerging framework with the help of these three network dimensions, I was well placed to structure an analysis around the issues that influence the linking of internal and external organising. However, I was still struggling to explicate the organising part, and how it stretches beyond company boundaries, which was the focal research aim. In hindsight, many factors contributed to the difficulties related to uncovering this link that I had set out to clarify.

First, organising is a widely used concept whose meaning is ambiguous since it concerns researchers from several disciplines. Furthermore, some authors focus on organising as a static concept while others emphasise its dynamic characteristic. In addition, organising can be very specifically applied to organisational design matters, but it is equally often used in order to describe strategic intentions, especially outside company boundaries. For me, this ambiguity implied that I risked drowning in the vast literature available. It took some time for me to articulate the framing of organising on which this study is based. Thereafter, it took as long to identify the existing research that would be useful.

Second, I was trying to capture the link between matters that were mostly separate in the literature. Most organising literature focuses on either internal or external matters. Rather early, I was able to discern three domains of organising purchasing and supply management in the existing research. These domains are internal organising, relationship organising and supplier base organising. The two latter domains cover what I originally referred to as external organising. Since these three literature streams had very different perspectives on organising, I struggled to relate them to develop an analytical framework appropriate for my research interest.

Third, I perceived the current organising literature to focus more on the company boundary that separates internal and external organising than on emphasising the organising that occurs across this boundary. In contrast, the remaining part of the theoretical framework that relied on the industrial network approach emphasised the interdependencies across company boundaries. I early identified the potential contribution inherent in relating these complementing perspectives. However, how this could be done was not obvious. The problematisation of boundaries in Dubois (1998) helped me to articulate and nuance this issue somewhat. By supplementing

the make or buy boundary with the awareness and influence boundaries, I could empirically analyse the importance of boundaries other than the company boundary. However, although supporting my findings, this insight added further complexity. While crucial as a stepping stone in my research process, these boundaries eventually were discarded in the final version of the analytical framework.

While the above mentioned problems remained pending, I allowed the internal and external parts of the study to be separated, both in the analytical framework and in the empirical enquiry. In practice, this implied that I collected data with two scopes of analysis, one internally focused, and one targeting the selected buyer-supplier relationships and their network context. In the study I focused on both internal and external contact patterns and tried to outline the role of the purchasing function, both internally and in the buyer-supplier relationships, hoping that the empirical analysis would eventually help me to relate the two perspectives.

In order to try to reduce the ambiguity, I decided to focus on the link between internal and relationship organising, studying it from a network perspective to include supplier base organising only where it mattered. This decision marked an important turning point since it allowed me to focus on a specific aspect of external organising and its connection to internal organising. In this delimitation, both literature and empirical findings provided direction. Regarding the literature, I had early distinguished the contributions of Araujo et al. (1999), Dubois and Wynstra (2005) and Cunningham and Homse (1986), which I could see contributed to the emerging analytical framework. Since the majority of these contributions address relationship organising, this became a natural focus. Concerning the empirical findings, focusing on a number of purchased systems directed me towards analysing individual buyer-supplier relationships, implying that the data was more suitable for analysing relationship organising rather than supplier base organising. In retrospect, I realise that identification of aforementioned literature was facilitated by this empirical focus.

The solution to my search for the link between internal and relationship organising appeared when I shifted perspective and questioned the aim of the study. For a long time, I had looked for a way to conceptualise the link between internal and external matters beforehand, in order to be able to empirically analyse it. However, I realised that I had to use my study in order to explicate the link. Thus, the link between internal and relationship organising was the finding for which I was searching, not necessarily the starting point for my analysis. With this revised aim, I was able to turn the problems into opportunities. Instead of viewing internal organising and relationship organising as separate but connected entities, I started to focus on their connection as a whole. Thereby, I solved the boundary challenge by focusing on organising taking place across company boundaries instead of getting stuck in establishing the domains involved in this organising. Later, I encountered the work

of Abbott (1995: 857) who claims that "we should not look for boundaries of things, but for things of boundaries". His statement nicely illustrates the shifting perspective on my research phenomenon. This newfound perspective is the basis for the revised research aim in this thesis as well as an important research outcome in the analytical framework. It also constitutes a central part of the framing of the research problem presented in Chapter 3, and illustrates the conflict between the structure of this thesis and the actual research process.

To summarise, the research phenomenon of interest, organising purchasing and supply management, has endured throughout the research process. However, in exploring this phenomenon, I systematically and stepwisely redirected the study towards its current focus. I am convinced that this research approach contributed to the rich empirical material at the base of my study. Also, unless I had redirected the study in response to interesting findings, I am sure I would not have been able to achieve the same results. This research approach is presented next.

2.3 RESEARCH APPROACH

This section outlines the research approach. First, the single case study methodology is explained and justified. Second, systematic combining is discussed. Third, casing as a methodological tool is presented.

2.3.1 CASE STUDY APPROACH

Dubois and Gibbert (2010) emphasise the links between theory, empirical phenomena and method, as illustrated in Figure 2-1. This section addresses the links between method and theory and empirical phenomena, while the matching between empirical phenomena and theory is managed through the framework presented in Chapter 3.

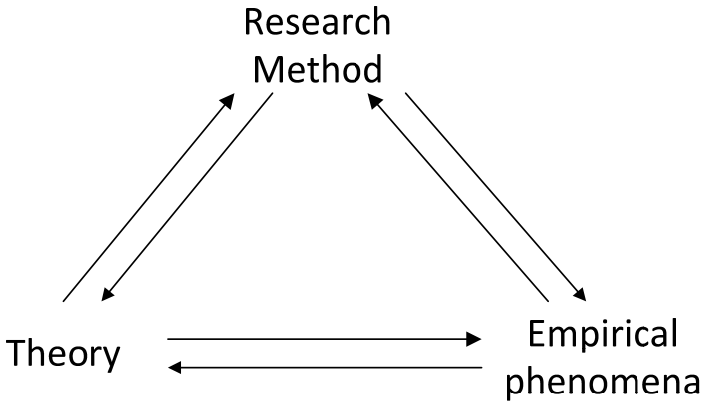


Figure 2-1: Linking theory, empirical phenomena and research method.
(Dubois and Gibbert, 2010)

This thesis deals with organising of purchasing and supply management. The study addresses inter-organisational aspects of this phenomenon and how it influences and is influenced by the context in which it takes place. The studied phenomenon suits a single case study approach for three reasons outlined below.

First, taking organisations and relationships as the basic unit of analysis is complicated because of the inherent interactions and interdependencies. This is supported by Easton (2010), who claims that organisations and relationships are difficult to access, and complex in structure. Similarly, Dubois and Gibbert (2010: 130) state that "industrial networks present researchers with particular challenges since they do not constitute closed, bounded or clearly defined systems". Pettigrew (1997) and Abbott (2001) argue that it is important that the research methodology is well aligned and resonates with the theoretical approach and the research problem. Easton (1995) states that the attributes of case study research fit well with industrial network phenomena. He argues that "…because of the richness of the picture produced by case research, the approach is suitable to handle the complexity of network links amongst actors and can be used to trace the development of network changes over time" (Easton, 1995: 480). Qualitative case studies are frequently used by industrial network researchers (Dubois and Araujo, 2004). Dubois and Araujo (2004) claim that a case study approach historically has been successful in contributing to the development of interaction and network approaches. They assert that the studies preceding the formation of the IMP Group, as well as the IMP Group's conceptualisation of the industrial network approach was possible thanks to the openness offered by the case study approach.

Secondly, a case study method is suited to investigation of context-specific characteristics which are emphasised in this study. If the phenomenon develops depending on its interdependencies and how they are interpreted, a method supporting and highlighting these characteristics is needed. A single case study approach allows for context-specific findings and, thus, is suitable not only for initial exploration but also for revealing the 'true' nature of the studied phenomenon (Dubois and Araujo, 2004). These characteristics seem to be highly relevant, considering the nature of organising purchasing and supply management. Johnson and Leenders (2006) call for more case-based research to achieve a deeper understanding of the organising purchasing and supply management. The context-specific findings are also the reason for pursuing a single case study. According to Dubois and Gadde (2002: 554), "the interaction between a phenomenon and its context is best understood through in-depth case studies". The number of cases is always a compromise between breadth and depth. According to Easton (1995: 382), "researching [a] greater number of cases, with the same resources, means more breadth, but less depth". Although not arguing that depth is generally better than breadth, this study focuses on deeper and more complicated relationships between

studied features, findings that can only be attained by prioritising depth. With such scope, it is better to focus on one case than to try to measure and compare several cases (Dyer and Wilkins, 1991).

Third, this study actively pursues and exploits the flexibility inherent in a case study approach, rather than trying to limit it in a more positivistic case approach. The case study method allows for handling the interrelatedness of theory, empirical fieldwork and direction of the study (see e.g. Dubois and Araujo, 2004; Ragin and Becker, 1992). Moreover, dynamics is used as a methodological tool in order to reveal connections in the organising efforts of the studied actors. These dynamics make it difficult to delimit the scope of the study beforehand. Dubois and Araujo (2004: 225) describe how, in research characterised by these features "…what constitutes the phenomenon of interest and its boundaries is often the outcome of the study rather than a decision that can be firmed up prior to conducting the study". Such a complex situation requires a methodology and data collection process that parallels the connectedness and dynamics that provide the foundations of industrial networks. The case study fulfils these requirements. In the next section, the interrelatedness and continuous matching of theory, empirical fieldwork and research scope is discussed.

2.3.2 SYSTEMATIC COMBINING

As discussed in Section 2.2, the research area evolved during the study. All the modifications were prompted by both empirical and theoretical insights. The findings that are presented in this thesis would not have been achieved unless the research aim had been allowed to develop in line with these insights throughout the course of the study. They are the result of direction and redirection through iteration between theory and reality. This research approach that the study relies on is referred to as systematic combining (Dubois and Gadde, 2002).

Systematic combining is a non-linear, path dependent process based on continuous exchange and interplay between theory and reality (Dubois and Gadde, 2002). This means that what is found in the empirical world might require refinement to the frame of reference. Similarly, the emerging framework may call for additional information about the empirical world. Systematic combining is described as "a process where theoretical framework, empirical fieldwork and case analysis evolve simultaneously and it is particularly useful for development of new theories" (Dubois and Gadde, 2002: 554). The argument for systematic combining is that a researcher that moves between different research phases, and alternates between empirical insights and theory development "can expand the understanding of both theory and empirical phenomena" (Dubois and Gadde, 2002: 555). Section 2.2 illustrates this process of systematic combining. While the research interest gradually emerged with redirections that could not be foreseen, there was systematic character to every individual development rather than their being random and a chaotic.

The principles of systematic combining do not imply that theory is not important. However, the role of theory differs from more linear research approaches. Glaser (1978) argues that when the objective is to develop theory further or to discover new things, empirical data should not be forced to fit predetermined theoretically deduced categories, but rather the categories should develop from the data. In systematic combining, such discovery or development is important. In this process, however, theory plays an important role. Strauss and Corbin (1990) and Huberman and Miles (1994) describe the need to balance between too little and too much pre-structuring of the theoretical framework. While too much structuring can 'blind' the researcher or lead to misreading of the data, too little structuring can lead to 'data overload'. Similarly, Bryman and Bell (2007) emphasise the importance of remaining open to the multitude of meanings that a certain concept can give rise to. In my own research process, there were many times when a looser connection to a predefined theoretical framework enabled discovery of new aspects of my case. However, as described earlier, I also experienced some episodes of data overload. For example, I believe that refraining from a concrete definition of organising opened up research avenues that otherwise I might not have explored. At the same time, trying to manage these numerous alternative directions sometimes clouded the bigger picture. The period when I strayed away from organising as a key research focus towards system sourcing is an example of this.

According to Dubois and Gadde (2002), a theoretical framework should be both tight and evolving in order to avoid the pitfalls of both too loose and too tight conceptualisations. It is suggested to start a study with some initial theory to know what to look for and to avoid indiscriminate data collection and data overload. Meanwhile, as the empirical fieldwork parallels the theoretical conceptualisation, not all the relevant literature can be identified in advance. Instead, the need for theory is created in the process. Such an approach allows the researcher to take advantage of the systemic character of the empirical world and the theoretical world simultaneously. Hence, theory is important as it provides explanatory power for the case. However, it also develops over time. The theoretical framework and the empirical data in this PhD research developed in tandem over the course of the study, in line with this description. All data collection was based on previous research on organising purchasing and supply management and the industrial network. However, the theoretical framework was initially rather open and became more focused over time. The data collected were very important for this focusing in prompting several revisions of the theoretical framework. Much of the theoretical framework content existed before the empirical enquiry started. However, the arrangement of this theoretical framework into its current composition could not have occurred without the study. Therefore, it can be argued that the theoretical framework provided in Chapter 3 is as much of a contribution as the findings deduced from it in later chapters.

As a consequence of relying on the principles of systematic combining, the case developed in parallel with the theoretical framework. Therefore, it is important to account for the role of the case and explain how it evolved during the research process. This process is described next.

2.3.3 CASING AS A METHODOLOGICAL TOOL

According to Ragin and Becker (1992), the case constitutes the centre in case-oriented research. In this respect, a case is both a product and a tool (Dubois and Gadde, 2002). On the one hand, the case is an outcome of an empirical study and an important result in itself. On the other hand, the case provides explanatory power throughout the research process and thereby moves the study forward and influences the findings. Therefore, Ragin and Becker (1992) argue that cases are both found, as empirical units, and made, as theoretical constructs. Casing as a methodological tool is like building a jigsaw puzzle. Dubois and Gadde (2002) explain that the efforts to match theory and reality can take us in many directions. They argue that there is never one single way of matching theory and literature. In other words, there are many potential puzzles to solve in the casing process. For example, in relation to my rich empirical material, there were many alternative ways to combine theory and literature. In this matching process, I rewrote the case many times before achieving its current form. These previous case versions are referred to by Dubois and Gadde (2002: 554) as “children of the prevailing framework”.

In order to rely on casing as a methodological tool, it is vital to maintain the empirical language in the case during the research process and reserve the theoretical language for the final product (Dubois and Gadde, 2002). Thus, the case constitutes a platform for interpretation as well as a basis for communication with other researchers, without imposing particular meaning on it. In my communication with others, many people were intrigued by my case. Moreover, these people assigned their own meanings based on their experience and perspectives, thereby enriching my own interpretation of the case. However, the wide array of interpretations and research interests that I was exposed to sometimes added confusion rather than contributing to my own theoretical developments. These impressions are supported in the literature, where it is argued that “both empirical observations and interaction with other researchers may confuse the researcher in the process. The confusion concerns both what patterns can be found among the collected pieces and also which of the many puzzles the researcher should concentrate on” (Dubois and Gadde, 2002: 558).

Having identified casing as crucial, the question becomes ‘what is this a case of?’ This question had a clear answer. My case has always been about organising purchasing and supply management. However, the boundaries of it have changed gradually along the way as the case has taken on its current shape through the decisions outlined in Section 2.2. This development refers not only to the actors

included and the systems involved but also to the scope of the case in terms of content. Regarding these boundaries, which Ragin and Becker (1992) claim define the case, other questions concerned me more. For example, I questioned whether there really was only one case. At one point in time, there were clearly two cases, when I was studying organising purchasing and supply management in two different contexts that had nothing in common. However, I mostly study organising purchasing and supply management within a single setting, but one that includes several different parallel scopes. As the next section outlines, I studied organising in one buying company, and three buyer-supplier relationships related to four purchased systems. So how many cases does that imply? I also experienced some confusion about the unit of analysis. On the one hand, I was studying internal organising in a single buying company. From this perspective, the unit of analysis is the buying firm. However, I also study relationship organising, implying relationship as the unit of analysis. My research also considers the network context in which these organising activities take place and includes organising initiatives at departmental and individual levels. Eventually, I concluded that there is one case and three subcases that all share a similar context; it is the subcases in combination that provide insights for organising. The fact that the variations across these subcases are not independent makes them valuable to the study. Therefore, they must be part of the same case. This reasoning is supported by Dubois and Gadde (2002: 558) who argue that "the fact that subcases were not independent increased their individual contribution to the total case".

Ragin and Becker (1992) also assert that there is a boundary in time that defines the case. Dubois and Gadde (2002) explain that while studies come to an end, the processes continue in the real world. Therefore, the findings of a case represent a function of the time at which the study took place. This is true in my study. For example, in the time between data collection and writing the thesis, the focal buying company of my case has undertaken additional reorganising. If the time boundary were changed, this reorganising could potentially change the interpretation of my case. However, there is a difference between reinterpreting and misinterpreting a case. While other time boundaries would imply other case content, this alternative content would not necessarily represent a truer or better portrait of reality. The time boundary merely governs what is included in the case and what research issues it can explain.

2.4 DATA COLLECTION AND ANALYSIS

Having described the research process and the research approach, this section outlines the data collection and data analysis. First, the reasons for the particular case choice are addressed. Second, the sources of data collection and the interview procedure are described. Third, data analysis is described as taking place throughout the study.

2.4.1 CASE SELECTION

As argued above, casing is an ongoing process during the course of a study. In the words of Ragin and Becker (1992: 220), "cases must be 'found' in the course of research, since they cannot be specified beforehand". In line with this argument, Dubois and Gadde (2014) maintain that it is possible to claim that cases select the researcher rather than vice versa. On the basis of these statements and the research process outlined above, I did not select a case. However, I did select a company as the starting point for my empirical enquiry.

According to Flick (2009), qualitative research often relies on theoretical sampling in the selection of study objects. Such theoretical sampling is explained by the fact that there are theoretical reasons why some study objects are more important than others. Dubois and Araujo (2007) explain further that selection often involves searching for examples where the particular research phenomenon occurs. Since the interest in the research phenomenon in this study, organising of purchasing and supply management, arose as a result of my Master's thesis conducted at the company Signal Solutions, this company was judged to be a good starting point for further study. Although this choice in many ways constitutes convenience sampling, there are many reasons why it is also a particularly good choice. First, at the time of the study, Signal Solutions was facing severe challenges in relation to its supply side and there were many ongoing organising initiatives. As the initial aim of the study was to understand the interplay between internal and external dimensions of organising purchasing and supply management, it was judged useful to study a company involved in changes to purchasing and supply management. The reasoning behind this decision is that the interplay between internal and external organising becomes visible when it is subjected to tension, but can be difficult to identify in more stable situations. Moreover, the ongoing transformations provided me with a unique opportunity to discuss real-time organising as opposed to exploring past events. Second, Signal Solutions designs and manufactures offerings encompassing technologically advanced and complicated characteristics. Technology intensive goods are potentially involved in many complex purchases. These conditions were favourable for the study since they implied that more interdependencies across company boundaries could be anticipated compared to less complicated buying situations. Third, since I did not depend on the studied company for financing, I was able to conduct my research independently without Signal Solutions' requiring any services in return for the data access provided. The Master's thesis experience had also demonstrated the company's appreciation of independent findings without tendencies to influence my research. Fourth, my previous connections with the company provided many advantages. Because of previous insights into the company and its context I was able to interpret the information in more depth based on the already accumulated knowledge. I had also established a high level of trust with

people who possessed crucial information, which allowed access to information that would be difficult to get from another company.

As described in Section 2.2, I eventually decided to focus on a number of purchased systems in order to analyse interdependencies related to internal organising and relationship organising. The four systems I decided to include were selected by me, not identified by Signal Solutions. The systems were selected as a result of interviews at Signal Solutions, based on frequent mention in interviews or my judgement that they would best illustrate the conditions governing the company's purchasing activities and organising initiatives. Furthermore, they were sampled theoretically to allow for variation in their organising. Table 2-1 outlines some of the variety across the four systems. The table shows that the systems are included in different product platforms, rely on different design principles and internal organising approaches, and have different physical and functional roles in Signal Solutions' offerings. This variation was not all identified 'ex ante'. While product platform belonging and design principle were known, most variation emerged during data collection and case analysis. It resulted from comparing the systems and confronting them against the unfolding theoretical framework. Glaser and Strauss (1976) refer to such simultaneous data collection and analysis as 'constant comparison'.

Table 2-1: Variety across the four systems included in the case.

	Structural frame	Standardised electronic device	Customised electronic device	Data processor
Product platform	A	B, C	D	B, C, D
Design principle	Integral	Integral	Integral	Modular
Internal organising principle	Project-based organising	Project-based organising	Project-based organising	Product-based organising
Physical role in offering	Encapsulation	Substantial physical interfaces	No physical interface	Substantial physical interfaces
Functional role in offering	No functional interface	Important for customers	Optional application	Substantial functional interfaces

There is also variety in the reasons for including the systems, in that there were different characteristics that made them interesting to study. The data processor was identified first because it was mentioned almost immediately in interviews. Since it was the most frequently mentioned system, it was clear that it represented a new way

to manage purchasing activities, in terms of both physical design and purchasing strategy. This system was included in the study in order to reflect current organising initiatives. The structural frame was the last system to be identified. It represents traditionally difficult times in the purchasing activities of Signal Solutions. In representing the most long term buyer-supplier relationship studied, its characteristics capture most of the challenges experienced related to purchasing and supply management at Signal Solutions. The structural frame has similar physical characteristics to the body originally selected for study, and was chosen instead because of its more interesting buyer-supplier relationship. The standardised and customised electronic devices were selected together as they belong to the same buyer-supplier relationship. The standardised electronic device was frequently mentioned in relation to a difficult buyer-supplier relationship. However, many of the problems described in relation to this supplier had much in common with the structural frame. Another supplier of this standardised electronic device was described as piloting a new contractual arrangement that seemed interesting to study and was selected instead. When data collection regarding this system started, design problems related to the customised electronic device were a hot topic for both buyer and supplier, making it necessary to include this system in the study in order to reflect the content of this relationship. The identification of systems is included in the data collection timeline in Figure 2-2 below.

The resulting case consists of four purchased systems in three buyer-supplier relationships, described as three embedded cases sharing a common buying company context - Signal Solutions and its business environment. The decision about the number of systems and buyer-supplier relationships developed during the course of the study based on the time available. The number of sub-cases constitutes a balance between depth and breadth. Neither few nor many sub-cases is preferable; what is important is that the decision is aligned to confrontation between data and the conceptual world (Suddaby, 2006). I believe I have achieved a balance between breadth and depth in this study. Because of the variety inherent in the studied sub-cases, having more sub-cases allowed me to identify more aspects of the phenomenon than fewer sub-cases would have enabled. However, fewer sub-cases would have allowed me to analyse the extant aspects in more depth. It was unclear for some time whether I should include the third sub-case in the study, partly because there were plentiful and interesting data emerging from the other two buyer-supplier relationships, and partly because of uncertain access to this supplier. The third sub-case addresses the redesign of the data processor identified early as a promising study object. However, while I was able to collect data related to this system internally at Signal Solutions, data collection at two other suppliers preceded a visit to the supplier of this system which was difficult to contact. I contemplated excluding the data processor. However, over time, the data analysis and emerging theoretical framework identified the design principle as particularly important,

making it interesting to include this sub-case which represented a different design principle compared to the other two. Therefore, when an opportunity to visit this supplier arose, I decided to include it. The time already invested in collecting data internally also contributed to this decision.

The question surfaces whether I have selected 'the best case'? The relevance of a case cannot be known in advance, since the direction and boundaries of the study evolve during the study process (Dubois and Araujo, 2007). I would argue that it is neither necessary nor even possible to identify 'the best case'. This is not to imply that case selection is not important; on the contrary, when relying on principles of systematic combining, the case is crucial because it influences the direction and redirection of the study. Selection of a different case would undoubtedly have resulted in different outcomes. For example, the technology intensive purchasing activities of Signal Solutions definitely influenced both the framing and findings of the study. So long as the boundaries of the study are allowed to evolve to fit the unique circumstances of the chosen case, the findings will be relevant although perhaps for reasons that could not be foreseen (Dubois and Araujo, 2004).

2.4.2 SOURCES OF DATA

The case was studied from a network perspective. Data were collected from the focal buyer, three suppliers and three customers, but the study scope extended beyond these actors to include the surrounding business network where applicable. For instance, although no data were collected from these additional actors, second tier suppliers proved to play major roles in purchasing arrangements. I also describe how other customers of the included suppliers determined what was feasible within the studied buyer-supplier relationships.

Data collection consisted mostly of semi-structured interviews (Flick, 2009) for two reasons. First, it was judged that interaction with people was needed to allow for a deep understanding of the phenomenon. In order to reveal interdependencies between internal and external organising, it was necessary to talk to the people involved in designing and integrating the purchased systems, as well as those involved in the buyer-supplier contact patterns. Second, semi-structured interviews allow for emergence of unexpected data that can redirect the study to better mirror reality. According to Dubois and Gadde (2002), posing open questions and allowing respondents to speak freely about topics imply that interviewees are not limited to discussing aspects of the phenomenon that could be identified in advance.

Other data collection approaches complemented the semi-structured interviews. First, there was observation of assembly operations at Signal Solutions, and the production facilities of the three studied suppliers. Second, I participated as a guest in a supplier visit by Signal Solutions which allowed me to observe the atmosphere and content of buyer-supplier meetings. I have also studied meeting protocols and agendas in order

to get a sense of the content of the interaction between buyer and suppliers, and studied requirements specifications and design specifications. Third, I obtained internal company documentation from Signal Solutions. This included, but was not limited to descriptions of internal business processes, role descriptions, allocation of responsibilities, purchasing strategies and contract policies. Fourth, I obtained approximated purchasing statistics from the IT systems. Examples of these data include number of suppliers, ingoing components in the product hierarchies, purchasing costs and man hour ratios, prices and lead times.

The range of data sources enabled data triangulation. Triangulation was valuable because of the different perspectives provided by each data source (Dubois and Gadde, 2002). The interviews were valuable for providing a rich understanding of the dealings of both buyer and suppliers and the systems exchanged between them. Also, the interviews allowed for opinions and emotions to emerge, providing information that would not have been available from any other data source. The supplier visits and production operations observations provided insights into the nature of the operations of both buyer and suppliers which would have been difficult to understand from spoken descriptions. For example, conversations about capital intensive or flexible manufacturing operations are less comprehensible than observation of the huge machinery and manual assembly tasks involved. Finally, statistics and numbers are important to grasp the magnitude and specificity of described characteristics. For example, instead of a statement that purchasing operations account for substantial parts of lead times, the actual lead time percentages provided by the statistics made it much easier to appreciate the magnitude of this problem. Similarly, realising exactly how much a purchased system costs and how much the costs have increased makes it easier to understand the severity of the situation, compared to a statement only that something is costly.

It should be emphasised that the multiple data collection approaches complemented each other rather than acting as confirmation or contradiction. While similar information was rarely accessed from different data sources, each type of data served as pieces in a puzzle to provide a complete picture.

2.4.3 INTERVIEWS

This section describes the interviews conducted at Signal Solutions and those carried out with suppliers and customers. It also describes the interview procedure.

Figure 2-2 depicts the data collection timeline. This timeline shows that data collection started internally at Signal Solutions and eventually included suppliers and customers in a sequential manner. The first customer interview was an exception. It was conducted during the Master's thesis in order to get their perspective on the changing business environment that led to the purchasing transformation in question. In hindsight, this data collection sequence probably influenced the findings. For

example, when I eventually interviewed suppliers, I had already developed an interest in particular purchased systems and internally formulated relationship challenges. Although I attempted to be a 'passive' interviewer, these preconceptions naturally influenced the unfolding of the interviews. Had I started data collection with suppliers, other purchased systems or problems might have appeared equally interesting. Also, customers were interviewed last, more or less in order, to verify or refute internal statements. Had I begun with customer requirements, this would likely have resulted in a different study.

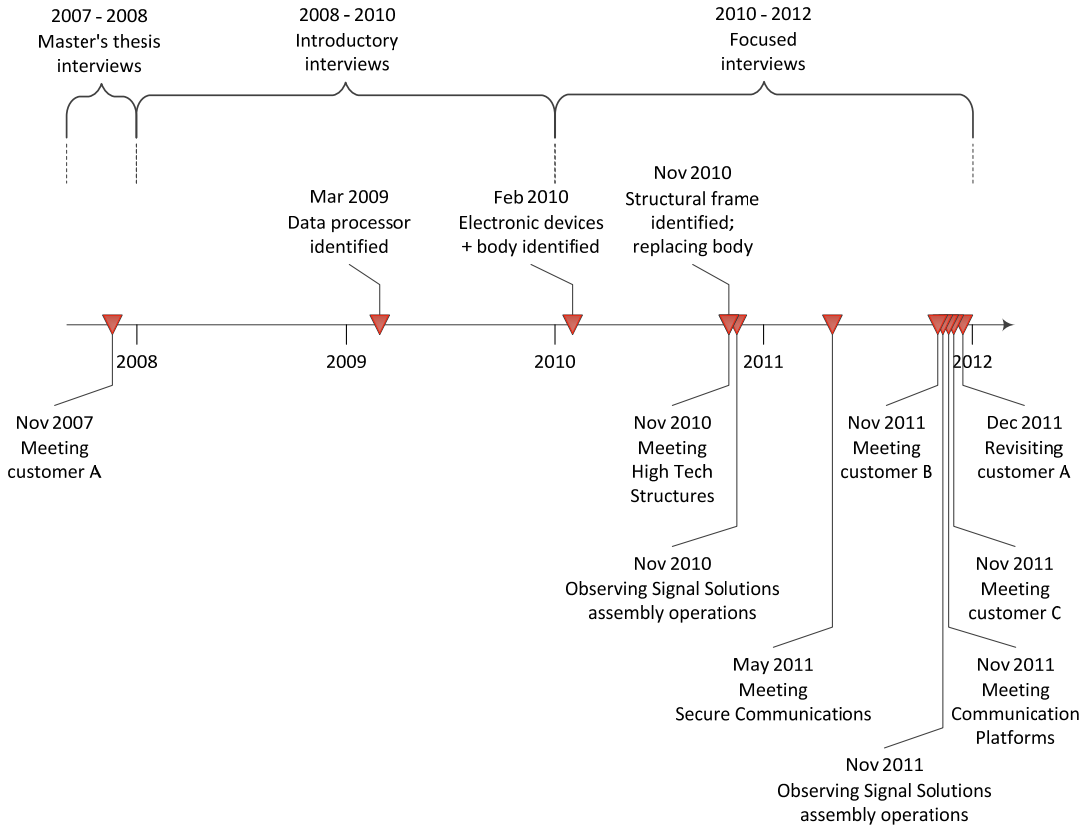


Figure 2-2: Data collection timeline.

Interviews at Signal Solutions

The interviews at Signal Solutions were conducted in three phases. First, 26 interviews were conducted as part of the Master's thesis. These interviews were focused on the internal organising and the nature of the business environment in general and supply management challenges in particular. One of the most important outcomes of this research phase was analysis of the links between the purchasing department and the purchasing function through cross-functional interaction in individual customer projects. Moreover, establishing the Partner Management group constituted the focal point of this Master's thesis study. Second, after embarking on the PhD research, 14 interviews were conducted as follow ups and to identify interesting organising initiatives. During this stage, the shift from project-based

organising towards product-based organising was identified, together with the corporate level consolidation efforts and three out of the four studied purchased systems. Third, the final interview phase includes the main study involving 28 interviews focused on the four studied purchased systems and the organisational arrangements surrounding them. Interviewees in this stage included the actors directly or indirectly involved with the systems and the corresponding buyer-supplier relationships. Such interviewees included relationship representatives, decision makers and people affected by the relationship. Twenty of these interviews focused mainly on the organisational arrangements and buyer-supplier relationships; 8 interviews served to analyse the systems and their roles in the offerings of Signal Solutions.

A total of 68 interviews were conducted with 44 respondents at Signal Solutions - some people were interviewed more than once. For example, five interviewees from the Master's thesis were re-interviewed to follow up on events during the attempted purchasing transformation. The Supplier Account Managers were reinterviewed regularly to monitor ongoing developments within the three studied buyer-supplier relationships. This overlap provided a better understanding of the events taking place during the course of the study. Not only was I able to get valuable updates that facilitated the analysis, but sometimes time allowed respondents to reflect on and interpret situations differently. For example, the Partner Management group initially was heavily criticised in the organisation. However, over time it became clear that many interviewees perceived their work as valuable despite not approving the work methods applied. These nuanced reflections would have been missed had I not done some reinterviewing.

The departmental belonging of the interviewees is outlined in Table 2-2 which shows that purchasing, Partner Management, product management, project management, product development and sales are all represented in the data. The 'other' category includes the head of human resources, an advisor to the process management system and the convenor of the consolidation efforts at corporate level. The table shows a rather even distribution across departments. However, there are some exceptions. First, the largest number of interviewees was from the product development department. Considering the technological complexity of the offerings of Signal Solutions this representation in the data is justified. Moreover, since the data collection focused on a number of purchased systems, it was necessary to analyse the physical and functional interfaces with adjacent systems with the help of engineers. The number of sales representatives interviewed is small explained by the fact that the sales department only represents the customer during the initial stages of customer projects, and mainly interacts with the customer together with other departments which have higher representation. Also, since I conducted interviews with customers it was less important to talk to sales representatives about customer

requirements. Finally, since the study focuses on purchasing activities, it is perhaps surprising that there are not more purchasing department interviewees. Due to the limited involvement and influence of purchasing representatives, the other departments were as important. Also, the four representatives of the Partner Management group had all recently worked in the strategic purchasing group and were able to discuss experience in the purchasing department.

Table 2-2: Departmental belonging of interviewees at Signal Solutions.

DEPARTMENT	NUMBER OF INTERVIEWEES
Purchasing	8
Partner management	4
Product management	8
Project management	6
Product development	13
Sales	2
Other	3

The departmental belonging of the interviewees influenced the data gathered. Since the interviewed departments represent different company functions, I was able to analyse how the purchasing function is influencing and being influenced by each department. Inevitably, departmental belonging guided the knowledge of the interviewees and, therefore, the interview topics. For example, sales representatives were able to talk about how customer requirements affect product specifications and engineers from the product development departments described how customer specific requirements spread across the functional and physical interfaces in the offerings. However, it should be emphasised that other characteristics than departmental belonging also had an effect. For example, the respondents' history with the company ranged from 1 to 35 years with a fairly even distribution. Longer serving employees possessed valuable knowledge about the company's history, culture and business context. Newer ones critically reflected upon current work by comparing them with previous work experience. In addition, previous experience in other company departments or contexts and educational background affected interviewees' viewpoints. Most of at Signal Solutions' employees have a strong technical background based on education and job experience, and the people with commercial business backgrounds stood out in their opinions and interpretations of current affairs. Also, interviewees with responsibility for cross-functional business processes provided more general data. Finally, the hierarchical position of respondents mattered. Of the 44 representatives interviewed, 10 were in management

positions, ranging from directors to departmental heads to group managers. These representatives were often able to give a bird's-eye view and provide information on important challenges and dilemmas rather than just responding straightforwardly to the interviewer's questions.

The respondents were chosen as a result of theoretical sampling and snowballing techniques (Miles and Huberman, 1994). At the outset of the study, interviewees were selected based on departmental belonging in order to achieve general descriptions of the internal organising, supply management activities and current challenges and initiatives. As the study proceeded and some activities became particularly interesting, I began to approach interviewees based on their involvement in particular purchased systems, buyer-supplier relationships and internal organising initiatives. At this stage, snowballing was used since interviewees typically mentioned colleagues' names which I judged to be important for continuing data collection. It was relatively easy to make contact with some, but less easy with others. In many cases, people were aware of the study, and interviewees welcomed the chance to participate. In a few cases, people took the initiative to contact me. The interviewees that were most difficult to contact were those with the heaviest workloads. However, when they agreed to be interviewed they were open in sharing their experience and viewpoints. I was able to interview everyone I assessed as important for my study. I interviewed all the key players in the organising initiatives that I was interested in, all relationship representatives and the people responsible for specifying purchased systems. In two cases it was necessary to track down people who had left the company. In two other cases, I did not manage to interview the potential respondent. The first was a senior manager who would have been indirectly valuable for providing information on the organising of the purchasing function. He agreed reluctantly to meet with me, but eventually cancelled. Having already achieved several perspectives on the role of this individual in current affairs, I considered this setback to be of minor importance. The second person was a newly appointed group manager in the purchasing department who for personal reasons was forced to cancel the interview. Having already interviewed the two group managers who had previously occupied the same position, all I lost was the new manager's vision for the future.

Interviews with Suppliers and Customers

Interviews were conducted at three suppliers which together represent the four purchased systems that became the eventual focus of my study. Secure Communications supplies two systems, the standardised and customised electronic device, and High Tech Structures and Communication Platforms supply the structural frame and the data processor respectively.

The targeted suppliers were not the result of convenience sampling; they were a given once I had identified the purchased systems that I wanted to focus on. In only

one case did the offer to visit a supplier precede the decision to include the purchased system in the study. This was the case of the structural frame, which replaced the body after the purchasing strategy for this latter changed making it no longer suitable for my study. The other two suppliers were difficult to access, partly because of Signal Solutions' reluctance to allow me to contact them, but also because of initial scepticism on the suppliers' parts. The fact that two out of three studied buyer-supplier relationships experienced turmoil during my data collection definitely contributed to these difficulties. In two out of three cases, the suppliers agreed to a first meeting while they were visiting Signal Solutions. Eventually, I managed to visit all three suppliers and they openly shared opinions and reflections regarding their relationship with Signal Solutions and guided me through their production facilities.

At the suppliers, data collection had to be more focused. This was enabled by the extensive data collection at Signal Solutions. Because of this preparation, I was able to focus the interviews. An almost equal number of internal informants provided information on the purchased systems as did their suppliers. During supplier visits, priority was given to interviewing everyone regularly involved in the relationship. This typically implied representation from sales, project or programme management and engineers from product development or operations. Sometimes, the internal organising of the suppliers implied that there was an overlap in these responsibilities. In addition, in two suppliers, the General Managers, Vice Presidents and Chief Operating Officers were interviewed.

Customers were included to enrich my understanding of Signal Solutions' external business environment. They provided information on the characteristics of general demand and working procedures, including degrees of customisation and division of roles and responsibilities between customer and Signal Solutions throughout the product development process and project fulfilment. Although Signal Solutions' products were discussed, customers did not comment on the specific relationships analysed in this study. Customers were convenience sampled in that I chose whichever were made available to me. However, it was considered important to interview more than one customer to allow for potential variation in the findings. Also, customers were sometimes neighbouring business units within the Signal Solutions' corporate group. I expected buying behaviour between internal and external customers to differ, and therefore considered it important to interview both types of customers. Finally, customers were interviewed to include variety related to buying behaviour across all four product offerings included in the study.

In total, 18 external representatives were interviewed, including 12 representatives from 3 suppliers and 6 representatives from 3 customer organisations. The distribution of interviewees is outlined in Table 2-3 and Table 2-4.

Table 2-3: Job titles of interviewees at suppliers.

SUPPLIERS	NUMBER OF INTERVIEWEES	JOB TITLE
High Tech Structures	3	Chief of Operations Sales and Programme Manager Manufacturing Engineer
Secure Communications	6	Senior Vice President Vice President Key Account Manager Sales Manager Head of Manufacturing Head of Engineering
Communication Platforms	3	Key Account Manager Programme Manager Quality Manager

Table 2-4: Job titles of interviewees at customers.

CUSTOMERS	NUMBER OF INTERVIEWEES	JOB TITLE
Customer A	3	Advisory position: material supply strategy Advisory position: partnering Project Manager and former purchaser
Customer B	1	Programme Manager
Customer C	2	Key Account Manager Programme Manager

Interview Procedure and Transcribing

All potential interviewees at Signal Solutions were invited to participate in the study via telephone. I began by introducing myself, the university and my research. I informed respondents about what would be their role in the study and the information I was looking for, and I assured them of anonymity. These telephone introductions were typically followed up by an email summarising the purpose of my research, and the information I was looking for in the upcoming interview.

Most interviews lasted between 60 and 120 minutes. During the interviews, I tried to maintain open conversations rather than asking specific questions. For example I

asked: “What do you know about the data processor?”, “Do you have anything to do with Communication Platforms?” “What do you think about the design of the structural frame?” The interviews were guided by an interview template. Sometimes the respondent asked for this template beforehand. However, I tried to avoid supplying this in advance since I preferred the interviewees not to feel limited by the interview guide. Each interview had a specific interview guide depending on the respondent and the information I wanted to extract. Appendices I and II provide examples of interview templates for the exploratory and focused data collection stages respectively.

Suppliers were invited to participate in the study via a formal letter that was forwarded to them by the Supplier Account Managers at Signal Solutions. The letter introduced me and my research, stressed the importance of their participation to my research, and the potential value for themselves, and emphasised the independence of my study in relation to Signal Solutions. The interviews followed a similar pattern to the interviews at Signal Solutions. Appendix III provides a typical interview guide.

Customers were typically invited directly via Signal Solutions representatives. Since only one meeting was needed it was not judged necessary to make a formal invitation. As a result of not contacting these respondents myself, the majority of customers requested an interview guide in advance before they would agree to a meeting. Appendix IV provides the interview template. These interviews also took the form of an open conversation, but were more structured than the other sets of interviews because of the smaller potential to drift away from the intended focus areas.

Handwritten notes were taken of the interviews (Flick, 2009). It was a deliberate choice not to record interviews electronically, partly because of the confidentiality agreement between me and Signal Solutions, which would have made it necessary to keep switching the recorder on and off during interviews. However, the decision was based mostly on my Master’s thesis experience. The Master’s thesis topic was sensitive since it addressed emotions and resistance to the implementation of a new sourcing strategy that potentially would shift power balances and result in redundancies. For this reason, it was decided not to tape record interviews. During these interviews, I learnt that just putting down my pen during a delicate conversation made interviewees more relaxed and probably more ready to share sensitive information. Although I could not take direct notes, such information provided valuable background and context for the subsequent analysis. If interviews had been recorded, much of this information would not have been provided by interviewees. Having developed and noted the efficacy of not recording interviews, I decided to continue with this approach for subsequent data collection. Flick (2009) supports this choice in his recommendation about restrictive use of recording equipment during interviews, arguing that the technology interferes with the

naturalness of the situation. On the use of recording devices he asserts that "after informing the participants about the purpose of the recording, the researcher hopes that they will simply forget about the tape recorder and that the conversation will take place 'naturally' – even at awkward points" (Flick, 2009: 294).

In order to alleviate the disadvantages of only having research notes, I made great effort to listen carefully and take note of everything that was said during the interviews. I applied these techniques even to parts of the conversation that I considered not important to my study. Often, this material was not useful, but sometimes peripheral content provided context to more important data. In some cases, the importance of peripheral data was recognised only after the interview, and I was able to contact the interviewee to achieve more detail or clarification. For example, in the case of the four purchased systems, I returned to my transcripts when I had decided to include these systems in the study. In addition, I made notes on the atmosphere of the interview, tones of voice, body language and included key quotes to enrich the information and increase my recall of the interview situations. Some of these quotes are used to support the empirical descriptions in Chapters 4-7.

In accordance with the recommendations in Lofland and Lofland (1984), all interviews were transcribed immediately after the interview, or at least on the same day. The result was some 400 pages of transcribed notes which provided the foundation for the subsequent data analysis.

2.4.4 DATA ANALYSIS

Many authors provide recommendations for data analysis. Flick (2009) outlines a range of coding principles, describing the process of transforming transcribed data into coded analysis. For example, grounded theory coding, as described by Strauss and Corbin (1990), aims at developing theory from empirical data through systematic coding of thematic data content. Alternatively, Mayring (2004) suggests qualitative content analysis, where data are analysed with the help of predefined categories derived from theoretical models.

In my study, relying on the principles of systematic combining implies that neither data nor theory take precedence. Rather, it is the iteration between empirical data and the theoretical framework that is the main feature of data analysis. In such an approach, data analysis takes place continuously throughout the study.

The first stage of analysis took place during writing up of interviews, when I thematised the collected data. According to Flick (2009: 303), "the construction of a new reality in the text has already begun at the level of the field notes and at the level of the transcript and this is the only [version of] reality available to the researchers during their following interpretations".

The case description constitutes the second stage of analysis. Flick (2009: 303) explains that "the documentation has to be exact enough to reveal structures in those materials and it has to permit approaches from different perspectives". He argues also that the organisation of the data is aimed at documenting the case in its specificity. Texts produced in this manner should make the studied reality accessible as empirical material for interpretative procedures. As explained above, the casing process meant the case description was built step by step throughout the study. Many case descriptions preceded the versions presented in Chapters 4-7. These different versions were informed by my analysis ideas. For instance, I initially described all three relationships with similar content, in an attempt to later apply an early version of the theoretical framework to the empirical content. As the analysis progressed, differences between the three relationships were revealed and I later decided to structure the case description differently in order to highlight the critical incidents that made each relationship unique. To accomplish this restructuring I returned to the transcripts to search for data previously not included in the case descriptions. This restructuring allowed identification of additional important issues that were included in successive versions of the theoretical framework. This stepwise modification would have been impossible had I not found a suitable balance between specificity and openness in the case description. The current case description is a selective depiction of the phenomenon of interest, which includes some things and omits others in order to highlight key issues for the reader.

Analysis of the case description using the concepts of the theoretical framework constitutes the third stage of data analysis. This analysis centres on the interplay between empirical data and theoretical content and was developed continuously throughout the study. According to Suddaby (2006), this concurrent interpretation of the case description together with the evolving theoretical framework is crucial for theory development. During this interpretative stage of data analysis, the case description sometimes clarified the content of the analysis. For example, the theoretical framework originally focused on internal organising and relational organising separately, but the empirical case description made it possible to redirect the analysis towards organising occuring across company boundaries. Having clarified this linking of internal and relationship organising, it was possible to further develop both the theoretical framework and the data analysis. Conversely, the analysis sometimes identified gaps in the case description that required additional data collection. This occurred when modular versus integral design principles were identified in the literature, guiding data collection towards exploring the nature of physical and functional system interfaces related to the purchased systems in the study.

2.5 QUALITY OF THE STUDY

There are many opinions regarding the most suitable approach to evaluating the quality of research. Many of these evaluation criteria are applicable to my study, although not necessarily in exactly the same way as the literature suggests. For example, Lincoln and Guba (1985) advocate triangulation, member checks and providing a trail of evidence. I rely on all these principles in my study, however, for different reasons than those Lincoln and Guba (1985) emphasise. Beginning with triangulation, it is suggested that many data sources make it possible to verify the accuracy of collected data. However, in my study, triangulation served to reveal additional perspectives on and dimensions of the studied phenomenon (Dubois and Gadde, 2002). In relation to member checks, these enquiries are recommended in order to validate that the interpretation of the data collected reflects a 'true' picture of reality. However, in my study, member checks were used as a platform for further data collection. My interpretation of the data served as inspiration for further reflection on and discussion of interesting findings. Finally, trails of evidence are claimed to be important to ensure dependability based on replication logic. In my case replication is neither possible nor desirable. However, the trail of evidence is crucial to provide transparency that makes it possible for the reader to make an informed judgement about the quality of the study.

Dubois and Gibbert (2010) emphasise that the quality of a study consists of a process of matching between theory, empirical reality and methodology. They claim that "the basis for quality criteria that apply always relate in some way to how the links between the three dimensions were created, for example through deductive, inductive or abductive approaches" (Dubois and Gibbert, 2010: 135). Relying on the principles of systematic combining, there was constant interplay between theory, empirical phenomenon and methodology. In such an approach, the most important evaluation criteria consist of providing transparency by guiding the reader through the various stages of this interplay. Furthermore, Piekkari et al. (2010) and Dubois and Gadde (2014) among others argue that reflexivity is needed to address the consequences of the flexibility that is the essence of abductive case study research. Similarly, Dubois and Araujo (2007: 178) assert that "the intellectual journey needs description and reflection". Although it is not possible to provide a detailed account of every twist and turn in this study, this chapter provides a transparent account of the research process. Section 2.2 is especially important in this respect.

Apart from transparency and reflexivity, this study relies on logical coherence in the matching of theory and empirical reality (Dubois and Gadde, 2002). Conditioned by the environmental context, Dubois and Gadde (2002) explain that case studies cannot build on statistical inference. Instead, it becomes necessary to rely on analytical inference. Such analytical inference is characterised by the inseparability of theory generation and confirmation and is created in the process of data analysis. Logical

coherence in the interplay between data and theory serves to demonstrate such analytical inference, making it possible to evaluate the research procedure and its outcomes. Whether this research adheres to logical coherence should become clear from successive chapters of this thesis.

Based on this methodological account, I hope I have been able to convince the reader of the quality of the study and the value of my findings. I leave this decision to the perception of the reader.

3 FRAME OF REFERENCE

This chapter introduces the frame of reference for the study. It should be noted that, although the framework is presented before the empirical study, it is as much a result of the empirical enquiry as an input. This methodological approach was discussed in Chapter 2.

Chapter 3 is organised as follows. Section 3.1 focuses on defining and framing the meaning of organising drawing on organisation theory. In line with this framing, Section 3.2 introduces the industrial network approach as the theoretical perspective on which this study is based. Sections 3.3 and 3.4 describe previous research on internal and relationship organising, respectively. The linking of these two organising domains is addressed in Section 3.5, which focuses mostly on problematising the focus on the company boundary as a separating mechanism. This problematisation leads to a revised research aim. In Section 3.6, the three layers of the industrial network approach are used to derive issues important for organising purchasing and supply management, in light of the revised aim. The chapter concludes in Sections 3.7 and 3.8 which summarise the analytical framework and define research questions for the empirical enquiry.

3.1 FRAMING THE ORGANISING CONCEPT

Organising is a frequently used concept that is applied across a wide range of research disciplines, including for example purchasing, marketing, business administration and social sciences. The concept is applied differently within and across these disciplines, ranging from being a rather vague term signifying general behaviour or strategies, to a very specific conception of organisational design. This section explains the perspective on organising on which this study is based.

The *Oxford English Dictionary* suggests synonyms for organising including "systematically order", "coordinate activities efficiently" and "make arrangements for" with references to both resources and activities that are organised. Whether addressing resources that are arranged or activities that are coordinated, organising is associated with actions that provide order and structure to the undertakings of organisations. Drawing on organisation theory, Weick (1969: 40) explains that organising is directed towards "the establishment of a workable level of certainty" by narrowing the range of possibilities in terms of plausible outcomes. These outcomes relate not only to the tasks and responsibilities associated with the technology but also to social structures. According to Morgan (1986), organisations can either be viewed as the formal means to manage activities and products in order to meet specific objectives or as socially imposed arenas where individuals and groups of people act in order to pursue conflicting interests. This latter approach follows Cyert and March (1963) who emphasise the importance of viewing key participants in

organisations as loosely coupled coalitions of shifting interest groups. This study is based on the notion that both technology and social structures are important aspects of organising.

Moreover, with the aim to relate internal and relationship organising, the perspective on the interplay between internal and external features is important. In organisation theory, there are different views on the way organisations relate to their environment. Buckley (1967) maintains that an open system implies not only that the system engages in interchanges with the environment, but that the interchange itself constitutes the essence of the system's viability. In other words, organisations are assumed to form part of their environment and all organising taking place internally occurs in direct connection with and in relation to this environment. With such an open systems perspective on organising, external forces are assumed to shape internal arrangements, and vice versa (Scott and Davis, 2007). Lawrence and Lorsch (1967) explain that different environments place different requirements on organisations and that, therefore, organising efforts depend on the nature of the environment to which the organisation relates. Similarly, Galbraith (1973: 2) states that "there is no one best way to organise; however, any way of organising is not equally effective". This study is also based on the assumption that organisations form part of their environment. However, a system assumes that there is a stable boundary between internal and external matters. In this study, however, boundaries are considered to be arbitrary, and what constitutes internal and external matters varies depending on the perspective. In this sense, the approach in this study is somewhat different compared to an open systems view.

In this study, organising is not only assumed to depend on the context in which it takes place but also the use of organising as a verb emphasises the process-like and dynamic characteristics that follow from such a perspective. Since organisations are inseparable from the transactional contexts in which they are embedded, advocates of relational approaches to organising argue that organisational structures are continually created and recreated as a result of their dual nature. Weick (1969) argues that organisations appear like structures because we glimpse a brief and 'frozen' picture of them, while in fact these structures are continuously changing. The notion of enactment is used to explain these dynamics. Enactment implies that actors separate out and make sense of parts of the environment and act within these preconceptions. Weick describes how organisational activities thereby become structured as sets of 'interlocked behaviours' that give rise to repeated routines and patterns of interaction, constituting the process of organising. Through this behaviour, the organisational members directly influence the environment towards reinforcement of the preconceptions. In this way, the enacted environment is a result of the preconceptions held by the actors. In line with this reasoning, Giddens (1979) explains that structure is important both as outcome and process. On the one hand,

structure is important as a process since it provides the context for action. On the other hand, structure is an outcome in that it also follows from human action. Giddens therefore calls for a more dynamic view of social structure by considering the ways in which structures undergo constant transformation in response to the acting that takes place within them.

This framing of organising provides the foundation for studying the linking of internal and relationship organising. Next, a theoretical perspective that is aligned with these views, while also addressing purchasing and supply management, is presented as the theoretical foundation of the study.

3.2 THE INDUSTRIAL NETWORK APPROACH

Naturally, the perspective applied in a study will have a major influence on what is discovered. As described above, organising can be studied from almost any type of theoretical basis and the results will differ accordingly. In this study, the organising of purchasing and supply management has been theoretically framed as an ongoing process that is embedded into the dynamic context where it takes place. In order to study organising under such circumstances, a theoretical perspective is needed that can capture these interactive characteristics. Furthermore, since the starting point of this study was to investigate the link between internal and relationship organising, a theoretical perspective is needed that allows for exploration of complex inter-organisational phenomena.

In this section, the industrial network approach is introduced, a theoretical foundation that fits with the above requirements and, thus, with the standpoint of the study. As will be explained in this section, the industrial network approach recognises the embeddedness of firms and relationships within a network context, focusing more on the connections between firms than on the undertakings of isolated companies. Such a perspective is valuable for studying inter-organisational phenomena. Furthermore, analytical tools developed within the industrial network perspective allow for analysis of complex interrelations across company boundaries, through the three interlinked network layers of activities, resources and actors. According to Weick (1999: 801), “complex phenomena necessitate complex theories”. The interplay among organising purchasing and supply management both within and between companies constitutes such complex phenomena, which benefit from elaborate analytical tools. In addition, the industrial network approach represents a socio-material perspective that combines technical features and social aspects, thereby enabling the analysis of these issues that are important for the phenomenon in question. Network theory is recommended for studying purchasing and supply management by Van Weele and van Raaij (2014), to manage what they refer to as an increasingly interconnected world.

3.2.1 A NETWORK VIEW OF THE WORLD

The industrial network approach orginates in research by the Industrial Marketing and Purchasing (IMP) Group (Håkansson, 1982). It is a large research network that has been conducting research into the interactive nature of buyer-seller relationships since the 1970s (Turnbull et al., 1996). The IMP Group was formed when shared interests in buyer-seller relationships led to the initiation of a large international research project. The hypothesis underlying the project was that the content of buyer-supplier relationships is broader than simple economic exchanges. These empirical studies eventually led to an alternative theoretical foundation concerning marketing and purchasing and especially how they relate to each other.

Historically, the view of purchasing stems from traditional economic theory claiming that the market is composed of a large number of autonomous and independent buyers and sellers that individually build and execute the strategies of their choice. From a marketing perspective, the seller is perceived as manipulating a set of marketing mix variables until a reaction is received from the homogeneous, passive buyer group. From a purchasing perspective, each purchase is viewed in isolation where the buyer searches the market and reacts to the best solution available, from a homogeneous seller group. This view also indicates that buying companies can choose freely between different alternatives and that the business market develops accordingly. Within this market-based view, relationships and interdependencies are conceptualised as market imperfections or exceptions to the rule. At best, relationships are viewed as one-sided tools available to achieve one-sided goals. Moreover, what happens between these autonomous and independent entities is viewed as a transaction-based, linear flows of goods and services controlled by individual actors. The market-based view has, over time, become more or less outdated. Many researchers have questioned the atomistic market characteristics in favour of the network-like features resulting from long-lasting business relationships. Scholars from quite different research disciplines have referred to relationships between firms as an increasingly important research phenomenon (see e.g. Bensaou, 1999; Dyer et al., 1998; Achrol and Kotler, 1999; Nohria and Eccles, 1991; Porter, 1990).

The industrial network approach is one of the theoretical perspectives on purchasing and supply management that contrasts sharply with the market-based view. Instead of denying the presence of long-lasting business relationships, the IMP Group researchers focused on them and were able to explain the rationales for their existence. Turnbull et al. (1996) emphasise that both the buyer and seller are active participants in the business landscape through their involvement in relationships. Supporters of this theoretical basis describe how relationships provide the atmosphere within which individual business transactions take place. Relationships are assumed to both influence and be influenced by these business transactions, and

provide the business landscape with a stability that is rarely recognised with a market-based view (Johanson and Mattsson, 1987). The stability stems from connections between buyers and sellers that become institutionalised into a set of roles that each party expects the other to perform. Moreover, proponents of the industrial network approach argue that adaptations in operations are often required in relationships, by either or both parties (Håkansson and Snehota, 1995). As a consequence, business relationships are related to each other and form part of an aggregate structure referred to as the business network, which is illustrated in Figure 3-1. The figure shows a number of companies, represented by circles or nodes, that are linked to each other through relationships. Perhaps the main factor differentiating the market-based view and the industrial network approach is the relative importance of the nodes or actors, and lines or relationships, in the figure. In a market-based view, the actors or nodes are central. However, in an industrial network approach, the interaction in business relationships represents a fundamental characteristic of the business world. Hence, the lines, representing what goes on *between* companies, become as important as what goes on inside them.

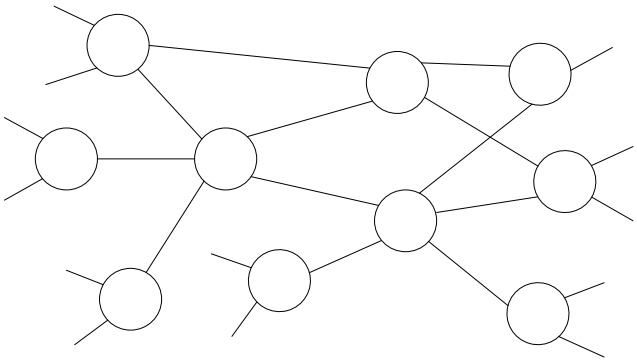


Figure 3-1: A network of relationships between companies.
(Håkansson and Snehota, 1995)

According to advocates of the industrial network approach, the connections between relationships in the business network are explained by the existence of interaction in individual relationships. The characteristics of this interaction can be divided into a space dimension and a time dimension outlined in the next section.

3.2.2 INTERACTION IN SPACE AND TIME

The industrial network approach centres around the notion of interaction in business relationships. According to Håkansson et al. (2009: 28) interaction is described as a "multidimensional process between companies that change and transform aspects of the resources and activities of those companies and the companies themselves". According to this characterisation, interaction is not just a mechanism that facilitates market exchange. Rather, interaction has content and leaves behind traces, thereby impacting on the resources, activities and people involved in it.

The interaction process can be characterised in terms of a space and a time dimension (Håkansson et al., 2009). The space dimension describes the relatedness in the business network at a specific point in time, while the time dimension outlines the development of this relatedness over time. There is also a connection between the time and space dimension in that the business landscape characteristics are just as much an outcome of interaction as they are an input to it.

Beginning with the space dimension, interaction constitutes the major means through which companies systematically relate to each other in business relationships. The interaction content can be described in terms of three connected network layers, namely activities, resources and actors. This interaction content implies that the elements in a business network are connected to and relative to each other. Each interaction episode within this networked context will have unique results for those involved in a business relationship. This interaction content not only influences individual relationships but stretches beyond dyadic relationships and connects indirect relationships in the wider network. Lambert and Cooper (2000) refer to these indirect connections as non-member process links, indicating that reality is much more complicated than the popular supply chain perspective. Translated to the setting of organising of purchasing and supply management, the fact that actors are not self-contained and autonomous entities implies that all organising initiatives, whether internal or external, depend on the initiatives of other actors in the network.

In relation to the time dimension, interaction is not only relative to other actors, it is also relative over time. The industrial network approach asserts that the characteristics of business networks are neither definitive nor imposed on the actors within them. Rather, the features of the business landscape result from the ongoing interaction in business relationships. Through these interactions, actors systematically adapt to each other, in one or several dimensions. These adaptations are manifested in resources and activities of companies and their relative positions to each other. This interaction occurs throughout the business network, causing actors to move simultaneously in relation to other actors. Because every interaction episode causes reactions and re-reactions, the business network is constantly evolving. This evolution occurs without control of individual actors and without the accumulated control of all parties together. Instead, interaction has a life of its own and transforms the companies involved in ways that cannot be fully predicted or influenced. This logic is also assumed to apply to the organising of purchasing and supply management. While organising efforts are indeed intentional, the outcomes of these efforts are mediated by intentional efforts elsewhere in the business network. Thus, organising outcomes resemble what can be perceived as accidental, random traits. However, these characteristics do not mean that the outcomes are random. Nor does it imply that organising efforts are meaningless. The interactions in a business network are systematic in nature, and the actions and reactions associated with

organising initiatives do have specific effects. However, the relatedness in the business network implies that the effects of organising cannot be one-sidedly controlled.

3.2.3 THE COMPANY BOUNDARY AS A DYNAMIC AND CONNECTING MECHANISM

Applying an industrial network perspective to the organising of purchasing and supply management has consequences for research on the linking of internal organising and relationship organising. As already mentioned, this theoretical perspective advocates that what goes on internally in a firm is closely related to what is ongoing outside the company boundary, both in relation to individual business relationships and to the wider network context. Many theoretical perspectives acknowledge the interplay between internal and external matters. However, the nature of this interplay and the way that it is addressed differ substantially. Two characteristics distinguish the industrial network approach in this respect.

First, many influential theoretical perspectives, such as transaction cost economics, place heavy emphasis on the company boundary as the defining feature that separates internal matters from the surrounding business environment. Characteristics on one side of the ownership boundary are assumed to differ from characteristics on the other side of the company boundary, for example in terms of possibilities to apply control. The industrial network approach also recognises the importance of company boundaries. However, the role of the company boundary is assigned different meanings in the industrial network approach. Inspired by Thompson (1967), the contributions from this theoretical perspective focus more on the bonds between actors than on the boundaries between actors. To exemplify, because of the embeddedness in the network context, accessing and influencing resources become far more important than actually owning them. Based on an empirical study, Dubois (1998) emphasises the importance of the influence boundary in relation to the company boundary, indicating that influence can exist within or outside of a company boundary, irrespective of ownership. Ford and Saren (2001) use a similar connotation for what they refer to as the boundary of discretion. This boundary represents the extent to which a company allows others to influence what is perceived as internal organising as well as the extent to which it seeks to involve itself in the internal organising of others. Similarly, Fellows and Liu (2012) introduce the notion of permeability of boundaries as an important complement to research on its location. These contributions emphasise the connections across company boundaries rather than their separating characteristics. Hence, in an industrial network approach, the importance of the company boundary as a bridging or connecting mechanism, is equal to its buffering or separating role (Gadde et al., 2010).

Second, mainstream theoretical perspectives address the company boundary as a static feature while the industrial network approach acknowledges the dynamic and

interactive nature of this boundary setting. This dynamic notion is inspired by Penrose (1959). Her conceptualisation of resources and productive services as heterogeneous elements recognises that resources attain value depending on how they are combined with other resources. This heterogeneity implies that technical conditions are not taken for granted, but develop differently depending on how they are related within and across company boundaries. Richardson (1972) provides a similar argument, focusing on capabilities and activities. He argues that the firm's boundaries depend on the activities that are performed, how these activities relate to other activities, and the capabilities that are necessary for their undertaking. Because of this heterogeneity of resources, and the interconnectedness of activities in the business networks, Araujo et al. (2003: 1257) argue that "the drawing of boundaries is an interactive and negotiated process mediating a variety of internal and external relationships and involves more than establishing a difference between the inside and outside of the firm". In other words, the decision of where to draw the firm's boundaries depends on the availability of complementary capabilities, activities and resources in the business network, characteristics that change over time through interaction in business relationships.

The connecting mechanism among company boundaries implies that what goes on between companies rather than within companies becomes essential. Instead of focusing on internal and relationship organising as a separate notion, the linking of internal and relationship organising is spotlighted. Several IMP Group researchers reach similar conclusions regarding the interplay between internal organising and relationship organising. For example, Dubois and Wynstra (2005) and Gadde and Håkansson (2007) criticise the fact that internal and external dimensions of purchasing and supply management are kept separate. Dubois and Wynstra (2005: 1) argue that "how the firm works internally is closely related to how it relates to its environment and vice versa". Similarly, Gadde and Håkansson (2007) assert that the impact of internal organising on external orientation and vice versa is only seldom taken into account.

So far, the theoretical framing of organising in purchasing and supply management has been used to establish connections between internal and relationship organising. The consequences of this conceptualisation are further addressed in the problematising of this linking in Section 3.5. The analytical tools provided by the industrial network approach are used in Section 3.6 to derive issues that are important for the organising of purchasing and supply management across company boundaries. However, before further investigating the link between internal and relationship organising, it is necessary to explore the literature on internal organising and relationship organising.

3.3 INTERNAL ORGANISING

As already mentioned, much of the literature on organising purchasing and supply management addresses intra-organisational arrangements. Such organisational design is referred to as "the process of assessing and selecting the structure and formal system of communication, division of labour, coordination, control, authority and responsibility required to achieve an organisation's goals" (Trent, 2004: 4). In this section, important design characteristics related to internal organising are presented. In these organising efforts, it was described in Chapter 1 that literature separates between the purchasing department and the purchasing function, a distinction that is discussed first.

3.3.1 PURCHASING DEPARTMENT VERSUS PURCHASING FUNCTION

The purchasing department refers to the people employed within a specific department (P in Figure 3-2). The responsibilities of these employees naturally centre on purchasing activities. However, not all companies have purchasing departments. Sometimes the people involved in purchasing activities are dispersed across the organisation. In fact, even when there is a purchasing department, not all issues related to purchasing are necessarily confined to this organisational unit. The purchasing function refers to all processes impacting on purchasing and supply management, regardless of their departmental belonging (Dubois and Wynstra, 2005).

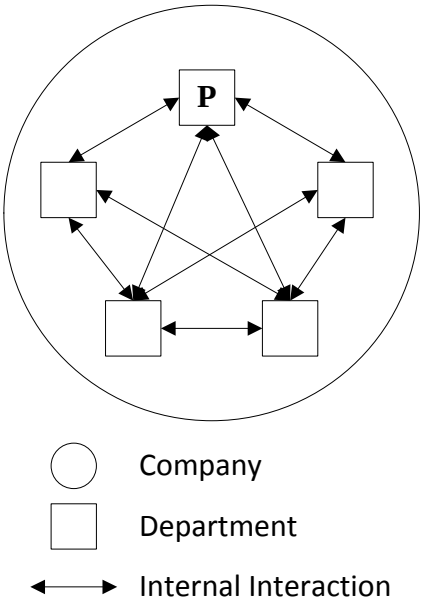


Figure 3-2: Interaction among departments in the purchasing function.

In the literature, the terms department and function are often used synonymously with little regard for their real meaning. In cases where most purchasing activities are confined to the purchasing department, the terms overlap. However, in many cases

the purchasing function includes activities that cut across the entire organisation. Therefore, there is interaction (the arrows in Figure 3-2) between the purchasing department and other departments that directly or indirectly influence the buying behaviour. These departments include, but are not limited to, production, logistics and product development. Coordinating the operations within the purchasing department with those of the other departments in the purchasing function is a major issue related to intra-organisational arrangements.

The situation is further complicated by the fact that organisations consist of several business functions. For example, the product development function or the production function coexists with the purchasing function. While there may be specialised departments serving these business functions, interaction between departments also assist these business functions. In this respect, the people employed in the purchasing department also contribute to other business functions. Similarly, it is also possible to claim that the purchasing function forms part of other business functions, since purchasing activities contribute to both product development and production operations. Because of these functional overlaps, the people in organisations are employed in departments, but serve several different business functions simultaneously.

The interplay between departments and functions is important for the organising of purchasing and supply management. Interaction between departments contributes to the fulfilment of purchasing processes that cut across departmental boundaries. Interaction between functions determines the status and priority awarded to the purchasing activities in relation to other functional needs. The remainder of this section addresses important design characteristics in the organising of the purchasing department and the purchasing function as well as their consequences for purchasing and supply management activities.

3.3.2 ORGANISING THE PURCHASING DEPARTMENT

Within the purchasing department, the allocation of tasks to purchasing staff can take several forms. The most common alternatives are based on specialisation of the purchasing tasks, either according to the characteristics of purchased items, or in terms of the required skills and capabilities (van Weele, 2005).

Beginning with specialisation according to purchased items, this approach is more commonly referred to as the commodity approach. When the commodity approach is applied, the purchased items are arranged into groups where all included items share similar features. These similar features can differ from one organisation to the other. For example, commodity categorisation can group purchases according to the role that the purchased item plays in the company, such as MRO items, logistics services and indirect materials. Alternatively, the categorisation can focus on shared characteristics, and categorise commodities according to materials, such as

electronics, mechanics and IT. This organisational form promotes knowledge related to specific types of buying and makes it possible to coordinate purchases with similar characteristics. The commodity-based organising of the purchasing department is illustrated in Figure 3-3.

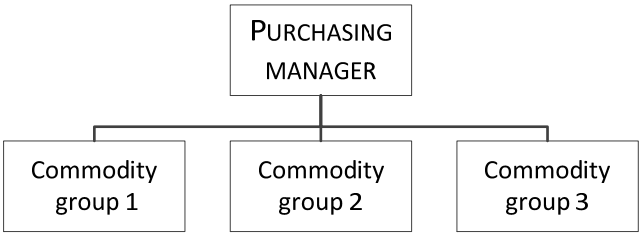


Figure 3-3: Commodity-based organising in the purchasing department.

Specialisation according to the necessary skills and capabilities concerns the professional requirements associated with various purchasing responsibilities. As Figure 3-4 illustrates, such functional organising focuses on the different tasks related to the purchasing profession. Examples of tasks include planning and control, quality management and engineering related to purchased items. The subdivision of the purchasing department into strategic purchasers and operative purchasers exemplifies such a functional approach to organising. Buyers that are organised according to such an approach develop their skills and capabilities in specific knowledge areas. However, such specialisation comes at the expense of coordination of purchases that have similar needs.

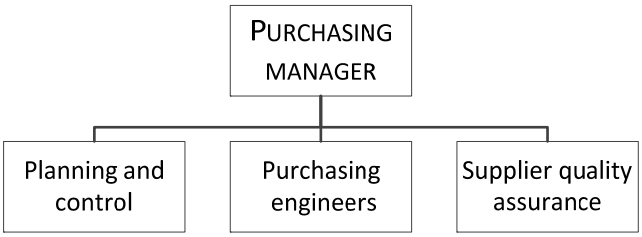


Figure 3-4: Functional organising in the purchasing department.

The commodity-based and functional approaches have particular benefits and advantages. According to Quayle (2006), the suitability of the approaches depends on the characteristics of the business context in which the purchasing activities take place. Moreover, he explains that large companies usually try to combine both approaches in order to reap the benefits of both while reducing their disadvantages.

Interestingly, both the commodity-based approach and the functional approach are identified from an inward-out perspective. That is to say, they focus on how to best utilise internal resources and capabilities (Gadde et al., 2010).

3.3.3 CENTRALISATION VERSUS DECENTRALISATION

When the attention is directed to organising of the purchasing function, the most frequently discussed design characteristic is centralisation versus decentralisation (see e.g. Gadde et al., 2010; Quayle, 2006). This design feature determines whether purchasing decisions in the organisation are managed and coordinated centrally or dispersed across the organisation.

Centralisation provides opportunities for effective utilisation of purchasing resources since centralised purchasing activities enable the use of specialised purchasers with expert competence and commercial skills. Furthermore, centralisation facilitates consolidation of purchases within and across business units. The increasing purchasing volumes that follow from such consolidation provide the purchasing function with better financial opportunities because of an improved negotiating position. A centralised purchasing function is favoured when there is a high level of commonality in purchased items across the organisation or when expert knowledge is required in the purchasing activities. Centralisation is beneficial also if there are few and large suppliers or when prices are fluctuating, since potential savings following from coordinated purchases increase under such circumstances.

Decentralisation is necessary when the purchasing function forms an integrated part of the performance of the company. Under these conditions, the purchasing activities are closely related to other business functions, making close interaction necessary between the functions affected by, or affecting, procurement decisions. Such interaction is hindered when purchasers and purchasing decisions are centralised in one organisational location. While reducing the opportunities for scale advantages, decentralisation provides internal customer orientation and more direct communication with suppliers, albeit in less coordinated fashion. A decentralised purchasing function is typically preferred when there is diversity in customer demand, low commonality of purchases or geographical distance that prevents coordinated purchases.

The distinction between centralised and decentralised organising is more clear-cut in theory than in practice. In reality, companies often employ a combination of centralised and decentralised features. These combinations are referred to as matrix organisations and can take various forms (see e.g. Rozemeijer and Wynstra, 2005b; Quayle, 2006). For example, hybrid and multi-level purchasing functions typically refer to centralisation at a strategic level. In such organisations, the centralised purchasing unit develops guidelines and policies and conducts supply market analyses, while the decentralised units operate independently under these directions. Alternatively, coordinated or pooled purchasing organisations imply that decentralised purchasing units work in parallel with a centrally located group or individual that attempts to identify synergies across all units. In these cases, pooling is either mandatory or voluntary and applies to either articles or suppliers. These

mixed organisations imply that it is also possible to distinguish between centralised and decentralised purchasing functions depending on decision area or type of activity. Based on empirical research, Leenders and Johnson (2000) claim that neither centralised, decentralised or hybrid structures outperform one another. However, in a survey investigating current and future design parameters in purchasing and supply management, Trent (2004) identify a tendency towards hybrid forms of organising in general, and coordinated purchasing organisations in particular.

3.3.4 HIERARCHICAL POSITION OF THE PURCHASING DEPARTMENT

The position of the purchasing department within the organisational hierarchy is an important design characteristic since it mirrors the impact that the purchasing function can have on company performance (Quayle, 2006). This design factor is also commonly described as the reporting structure (van Weele, 2005).

According to Johnson and Leenders (2006), the activities that are assigned to the purchasing department reflect the functional span of control of the purchasing department and thereby the responsibilities that this department controls. The responsibilities associated with the purchasing department are often reflected by the location of the department in the organisational structure. In this respect, Quayle (2006) describes how the purchasing department either can be organised as a supporting function under the production or logistics departments, or can be an independent department. A subordinate purchasing department implies that purchasing matters are controlled by departments that prioritise technical matters over commercial issues. In comparison, an independent department is argued to contribute more towards the achievement of commercial corporate objectives. Traditionally, the purchasing department is organised under either the production or logistics department. However, over time, it has become increasingly common for the purchasing department to become an independent department, on the same organisational level as for example manufacturing and logistics. Based on longitudinal survey research, Johnson et al. (2006) report that the purchasing department is associated with increasing supply chain responsibilities over time.

Many researchers emphasise the importance of the reporting lines of the purchasing department as indicating top management commitment to purchasing and supply management issues. Quayle (2006) argues that support from the general manager increases recognition of the purchasing function and encourages horizontal relationships with other departments. Therefore, it is argued that there should be a direct reporting line between the purchasing department and general management. Similarly, Trent (2004) emphasises the importance of strong purchasing champions in order to strengthen purchasing matters on the agenda. He states that the reporting line is a matter of key concern as it establishes how the organisation perceives the contribution of the purchasing function to organisational success. According to the

case-based research by Johnson and Leenders (2009), reporting lines to senior executives are necessary in order to unlock opportunities from supply. Along the same lines, van Weele (2005) underlines the importance of access to top management support.

While reporting lines are important for the status of the purchasing function internally, the influence of the purchasing department is also assisted by purchasing managers being directly represented at top management level, either through senior management team or board membership (Quayle, 2006). According to Van Weele (2005) the senior executive of the purchasing department, also referred to as the Chief Purchasing Officer (CPO), is increasingly often a member of these hierarchical levels. The longitudinal survey research by Johnson et al. (2006) reports more senior positions of CPOs compared to 1987. In addition, the case research of Johnson and Leenders (2009) concludes that representatives of the purchasing departments are becoming increasingly frequent members of top management.

Johnson et al. (2006) argue that the position of the purchasing department within the organisational hierarchy is closely related to the increased status and influence of the purchasing function. In this respect, their research claims to provide "solid evidence that in both manufacturing and services, today's CPOs have greater responsibilities, report higher in the organisation and carry more significant titles than their predecessors" (Johnson et al., 2006: 42).

3.3.5 LATERAL COMMUNICATION AND CROSS-FUNCTIONAL INTERACTION

The interaction occurring across departmental boundaries concerns another important organisational design feature. Galbraith (1995) refers to such interaction as lateral communication. The need for lateral communication arises because of the limited capacity of an organisation to attend to different coordination needs. If an organisation is designed in order to deal with one constituency, for example customers, this organisational design simultaneously fragments the ability to deal with other constituents, for example suppliers. Therefore, all organisational designs give rise to lateral communication needs, spanning across departments. According to Galbraith (1995), lateral communication can be formal or voluntary. Voluntary coordination includes informal mutual adjustments that occur on a need basis. Formal coordination mechanisms include direct supervision lines spanning departmental boundaries as well as decision forums operating as integrators between departments (Mintzberg and Quinn, 1991; Rozemeijer and Wynstra, 2005b).

The initial research on the lateral communication processes related to the purchasing function, stemmed from the marketing side. In order to understand the buying behaviour of firms, marketing researchers developed the concept 'buying center' to emphasise that people outside the purchasing department were influential in purchasing decisions (see e.g. Johnston and Bonoma, 1981). Today, the notion of

cross-functional communication is a widely researched organising principle within the purchasing discipline, applying not only to functional coordination but also to the need to relate the purchasing function to other company needs (see e.g. van Weele, 2005; Quayle, 2006; Minahan, 1996).

According to Ogden et al. (2005), the ability to integrate sourcing decisions with other functional areas is one of the key motivations for using cross-functional sourcing teams. Moses and Åhlström (2008) explain that purchasing activities have become more cross-functionally oriented because of a need to gain a more holistic view of their effects. Similarly, Carter and Narasimhan (1996) describe a shift in purchasing and supply management activities from a focus on functional coordination to managing interfaces with other functional units. The importance of managing the strategic connections between business functions provides an explanation for this shift. These claims are supported by a structured literature review on 50 years of research on organisational arrangements, revealing increased attention to cross-functional interaction (Schneider and Wallenburg, 2013). According to this literature review, more than 80% of research on cross-functional issues dates back less than 20 years.

On the basis of a survey, Trent and Monczka (1994) conclude that the most common goal of cross-functional sourcing teams is cost reduction. However, innovation through purchasing and supplier involvement in product development and time reduction are other common objectives. Many researchers have attempted to investigate the effect of cross-functional communication on performance. To exemplify, Foerstl et al. (2013) recently managed to identify a positive impact of cross-functional integration on firm performance via a global cross-industry survey.

Cross-functional communication can take many forms. In a conceptual paper, Trent (1996) categorises cross-functional sourcing teams according to the nature of their assignments. He asserts that cross-functional interaction can differ in terms of its time span. It can constitute a temporary group set up in response to a specific need, such as a task force or a project team. Alternatively, cross-functional communication can imply a more permanent constellation with shifting responsibilities over time. He proposes also that team membership can correspond to either part time or full time responsibility. While many company functions are mentioned in relation to cross-functional sourcing teams, most research focuses on the cross-functional interaction between the purchasing department and engineering. In an editorial piece for a Special Issue on the integration of marketing and purchasing functions, Ivens et al. (2009a) call for research that complements this heavy product development focus. The authors claim that the marketing and purchasing functions are bound together by the value creation processes of companies. They describe how the marketing function governs the combining and transforming of resources that arrive at the company through the purchasing function.

As indicated by the term, the concept of cross-functional interaction has developed in response to lateral communication needs in functional organisational arrangements, where each business function corresponds to a department. However, Rozemeijer and Wynstra (2005b) emphasise that there are different organisational approaches that have other lateral communication mechanisms. Divisional structures constitute an alternative organisational design, where functional expertise is organisationally structured in order to jointly serve the needs of for example products, customers or geographic divisions. Furthermore, the process structure is an increasingly common organisational design that supports the allocation of expertise that is organised around key business processes in full-time cross-functional teams, either as an alternative or complement to functional organising (Carter and Narasimhan, 1996; Trent, 2004). While cross-functional communication in a functional structure is targeted at coordinating the needs of different business functions, the lateral communication in divisional and process-based organisational designs centre on coordinating individual functional needs since these functional representatives are dispersed across the organisation instead of being allocated within a single department. Related to the purchasing department, such lateral communication could serve the purpose of consolidating purchases or sharing purchasing knowledge and expertise across the divisions (Rozemeijer and Wynstra, 2005b).

This section has aimed to describe some of the design features related to internal organising of purchasing. While these characteristics have been described separately, it should be emphasised that they are important in relation to each other. For instance, centralisation and decentralisation relates to both the overarching organisational structure and the position of purchasing within the organisational hierarchy. In addition, because of the many design options available and the opportunities to complement organisational structures with lateral communication mechanisms, it is possible to achieve similar organising outcomes through very different organisational designs. The next section provides an account of current research concerning relationship organising.

3.4 RELATIONSHIP ORGANISING

Relationship organising addresses the couplings between buyer and seller. Figure 3-5 illustrates the organising of an individual supplier relationship, where interaction and the associated contact pattern takes place between departments and people in the two firms.

Because of the interrelatedness between the buying firm and its suppliers, Gadde et al. (2010) claim that it is relevant to consider the organising of these couplings. However, when it comes to relationship organising compared to internal organising, the literature is much scarcer. Often it is the strategic intentions of the buyer in the approach to supplier relationships that are addressed. It can be argued that

relationship organising depends largely on the perspective taken on supplier relationships since this perspective determines how the buying company handles its suppliers. Three perspectives on supplier relationships are identified in the literature (Gadde et al., 2010). They are described next.

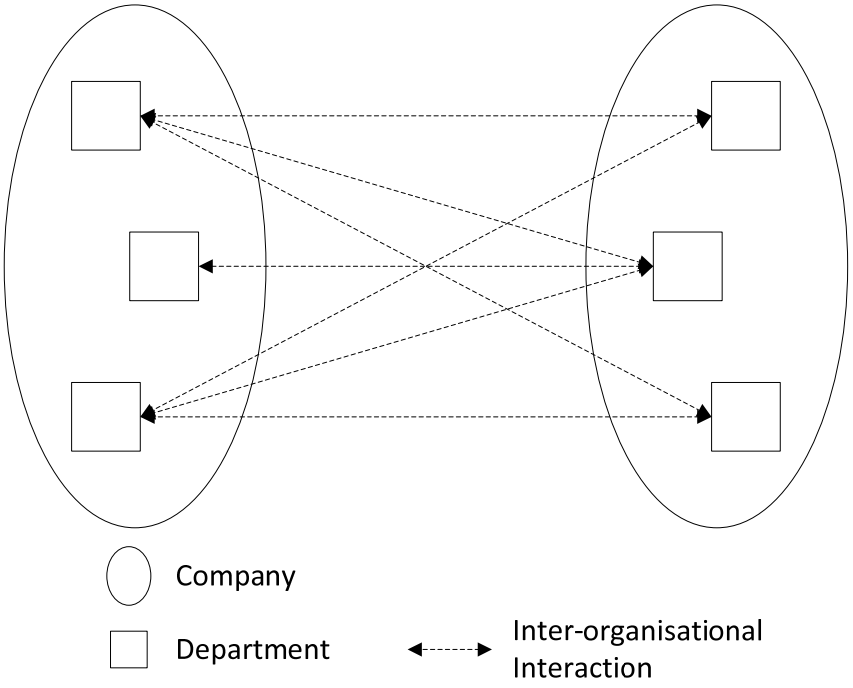


Figure 3-5: Interaction between companies in a relationship.

3.4.1 RELATIONSHIPS AS ALTERNATIVES TO MARKET EXCHANGE

The first perspective concerns the traditional view of purchasing and the assumption that relationships should be avoided. According to this perspective the market mechanism is the best way to handle suppliers. The ideal situation is to be independent of others in order to be free to select the most appropriate conditions for each individual transaction. Many of the portfolio and segmentation models in the purchasing literature adhere to this relationship perspective.

One of the first purchasing portfolio models was provided by Kraljic (1983). In a conceptual paper, he developed a model that classifies purchases with the objective of differentiating purchasing strategies related to different buying categories. In the model, purchased items are divided into four groups based on the importance of their purchase, and the complexity of the supply market. The differentiated strategies that follow from these four groups represent different approaches to managing suppliers in order to minimise supply risk and maximise buying power. According to Kraljic (1983: 110), “by assessing the company’s situation in terms of these two variables, top management and senior purchasing executives can determine the type of supply strategy the company needs both to exploit its purchasing power vis-à-vis important suppliers and to reduce its risk to an acceptable minimum”. Although the

contributions from suppliers differ across the alternatives in this portfolio, Gadde et al. (2010) claim that there is little differentiation in terms of establishing connections to suppliers. Kraljic (1983: 113), even for the most strategic purchasing category, recommends developing "counterstrategies vis-à-vis key suppliers". Accepting higher prices or long term contractual obligations are other tactics for securing long term supply. In this perspective on buyer-supplier relationships, there is little need to establish couplings with suppliers. Ideally, exchanges occur independently of each other and, therefore, need no stable organisational arrangements.

Others refer to this original portfolio model. Olsen and Ellram (1997) describe another attitude to relationships in their conceptual paper and outline how to manage supplier relationships depending on the purchasing situation. Their paper includes recommendations for achieving strong and collaborative relationships. Some authors move from classifying purchased items to categorising the buyer-supplier relationships within which these items are exchanged (Bensaou, 1999; Gelderman and van Weele). Despite these adaptations, Dubois and Pedersen (2002), in examining the theoretical assumptions governing these portfolio models, argue that they operate under the normative advice of avoiding dependence. According to the authors, exploiting power or avoiding risk constitute the main principles in order to avoid such dependence. Moreover, the differentiated strategies often concern the behavior of the buyer towards a supplier, rather than addressing the couplings between buyer and supplier. These approaches reflect the one-sided perspective of purchasing described in Chapter 1.

3.4.2 RELATIONSHIPS AS NORM

The second relationship perspective developed as a counterweight to the portfolio models. By declaring relationships as the norm in purchasing and supply management, this perspective is in sharp contrast to the traditional segmentation models in advocating exploitation of interdependencies in the relation with suppliers rather than avoiding them. Drawing on three empirical studies, Persson and Håkansson (2007) describe the benefits of buyer-supplier collaboration in all traditional purchasing portfolio categories. The authors emphasise the advantages associated with avoiding arm's length relationships and focusing instead on increased collaboration with a few suppliers. Furthermore, they recommend that each supplier should be made important in one way or another. In the words of Persson and Håkansson (2007: 40), "collaboration is not just beneficial in some specific situations but can always be useful". Interestingly, Corsten and Felde (2005) verify the positive effects of supplier collaboration on buyer performance, by linking collaboration to key performance indicators via a quantitative, mail survey. According to these authors, it was surprising to find that more dependence enhanced innovation in the buyer.

Persson and Håkansson (2007) divide the benefits associated with supplier collaboration into three categories. First, collaboration can lead to rationalisations through scale advantages and joint efforts to reduce costs. Second, relationship involvement is beneficial for innovation and learning by sharing knowledge and experience. Third, coordination and joint planning through for example build-to-order arrangements and just-in-time deliveries to enable reductions in tied up capital and secure continuity in physical flows.

With relationships as a key element in the strategising efforts of companies, Gadde et al. (2010: 153) state that the approach "will shift the management focus towards identifying, developing and maintaining collaborative solutions that significantly outperform what can be provided through market exchange". This emphasis on high involvement and long term relationships makes the couplings between companies important. Persson and Håkansson (2009) focus explicitly on organisational matters and address the interaction process with key suppliers. Drawing on a prior empirical study, they conclude that cross-firm coordination mechanisms are important in order to achieve efficiency and innovation.

3.4.3 Relationships as a Means to Access Supplier Resources

The third relationship perspective also emphasises the importance and widespread of buyer-supplier relationships, but stresses the diversity of relationships needed in order to balance various supply side requirements. Thus, it reprsents a middle-ground between the other two relationship perspectives.

In order to illustrate the diversity in buyer-supplier relationships, Araujo et al. (1999) identify four types of buyer-supplier interfaces – 'standardised' interfaces, 'specified' interfaces, 'translation' interfaces and 'interactive' interfaces. These interfaces outline the way that the resources of buyer and supplier are related. 'Standardised' interfaces represent the typical arm's length relationship which is not a resource demanding form of interaction. In this case the resources of buyer and supplier are not related since the relationship is centred around a standardised assortment. When there is customised content in a buyer-supplier relationship, the resources of the buyer and supplier have to be related. Such interaction is more resource demanding compared to standardised interfaces, and can take various forms. In this respect, 'specified' interfaces represent the typical subcontractor relationship. This interface implies that the buyer provides the supplier with detailed specifications and, thereby, determines the task that is to be fulfilled by the supplier. Such directions are not particularly resource intenstive, however, there are also limited opportunities for innovative solutions. When 'translation' interfaces are applied the buyer specifies the functionality of what is to be exchanged, but allows freedom to suppliers with respect to how this functionality should be fulfilled. In this interface the supplier can translate these functional specifications to its own context and tailor the solution accordingly. This interface is slightly more resource

demanding, but implies potential for innovative and cost-efficient solutions. Finally, 'interactive' interfaces feature open-ended dialogues, concerning how buyer and supplier can exploit their capabilities together. This interface is the most resource intensive and involves costly interaction. However, these costs provide opportunities to reap considerable advantages in terms of innovation and productivity for both sides of the relationship.

The diversity in the four buyer-supplier relationships not only has different outcomes in terms of benefits and costs but also calls for different organisational arrangements. While the 'standardised' interfaces do not necessitate any couplings between buyer and supplier, Gadde et al. (2010) state that 'specified' and 'translation' interfaces require some form of contact and communication across company boundaries. They also describe how 'interactive' interfaces call for substantial couplings between buyer and supplier that require commitment from both parties.

3.4.4 CONTACT PATTERNS IN RELATIONSHIPS

When there are couplings between buyer and supplier, these links require organising. While research on buyer-supplier contact patterns is scarce compared to the internal equivalent, there are some contributions that should be mentioned.

First, Wynstra et al. (1999) emphasise the importance of maintaining buyer-supplier relationships not only during individual development projects but also between projects. In line with these argument, the Key Account Management principles that stem from the marketing discipline have become popular in the purchasing discipline. Ivens et al. (2009b) refer to Supplier Account Management as the equivalent toKey Account Management on the supply sides of companies. These relationships should "take an interaction approach to the management of exchange with important external actors", thus contrasting conventional discrete approaches focussing on single transactions (ibid: 516). The authors emphasise the importance of two-way communication in these interactions.

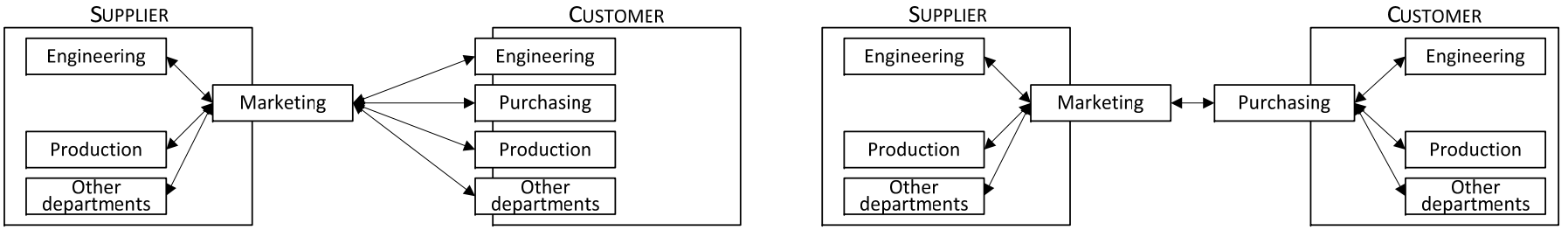
Second, suppliers are increasingly becoming involved in cross-functional teams during for example product development projects (Milligan, 2000). Based on a survey, Trent and Monczka (1994) emphasise the importance of cross-boundary communication as part of cross-functional interaction related to identification of supplier involvement as a factor contributing to cross-functional team performance. Gadde and Håkansson (1992) explain that their empirical studies provide examples of complexity of personal contacts and communication patterns. Their findings show that buyer-supplier relationships often include extensive contacts between various departments on both sides that meet together in order to discuss and solve problems.

Third, when there is a need for concurrent interactions between many members, Supplier Account Management and supplier representation in cross-functional teams

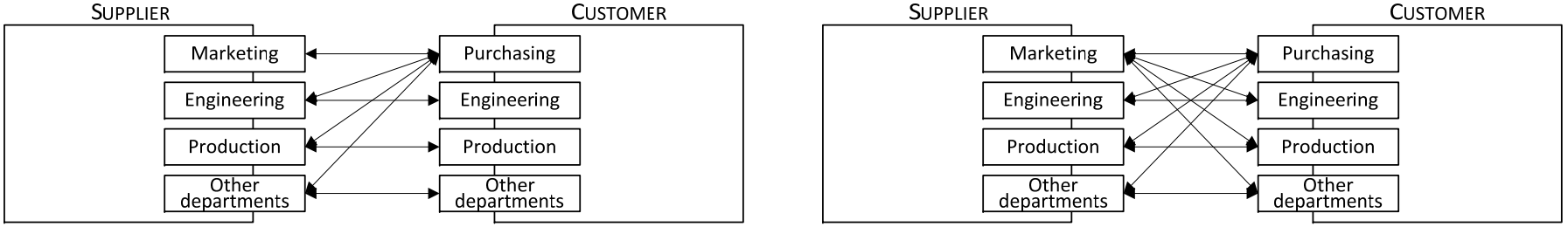
can be supplemented by steering committees that include several members of both the buyer and supplier organisations. According to Rozemeijer and Wynstra (2005b), supplier councils is increasingly part of organising purchasing and supply management. Such groupings, being either formal or informal, permanent or temporary, are described by Gadde et al. (2010) as cross-corporate teams. They claim that it is critical that buyer and supplier involve people with adequate skills and capabilities in order for these teams to function effectively. They emphasise that the people in these cross-corporate groups need to have appropriate status within their own organisations to be able to exploit the potential residing in supplier teamwork.

Cunningham and Homse (1986) is one of the earliest and most elaborate studies of contact patterns. Based on an exploratory study of 49 European buyer-supplier dyads they identify multiple levels of contacts in each relationship and classify the variety in these contact patterns. In the study, they analyse the interaction between buyer and supplier in three dimensions: (i) hierarchical levels of the connections; (ii) interaction breadth in terms of number of business functions represented; and (iii) frequency or continuity of interpersonal contacts. The purchasing and marketing departments of the buyer and supplier respectively, are conceptualised as boundary spanning units. The study identifies three types of contact patterns between buyer and supplier, depending on the degree of control of these boundary spanning units. These three categories of contact patterns are illustrated in Figure 3-6.

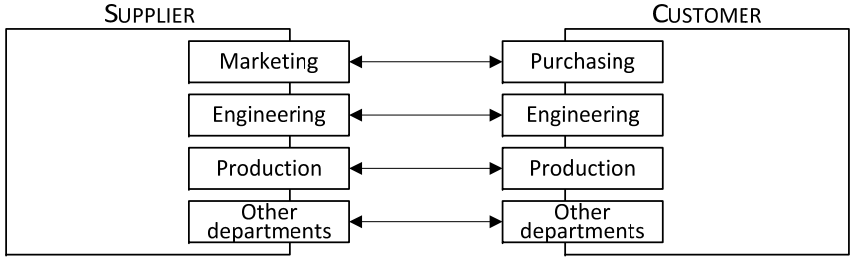
The contact pattern is labelled ‘controlled’ if either the marketing department of the supplier, or the purchasing department of the buyer, or both, operate as the single point of contact between buyer and supplier. Figure 3-6 a) outlines a ‘marketing controlled’ contact pattern, and ‘marketing and purchasing controlled’ contact pattern. The second contact pattern is labelled ‘coordinated’ and occurs when there are multiple connections between the two companies which are coordinated by either the marketing department, the purchasing department, or both. The Supplier Account Management principle described above corresponds to this contact pattern when the Supplier Account Managers constitute the only connection between buyer and supplier. Figure 3-6 b) outlines a ‘purchasing coordinated’ contact pattern and a ‘marketing and purchasing coordinated’ contact pattern. If the multiple connections occur simultaneously, this contact pattern resembles the cross-corporate teams described above. A ‘stratified’ contact pattern is when there are multiple connections between buyer and supplier without accompanying coordination. In this contact pattern, the multilayer connections between the two companies occur independently of each other. Figure 3-6 c) outlines the ‘stratified’ contact pattern. In this pattern, there are no Supplier Account Managers coordinating or controlling the relationship. Cunningham and Homse (1986) suggest that the contact pattern depends on a number of contextual factors, such as the relationship stage, power distribution, economic importance of the parties, and product and transaction complexity.



a) Controlled contact patterns.



b) Coordinated contact patterns.



c) Stratified contact pattern.

Figure 3-6: Three types of contact patterns in a relationship.
(Cunningham and Homse, 1986)

Having provided an account of existing research on internal and relationship organising respectively, the attention now shifts to the interplay between the two, in line with the preliminary research aim. As described next, the framing of the organising concept and subsequent introduction of the industrial network approach calls for a revisiting of this starting point of the study to revise the aim.

3.5 REVISED AIM

The study started out to explore the linking of internal and relationship organising, since these research domains are largely separated in the literature. The two previous sections discussed existing research on internal and relationship organising, respectively. Both these accounts encapsulate a number of organising dimensions that can vary. As outlined in Chapter 1, many researchers have highlighted the importance of linking internal organising and relationship organising. Furthermore, in their descriptions of relationship organising, both Cunningham and Homse (1986) and Araujo et al. (1999) emphasise that internal organising is crucial to the effects achieved by relationship organising.

However, in light of the framing of organising in Section 3.1 and introduction of the industrial network approach that followed from this framing in Section 3.2, the usefulness of distinguishing between internal and relationship organising is questioned. As a consequence of the theoretical perspective applied, two issues related to the distinction between internal and relationship organising were addressed. First, the importance of the company boundary as a connecting mechanism to complement the traditional separating mechanism was emphasised. Second, it was argued that the distinction between internal and relationship organising originates from the perspective of a single company. Such a one-sided perspective shifts attention from the embeddedness and connectedness of companies in the business network. The relevance of these conclusions were further emphasised in Section 3.4 through the framework dealing with the four types of buyer-supplier interfaces.

Instead of taking the starting point in the organising dimensions that follow from addressing the company boundary as a separating mechanisms, this study targets organising that occurs across company boundaries in order to address their connecting mechanisms. The connecting mechanism implies that what is organised across company boundaries is paramount. By taking this starting point in what is exchanged between firms it is possible to identify organising occurring between buyers and suppliers, and identify two important organising issues. First, something is being organised across company boundaries in order for the purchased items to emanate from a supply context, and become incorporated into a buying context. This leads to a question of ‘what’ is organised in relation to purchasing and supply management and how various ‘what’ aspects interplay. Such organising aspects

include commercial matters, physical material flows and administrative issues as outlined in Chapter 1. Second, someone makes this organising happen since action is needed for organising to take place. This leads to the question of 'who' is organising purchasing and supply management across company boundaries. As outlined in Sections 3.3 and 3.4, there are several departments involved in cross-functional and cross-corporate interaction patterns revolving around the purchasing function.

On the basis of these arguments, the revised aim of this study is to analyse the organising of purchasing and supply management in order to explicate 'what' is organised across company boundaries, and 'who' is organising, depending on the context in which organising takes place. As described in Chapter 1, examples of contextual characteristics include production technology features and distribution of power between buyer and supplier.

The remainder of this chapter centres on developing the analytical framework that is used as support for identifying 'what' is organised and 'who' is organising, depending on the context in which this organising takes place. As a theoretical basis for such an analytical framework, we return to the industrial network model and the three layers of activities, resources and actors.

3.6 A NETWORK VIEW OF ORGANISING

One of the main outcomes of the international research projects within the IMP Group is the industrial network model. First published in Håkansson (1987), it is a conceptual framework that can be used to analyse embeddedness in the business network by describing the content of business relationships in terms of three network layers: activities, resources and actors. While the three dimensions go together and are interrelated, they can be separated analytically for a deeper understanding of the process and outcome of interaction.

The industrial network model has been applied - especially to issues in purchasing and supply management - by for example Gadde et al. (2010). They claim that purchasing is concerned with configuring activities, combining resources and positioning of actors across company boundaries. Efficient configuration of activities is based on synchronisation of interdependent operations undertaken across company borders. Resource development relies on the continuous combining and recombining of resources – internal and and across company boundaries. Finally, activity configuring and resource development are dependent on the positioning of actors and the connections among them. In all these situations the purchasing function consitutes the interface between the buying company and its suppliers. Since configuring activities, combining resources and actor positioning all have to be organised, this implies that 'what' is organised and 'who' is organising can be

explored in terms of these three network layers. This is the point of departure for developing the analytical framework, as illustrated in Figure 3-7.

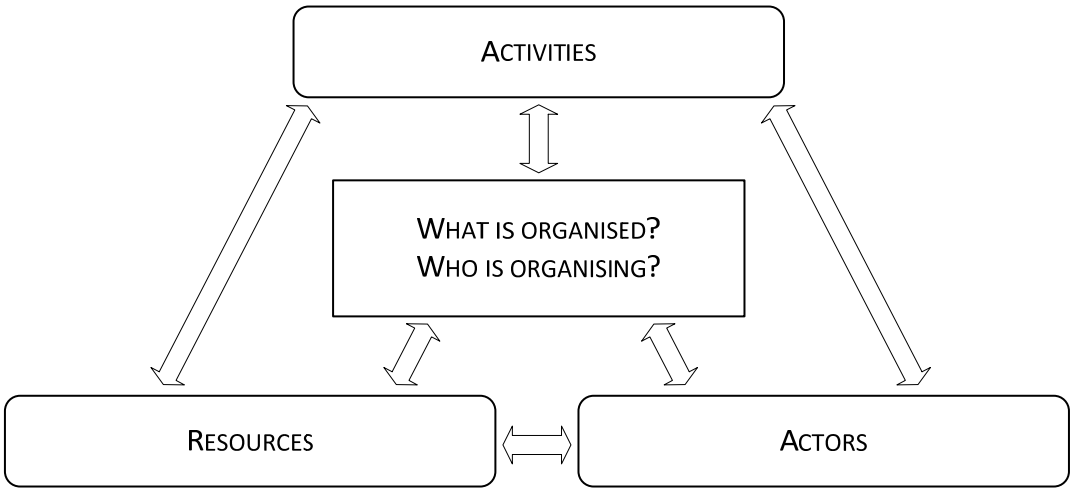


Figure 3-7: Three network layers underlying the analytical framework.

Assuming this point of departure, this section aims to develop central organising issues in relation to the three network layers of the industrial network model. First, the activity layer in relation to organising purchasing and supply management is addressed. Second, organising in relation to the resource layer is outlined. Third, the actor layer is used to derive organising issues. It should be emphasised that the industrial network model also describes the interplay between the three network layers, as illustrated in Figure 3-7. Starting from the three network layers, the organising issues that are derived include elements that cut across all three network layers. Thus, the interplay between network layers is addressed continuously throughout the following three sections.

3.6.1 ORGANISING AND THE ACTIVITY LAYER

Activities are central to the development, production and delivery of products, and the exchange of information. Håkansson and Snehota (1995: 52) define activities as "as [a] sequence of acts directed towards a purpose". A sequence of acts can be partitioned in several ways and Håkansson and Snehota acknowledge this, explaining that there is no given activity unit. This means that every activity can be divided into several sub-activities and simultaneously can form part of the activities at a more aggregated level.

The main feature of activities is that they are always related to other activities. An activity never exists in isolation, but simultaneously precedes and succeeds other activities. These connections among activities subsist regardless of whether the relatedness is planned or incidental, and whether the activity occurs at a single point in time or is performed more or less continuously (Håkansson et al., 2009). This relatedness in the activity layer is characterised by multiplicity in that any individual

activity is simultaneously directed towards several purposes. An activity configuration denotes all the activities that are involved in the formation of a particular end result, such as a product or a service. The multiplicity of activities occurs because each single activity within one activity configuration is also part of other activity configurations, forming other products or services. Because of the multidimensional character of activities, a single activity can be perceived as a junction among various activity configurations that all exploit this common activity. Each of these configurations has its own specific requirements and perspective regarding what constitutes effective and efficient activity undertaking. Naturally, this multiplicity of activity features introduces tensions in the design and development of single activities (Håkansson et al., 2009; Håkansson and Snehota, 1995).

Organising becomes important in the efforts of companies to design and configure activities. In the coming sections, central organising issues are derived from the configuring of activities across company boundaries.

Organising and Activity Configuring

Activities cannot configure themselves or refine themselves; this requires the involvement of actors. Because activity configurations stretch across firm boundaries, the purchasing function plays a crucial role in these organising efforts (Gadde et al., 2010).

The need to organise boundary spanning activity links with other actors, has become ever more important because of the increasing extent of outsourcing. Depending on the particular activity configuration, ‘what’ is organised across company boundaries can differ, ranging from more administrative tasks, to product development activities, to physical flows such as manufacturing operations or logistics. The nature of organising efforts depends on the particular requirements, and these requirements, in turn, stem from the characteristics of the business network to which the buyer and supplier belong. Examples of requirements influencing ‘what’ is organised include type of manufacturing operations, degree of customisation in product features and deliveries, information systems and administrative procedures (Gadde et al., 2010; Håkansson et al., 2009).

The nature of these organising needs has implications for the organising of the purchasing function (Gadde et al., 2010). Owing to the inherent complexity and dynamics of activity patterns, there will never be a best way to organise in order to fulfil the objectives related to the activity layer. In some circumstances, organising efforts are targeted at large scale supply of standardised items without specific adjustments to internal operations. In others, supply processes may require individualisation in relation to internal operations. It is reasonable to assume that ‘who’ is organising differs, depending on the activity configuration at hand and the organising needs that follow from it. In this respect, the roles of buyer and supplier in

these organising efforts vary as do the organisational arrangements accompanying these roles.

Having described some basic features of the activity layer and the role of purchasing and organising in activity configurations, the remainder of this section introduces issues that are closely related to the configuring of activities and, therefore, impact on 'what' is organised and 'who' is organising across company boundaries.

Similarities and Complementarities

Two concepts are particularly useful for analysing how activities are related: similarity and complementarity. The principle of similarity is important when considering the efficiency of undertaking single activities such as the manufacturing of a specific component. According to Richardson (1972), activities are similar if they exploit the same resource (e.g. a piece of machining equipment) or capability (e.g. a skilled work force) for their undertaking. Enhanced similarity among activities follows from standardisation of operations, resulting in turn, in scale advantages. The current attention to outsourcing has contributed to increasing similarity. Similarity also applies to capabilities. By relying on specialised suppliers, a buying firm can access a variety of technologies without having in-house expertise in all these areas. However, the desire for increasing similarity needs to be balanced with the need for differentiation. Differentiation emphasises the uniqueness and distinct features of an activity. Differentiation supports customer-specific solutions and diversity, which are important features in many types of contemporary activity configurations (Håkansson et al., 2009).

The principle of complementarity addresses the serial connections among activities. According to Richardson (1972), activities are complementary if they have to be undertaken in a specific order. For example, if a piece of sheet metal needs to be cut and bent before it is assembled and painted, these activities are serially interdependent and, thus, complementary. Customisation introduces an additional level of serial connections in that a customer-specific activity normally directs the features of the following activities. In these situations activities are closely complementary and require specific types of coordination (Richardson, 1972). Operational characteristics, such as customisation, just-in-time deliveries and build-to-order production, are significant examples of current trends that reinforce the close complementarity between activities. Customisation and close complementarity reduces the similarity of activities and, thus, needs to be balanced against the need for cost efficiency and standardisation. Altogether, balancing the simultaneous need for standardisation and differentiation, within and between activities, is an important part of activity configuring.

The conditions described above illustrate what is referred to as activity interdependence. A common means of handling activity interdependency is to adjust

activities in relation to each other (Håkansson and Snehota, 1995) and it is through these adjustments and routines that activities become linked. Adjustments occur in relation to individual activities as well as the links between them. Examples of adjustments include the synchronisation of production activities and adjustments to transportation or administrative routines. By adjusting two activities, their joint performance is improved. However, adjustment involves costs and is resource-demanding in several ways, which means that the expected benefits of adjustments must outweigh the associated costs. Adjustment is not just a tool for handling interdependence, it also imposes interdependences since the advantages provided by adjustments in response to one interdependence will create other interdependences. In addition, the more adjusted two activities become to each other, the more difficult it will be to utilise them in relation to activities that have been adjusted to other parts of the activity pattern. Thus, current interdependences and adjustments will favour some developments and constrain others (Håkansson et al., 2009).

The way that activities are related to each other has an impact 'what' is organised across company boundaries and also 'who' can contribute to this organising. For example, in order to achieve similarity across activities to achieve scale advantages, adjustments may be necessary to for example design and manufacturing activities. Also, complementary activities must be organised across company boundaries in order to create effective and efficient physical flows. In these organising efforts, activity adjustments play an important role in activity configurations.

Division of Responsibilities

As stated above, activity configuration represents all the activities necessary to provide an end result in terms of a product or a service. The characteristics of these activities and where they are conducted play an important role for the organising of activity configurations. Some parts of an offering are designed and manufactured by the buying company, others are outsourced to suppliers. The division of design and manufacturing responsibilities between buyer and supplier has been researched extensively (see e.g. Jellbo, 1998; Lilliecreutz, 1996). The opportunities for division of responsibilities depend largely on the ways that activities are related to each other in the activity configuration. In this respect, the coordination needs that arise, depending on a particular division of labour, determine the feasibility of assigning responsibilities between buyer and supplier. The division of design and manufacturing responsibilities has a substantial impact on 'who' is organising what parts of the activity configuration. In addition, the division of labour also influences 'what' is organised across company boundaries. For example, the need for joint problem solving across company borders is enhanced if some responsibilities remain within the buying firm, while others are outsourced.

However, the way that activities are related in the activity configuration is also an important determinant of the division of labour, since the opportunities for division

of responsibilities depend on these activity characteristics. Every activity configuration is based on some form of task partitioning that determines how activities relate to each other. In a conceptual paper, von Hippel (1990) emphasises the difference between the product or process that results from task work, and the task specifications aimed at developing these products and processes. According to von Hippel, there are many different ways to partition a given task. For example, tasks can be divided into a number of sub-tasks which can vary in the level of detail specified for the task. He provides an example of the design of an airplane. The variety inherent in task partitioning is illustrated by a description of task divisions in relation to designing the aircraft body and the engine, or designing the front half and back half of the airplane. Since task partitioning has consequences for the ways that activities relate it also impact on the organising that is necessary to handle these interdependences. Von Hippel (1990) argues that the the partitioning of tasks is central to the distribution of responsibilities among firms. Two issues that are important for task partitioning is design principles and capabilities. They are discussed next.

Design Principles

Task partitioning is important for the characteristics of activity configurations as are the physical characteristics of the resulting products and services. According to a conceptual paper by Ulrich (1995), there are endless ways to divide a totality into parts and subsystems. However, it is argued that partitioning is dominated by two logics: modular and integral product architectures (see Figure 3-8). In modular architecture the interfaces between the various subsystems are designed such that changes in one part of the system do not spread to other parts, since interfaces are decoupled from one another. When integral architecture is applied, changes to one interface impact on adjacent interfaces.

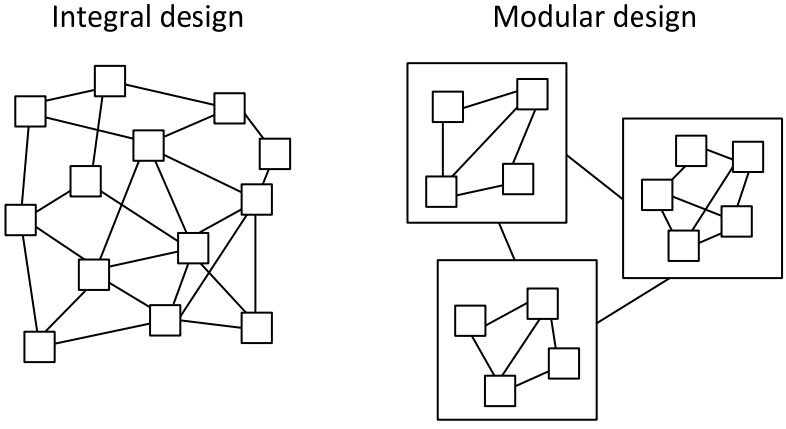


Figure 3-8: Integral and modular design principles.
(Dubois, 1998)

The design logic applied can be determined by the internal conditions of the buyer, or by the supplier's conditions. The design logic has clear implications for 'what' is organised in that the interdependences across subsystems determine the extent to which these systems have to be organised in relation to each other. Furthermore, since the characteristics of the product architecture also determine the opportunities for division of labour between buyer and supplier, there are consequence for 'who' is organising these interdependencies.

Capabilities

Finally, when partionining tasks in activity configurations, the capabilities of buyer and supplier become central (Jellbo, 1998). These capabilities can be divided into production and development capabilities. An actor may be physically able to produce and assemble a system, but may lack the capabilities necessary to design and specify the system. Similarly, an actor may take on functional responsibility and design the system, but lack the production capacity to manufacture and assemble it. Henderson and Clark (1990) go further and distinguish between component knowledge and architectural knowledge. Component knowledge refers to the ability to produce at low cost, while architectural knowledge is necessary to aggregate components into subsystems and entire offerings. Based on empirical research, Gadde and Jellbo (2002) conclude that the capabilities of buyer and supplier impact on the division of labour in the activity configuration, in terms of design and manufacturing responsibilities. They also find a reverse relationship in that the division of labour impacts on the way that capabilities develop over time. To illustrate, a supplier that only assumes production responsibility will develop capabilities related to production and assembly rather than design and specification. Similarly, if a buyer outsources design and specification the capabilities related to these responsibilities will erode over time. These findings suggest that capabilities, via their connection to the division of labour between buyer and supplier, affect 'what' is organised and by whom in purchasing and supply management.

Summary of the Activity Layer

Figure 3-9 summarises the issues that relates to configuring of activities and, thus, affects 'what' is organised and 'who' is organising across company boundaries. It was described how the way activities are related to each other, in terms of similarity and complementarity is crucial in organising activities. Furthermore, it was argued that the task partitioning principle applied, impacts the opportunities for division of labour. This division of labour was discussed in terms of design and manufacturing responsibilities. Also, the design logic applied in partitioning the product architecture influence the activity configuration and, thus, the organising efforts. Finally, the capabilities of buyer and supplier were introduced as central to activity configurations. Taken together, these issues describe the logic behind the partitioning

of activities in the activity configuration and the organising needs that follow from such partitioning. Therefore, they are referred to as partitioning principles.

Figure 3-9: Organising issues derived from the activity layer.

Partitioning principles are argued to influence the activity configurations, thereby influencing the organising of purchasing and supply management. However, it should be emphasised that 'what' is organised and 'who' is organising drives the adjustments to activities and the way that they relate to each other, thereby affecting the characteristics of these activity configurations. It is argued that there is a two-sided relationship between the partitioning principles and the organising of the activity configurations. Organising and the resource layer are addressed next.

3.6.2 ORGANISING AND THE RESOURCE LAYER

All companies require multitudes of resources in order to carry out their activities. According to Håkansson and Snehota (1995), resources are entities associated with a known use. Similar to activity features, there is no given resource unit - resources exist at multiple levels of aggregation. Thus, every resource can be divided into several sub-resources and also form part of the larger resource structure.

A central characteristic of resources is that a single resource is passive and without value. Rather, "it is the way that a resource interacts with other resources that define the nature of that resource and have the potential to generate economic value" (Håkansson et al., 2009: 65). This condition is referred to as the heterogeneity of resources, and builds on Penrose (1959). A particular consequence of resource heterogeneity is that there are endless opportunities related to potential combining and recombining of various resources. The heterogeneity of resources implies that the features of resources are constantly evolving through their interactions with other resources.

Organising is crucial in the efforts of companies to develop and combine resources. In the coming sections, central organising issues are derived from the combining of resources across company boundaries.

Organising and Resource Combining

No company can possess all the resources it requires for its business. A dominant aspect of business in networks in general, and especially with regard to purchasing, is

that every company makes use of the resources based in other companies (Håkansson et al., 2009). Boundary-spanning resource utilisation highlights the multiplicity of resources. Resources come together and create network wide resource constellations, and every resource is thus embedded in a multidimensional context (Håkansson et al., 2009; Gadde et al., 2010). This multiplicity of resources implies that what constitutes beneficial resource combining in one particular relationship, differs from what is advantageous in relation to other actors. Similarly, resource developments outside the focal business relationship may affect resource combining within this relationship.

Organising is important in order to utilise the resources of suppliers in the best possible way considering the prevailing business context (Gadde et al., 2010). Organising purchasing and supply management serves to monitor and analyse resource combining across company boundaries as well as managing and developing these resource combinations. Depending on the particular resource constellation, 'what' is organised across company boundaries differs in terms of the characteristics of purchased items and how they relate to the offerings of the buying company. Furthermore, the purchasing function may be involved in improving the performance of these resources by participating in product development projects.

The way that resources are combined and recombined in the resource constellations has implications for 'what' is organised across companies and 'who' is organising. For example, modifications to the design of a purchased item affect the manufacturing equipment used to produce it, and call for reorganising how these resource characteristics influence each other. Naturally, different organisational entitites will contribute to these organising efforts in distinct ways.

Physical and Organisational Resources

In resource combining, The literature distinguishes between physical or technical resources and organisational or social resources (see e.g. Gadde et al., 2010; North, 1981; Håkansson and Waluszewski, 2002). Physical resources include but are not limited to infrastructure, manufacturing equipment and products manufactured and distributed (Håkansson et al., 2009). Physical resources become organised when they are related to each other. Thereby, they develop through interaction processes where resources are continuously combined and recombined (Jahre et al., 2006). Organisational resources include competence and skills as well as the organising entities that are responsible for organising action (Jahre et al., 2006; Gadde et al., 2010).

While resource combining across company boundaries mostly concerns physical resources, history shows that these processes rely on organisaitonal resources since technological change and organisational change tend to go hand-in-hand, each requiring the other. The complex interplay between the two is illustrated by an

example where a particular organisational change "induced the technical change, which in turn required further organisational innovation to realise the potential of the new technology" (North, 1981: 38).

Organising is central for combining physical and organisational resources across company boundaries. On the one hand, physical and organisational resources constitute 'what' is organised. On the other hand, the organisational resources embody 'who' is organising in terms of the organisational entities that are responsible for the organising actions.

Resource Interfaces

In the combining of resources, resource interfaces are created. Three types of resource interfaces are illustrated in Figure 3-10.

Physical resources that are combined need to fit with each other (Gadde et al., 2010). These resource interfaces mainly concern the technical and functional features of the products manufactured and the facilities that are used. Dubois and Araujo (2006) exemplify a physical resource interface in the connection between a gear box and an engine. Another example of a physical resource interface is that between a product and the facility in which it is manufactured.

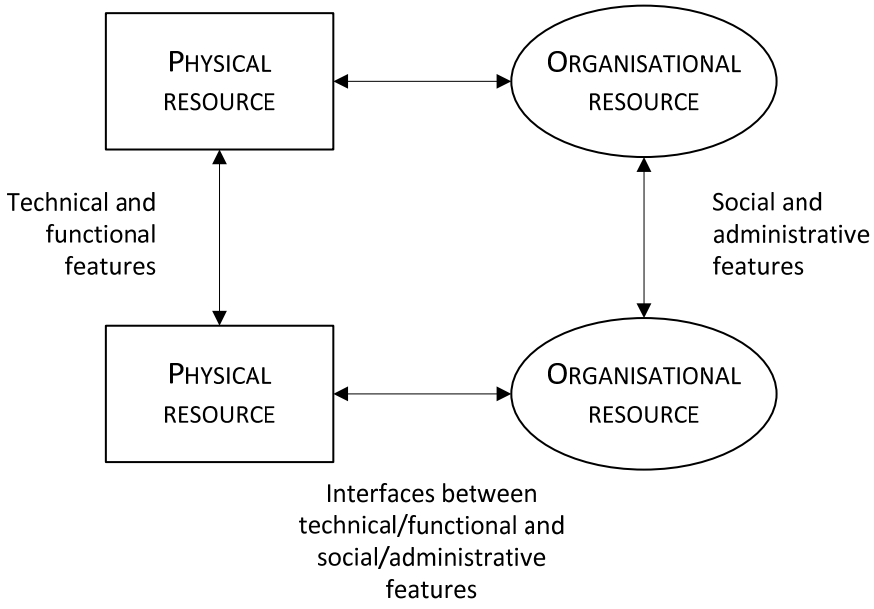


Figure 3-10: Interfaces among physical and organisational resources and mixed resource interfaces. (Gadde et al., 2010)

Simultaneously, the organisational resources must connect appropriately (Gadde et al., 2010). The most important features concerning the organisational resource interfaces relate to the social and administrative aspects in business units and relationships, that are designed to accomplish particular tasks. Dubois and Araujo

(2006) exemplify an organisational interface with the interaction between two organisational teams. Another organisational interface includes the interplay between internal business processes.

In addition, there are mixed resource interfaces stretching across company boundaries, involving a combination of technical/functional and social/administrative resources (Gadde et al., 2010). The relatedness and interfaces between physical resources do not develop spontaneously. They rely on organising actions by organisational resources (Jahre et al., 2006). These mixed resource interfaces are the most complicated.

Economising

The match between physical and organisational resources is achieved through adaptations in resource features. In these modifications, economic and financial issues are important since mixed resource interfaces are governed by economic logic. Jahre et al. (2006) propose economising as an important part of resource combining. Economising is described as a process where the financial and economic prerequisites and consequences are carefully considered.

Based on empirical research, Håkansson and Persson (2004) conclude that economising can be expressed in terms of economic potential or outcome related to three different types of economies. First, economies of scale and scope concern efficiency of resource utilisation. Håkansson and Persson explain that efficient activity execution increases when it involves sharing use of resources with other resources. Such sharing of resources can occur through scale or scope economies. Economies of scale imply that the identical activity can be repeated over and over again. Economies of scope refer to similar, but not identical activities that share a common resource. The economic potential that resides within economies of scale and scope is one of cost rationalisation. There are direct costs associated with shared resources since increased resource utilisation implies that the costs related to this resource can be split across a larger number of activities. Jahre et al. (2006) similarly argue in relation to economising on facilities, that economies of scale and scope are achieved when the capacity of a facility is utilised so that there is a favorable relationship between cost and output. Typically, the average cost is declining as the level of output increases.

In addition, there are economies of integration that emerge when one activity provides input to another activity. Exploitation of the time interdependences that follow from such sequentiality implies that activity coordination and administrative arrangements integrate activities. This integration can reduce costs and tied up capital, as well as increasing services in relation to specific counterparts through shorter lead times and better service levels. Economies of integration become especially important for order-based production since the economies of integration in

one relationship (such as the upstream supply operations) will become more closely integrated to the economies of integration in another relationship (such as a buyer-supplier relationship). It should be emphasised also that larger business volumes and regularity increase the potential for economies of integration.

Finally, economies of innovation refer to learning and problem solving, and concern the recombining of resources and reconfiguring of activities. The modification to resources and adjustment to activities can occur in either products or production processes. The economic potential related to economies of innovation is often measured in terms of benefit rather than cost. Problem solving or learning do not in themselves have any economic consequences. However, either it can lead to higher quality, better performance, lower costs, or knowledge that can be used later to earn benefits or rationalise costs.

In these economising efforts, 'what' is organised depends largely on the economies pursued. To exemplify, when striving to increase economies of scale and scope, organising physical resources for increased resource utilisation becomes crucial. Similarly, economies of integration refer to the organising of efficient physical flows to reduce tied up capital and increase service levels. Finally, economising in innovation implies organising organisational resource interfaces to enable learning and problem solving across company boundaries. 'Who' is organising also matters for economising since Jahre et al. (2006) argue that organisational actors constitute the economising force.

Use and Produce Contexts

The organising issues addressed above are substantially influenced by the fact that resources simultaneously relate to a number of different contexts, through its resource ties to other resources. These contexts refer to for example the resource collection of an invidual company and the resource constellations in relation to specific counterparts and the wider business network. An important aspect of these multiple contexts is that all resources feature are double-faced (Håkansson and Waluszewski, 2002). On the one hand, the items that are purchased spring from the 'produce context' in which they are developed and manufactured and in relation to the conditions of the supplier and other firms related to the supplier's operations. On the other hand, the purchased items end up in a 'use context' that includes the buyer, the other suppliers of the buyer, and the buyer's customers.

The main challenge related to resource combining across company boundaries is that what is efficient and effective in the produce context is not always feasible for the use context, and vice versa. For example, large-scale operations favouring economies of scale and scope on the produce side, constrain the opportunities for customisation and individualisation on the use side (Gadde et al., 2010). Several authors claim that a critical issue related to resource combining is the task of connecting the use and

produce sides (see e.g. Dosi et al., 1988; Harrison and Waluszewski, 2008; Håkansson and Snehota, 1995). Hence, identifying and bridging differences between use and produce contexts constitutes an important organising effort on the supply side of companies. It is argued that the nature of these differences, and the strategies pursued to bridge them, have implications for 'what' is organised across company boundaries and 'who' is organising it.

Summary of the Resource Layer

Figure 3-11 summarises the issues that have been identified as important for organising related to resource combining. The overarching issue in organising purchasing and supply management related to the resource layer constitute bridging of the use and produce contexts. This need arises because of the dual contexts that resources are exposed to as a result of resource combining occurring across company boundaries. In this resource combining, physical and organisational resources are relatede to each other, creating resource interfaces between physical and organisational resources as well as mixed resource interfaces. Because of the economic logic governing mixed resource interfaces, economising was identifed as a crucial issue in the bridging of use and produce contexts.

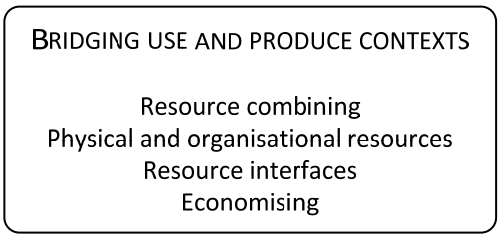


Figure 3-11: Organising issues derived from the resource layer.

These issues have been argued to impact on 'what' is organised across company boundaries and also 'who' is organising it. However, it should also be emphasised that 'what' is organised and by whom influences the developments of resource constellations. Hence, there is a two-sided relationship between organising on the one hand, and the bridging of use and produce contexts on the other hand. Next, organising related to the actor layer is addressed.

3.6.3 ORGANISING AND THE ACTOR LAYER

There is no clear-cut definition of a network actor. The actor layer includes actors at various levels (Dubois, 1998; Gadde et al., 2010), and includes companies, business units, divisions or departments and individuals. Depending on the specific situation, what constitutes the relevant actor perspective differs. In this way, the actor layers becomes multidimensional.

No actor is a self-contained, autonomous, unit with clear boundaries identified through its ownership border. Rather, its features are determined by its connections

to other actors and its behaviour in relation to these business partners. These connections are formed through business exchanges in relationships, which tend to be long term in nature (Håkansson, 1982; Gadde and Mattsson, 1987; Dubois et al., 2003). Every actor controls resources and conducts activities that relate to the resources and activities of other actors. This relatedness groups actors in large constellations identified as 'webs of actors'.

Actors are central to organising as they are present in the organising entities. In the coming sections, central organising issues are derived from the involvement of actors across company boundaries.

Actors as the Organising Force

According to Gadde et al. (2010), neither activities nor resources configure and combine themselves; the actors constitute the organising force and represent 'who' is organising. Håkansson et al. (2009) explain that actors do the resource combining and activity linking outlined above. Acoording to these authors, actors enact, learn and identify opportunities related to the activity layer and the resource layer. Organising purchasing and supply management is hence in the hands of the actors that determine 'what' is organised across company boundaries.

Actors are important also because they develop the business relationships linking activities and combining resources. Analysing business relationships from a resource perspective, Ivens et al. (2009b: 517) argue that a central issue in organising is "to determine what kind of relationship can allow for the 'best' combination of resources". However, it is also emphasised that the outcome of interaction in individual business relationships is strongly dependent on other relationships in the supplier base and the internal organising of the buying company (Gadde et al., 2010). In this respect, organising determines what interaction is possible with each supplier. The number of counterparts sets the upper limit for what connections it may be possible to exploit. Reliance on a large supplier base will allow for more connections, and focus on a limited number of suppliers will make it possible to invest in developing and adjusting connections.

The Multiplicity of Actors

There is an interesting duality in the characteristics of the actor layer (Håkansson et al., 2009). On the one hand, actors are identified through their interactions with others, since the actor is defined by its acting being of interest to others. Thus, an actor can be envisaged without ascribing purposeful and rational behavior to it. On the other hand, the main differences between the actor layer and the two previous ones is that actors can demonstrate willpower. In the words of Håkansson et al. (2009: 132), "it is only actors that form intent". In this respect, although actors are identified through their interactions with others, it should be emphasised that they relate to each other selectively (Håkansson et al., 2009; Gadde et al., 2010).

As a result of the multidimensional characteristic of the actor layer, the intents of actors have consequences for several organisational levels. At the company level, the preferences and priorities of individual buyers and suppliers differ, resulting in companies choosing to interact with some counterparts and not with others. Also, in their interactions with others, the actors pursue partly conflicting objectives within the relationship. In actor interaction within company boundaries, the interaction is also characterised by preferences and intentions. In this respect, an organisation is made up of multiple organising entities, consisting of actors pursuing different roles. For example, some actors are responsible for developing attractive product features, while others are engaged on individual customer projects. The roles of these actors vary in relation to each other; their objectives partly coincide, but also conflict with the responsibilities of others. Cyert and March (1963) emphasise these multiple and competing objectives of participants in organisations by distinguishing individuals from the 'collective actor'. The situation is further complicated by some actors belonging to multiple organisational entities and assuming multiple roles. Håkansson et al. (2009: 153) describe this as "rather than just having one of these identities at a particular time, the business actor has different 'personalities' at the same time". They also explain that the many ways in which resources and activities can be combined and linked causes frictions between these personalities.

The multiplicity of actors in relation to both organisational levels and preferences, and the multiple roles inherent in this multiplicity, have consequences for organising purchasing and supply management. Based on the conclusion that actors representing different organisational entities act in accordance with selective preferences, this implies that 'who' is organising is closely associated with 'what' is organised in terms of the priorities assigned by these actors.

Monitoring and Mobilising Suppliers

The selective preferences of actors has consequences for the managing in buyer-supplier relationships, both in terms of assessing the suitable level of relationship involvement but also in terms of mobilising suppliers to engage in collaborative efforts.

The relationship reflects the activity links and resource ties in the network and it is possible to distinguish between high and low involvement relationships (Ford et al., 2003). High-involvement relationship are characterised by considerable relationship substance in terms of activity links, resource ties and actor bonds. Other relationships score low for relationship substance, thus representing typical low-involvement connections. High-involvement relationships take time to develop, because they follow an investment logic. The initial costs are substantial since the adaptations tend to occur at an early stage, while the benefits of high involement relationships appear only over time.

Gadde and Håkansson (2001) stress the importance of assessing buyer-supplier relationships in order to ensure that the benefits of relationship involvement exceed the associated costs. They also recommend continuous or regular assessements to enable the level of involvement to respond to changing circumstances. Bensaou (1999) describes over- and under-designed relationships. Over-designed relationships exist when the resources utilised exceed the resource requirements. These relationships incur unnecessary costs and risks because the relationship investments that are not offset by accompanying relationship advantages. On the other hand, under-designed relationships imply that potential relationship benefits are not being exploited.

Because of the costs imposed on suppliers in high involvement relationships, the level of involvement in buyer-supplier relationships cannot be one-sidedly determined by the buying firm (Gadde and Håkansson, 2001). Buying firms need to encourage and motivate suppliers to commit to high-involvement relationships. Gadde and Håkansson (2001: 153) explain that "a key task for buying firms is to continuously mobilise and motivate suppliers to engage in relationships". Imbalances between the interests and motives of buyers and suppliers are reported by for example Krause and Ellram (1997). Furthermore, Ellram and Edis (1996) stress the importance of considering the supplier's situation in these mobilising efforts. Based on empirical case research, they show that suppliers might be interested in securing long term business, new development opportunities or opportunities that would reduce their administrative burden. They also explain that established high-involvement relationships require different approaches from low-involvement relationships. In this context, Gadde and Håkansson (2001) stress two-way communication and trust between buyer and supplier.

Functional Priorities

Lonsdale and Watson (2005) argue that the cross-functional nature of the purchasing function implies that there are often conflicting interests among the actors involved. Other authors reach similar conclusions (Axelsson et al., 2005a; Moses and Åhlström, 2008). The conflicting interests arise because organisations are characterised by politics, conflicts and bargaining rather than rational action (Lonsdale and Watson, 2005). Three explanations are proposed for these conflicting preferences. First, it is argued that bounded rationality implies that it is impossible for managers to calculate optimal solutions. Instead, they strive for 'good enough' approaches. Second, departmental cultures tend to imply general assumptions about operations and what is required to make an organisation successful. Third, actors do not act only to benefit company performance; there may be potential conflicts of interest among individuals and the company.

Axelsson et al. (Axelsson et al., 2005a) describe the information and attitude 'distances' between the purchasing department and other departments which can

have a negative impact on purchasing operations. For example, in manufacturing companies there is frequently reported conflict between purchasers and engineers; the product developers focus on technical aspects while purchasers are interested in the commercial aspects. Axelsson et al. (2005a) also describe potential conflict between the purchasing and production departments. While the manufacturing unit prioritises well-functioning production activities, purchasing specialists have wider responsibilities beyond securing manufacturing operations. In addition to these different interests, Wynstra (1998) addresses the product perspective and the project perspective in his discussion of supplier involvement in product development. Lonsdale and Watson (2005) highlight the marketing department as a commercially focused actor, although related to the demand rather than the supply side of companies. On these bases, Table 3-1 summarises some of the prioritised interests that constitute potential areas of conflict in the organising of purchasing and supply management.

Table 3-1: Functional priorities that may cause conflicting interests.

	FUNCTIONAL PRIORITY
PRODUCT DEVELOPMENT	Product characteristics
PRODUCTION	Production activities
PURCHASING	Commercially focused supply activities
MARKETING	Commercially focused customer management
PROJECT MANAGEMENT	Project fulfilment

According to Lonsdale and Watson (2005) some conflicts of interest are inevitable and can be constructive. However, if these conflicting priorities are not managed appropriately they can result in negative outcomes. Examples of problems in the organising of purchasing and supply management that can resuslt from poorly managed functional conflicts include over-specification, buying ‘off-contract’, premature establishment of product specifications, and fragmentation of spend.

Depending on the relative predominance of functional priorities, the purchasing function assumes different positions in a company. Dubois and Wynstra (2005) distinguish between three different roles of the purchasing function. The first role is the purchasing function as an ‘order-taking’ unit, meaning that purchasing representatives within the purchasing department execute operational purchasing tasks based on specifications from other departments. This role implies that other functional priorities take precedence over the purchasing function. The second role is the purchasing function as a ‘dominant’ unit, implying that the purchasing representatives dictate conditions for other business functions. In such a role, the

purchasing function outweighs other functional priorities. Finally, the third role is purchasing as an 'interactive' unit. An interactive purchasing function suggests that conditions are determined jointly with other business functions. This role denotes that functional priorities are equally important and managed together.

Control Systems

Control systems provide guidance to actors on managing functional priorities within an organisation. Control systems include performance measurements, budgeting systems and inter-organisational cost management.

Performance measurements function as motivators, control mechanisms, and assessment and feedback tools (Axelsson et al., 2005a; van Weele, 2005). Based on the assumption that people act differently when they know in advance that their performance is measured, Axelsson et al. (2002: 54) argue that "what gets measured, gets done". They contend that the management control system plays an important role in influencing the behaviour in an organisation. Van Weele (2005) argues that performance measurements can contribute to recognition and attention to purchasing matters, thereby facilitating communication between departments. He argues that the transparency provided by performance measurements can promote developments within the purchasing function of the company.

According to van Weele (2005), performance measurements should mirror the definition of purchasing performance in a company. Such performance definitions should include elements of both effectiveness and efficiency in order to capture goal fulfilment and resources spent on attaining the goal. The author emphasises the contribution of the purchasing function to risk reduction and product and process innovation in purchasing performance. According to Axelsson et al. (2005b), traditional performance measurements related to purchasing and supply management are overly focused on purchasing departments compared to the purchasing function, prioritise measurements of cost over value added, and neglect the importance of evaluating the proportions of purchased items in offerings. Therfore, they argue that performance measurements influence work methods in directions that effectively can either support or oppose purchasing objectives (Axelsson et al., 2005a).

While performance measurements impact on the goals pursued by actors, the accomplishments of these actors are influenced by the budgeting systems. According to Axelsson et al. (2005a: 27), the budgeting system "forces the sourcing unit into specific formats". Budgeting systems refer to the allocation of resources between departments and the accounting principles applied. According to the case study findings in Moses and Åhlström (2008), departments bearing the costs of the outcomes of cross-functional decisions often oppose these decisions. This suggests that the selective preferences of departments are not only influenced by cultural values and performance measurements but also depend on the effects of internal

resource management systems. Axelsson and Håkansson (1984) highlight the importance of internal resource allocation, and exemplify how their principles can be crucial for accomplishing strategic change.

Some control systems extend company boundaries and involve suppliers. According to the literature, most of these inter-organisational control systems address cost management (see e.g. Axelsson et al., 2002; Agndal and Nilsson, 2009). First, target costing is a technique enabling the cost of a product to be determined before it is designed, based on its selling price minus a profit margin. When the target cost is broken down, the supplier is usually involved, which pushes cost pressures further upstream along the supply chain. The degree of cooperation in this involvement varies from competitive bidding to joint redesign efforts. More collaborative efforts require the supplier to give the buyer access to internal accounting data in order to identify critical areas for cost reduction. Second, trade-off techniques are used in order to achieve the desired ratio between quality and functionality on the one hand, and price on the other hand. Such techniques increase the likelihood of arriving at a solution that is appropriate for both buyer and supplier. Third, activity-based costing includes a system for allocating indirect costs to products without using open profit margins. These systems establish causal relationships between overhead costs and specific products to arrive at an appropriate price.

In many of these efforts, the sharing of cost data is important. Cost sharing ranges from sharing cost split-ups to open book policies. Based on case research, Agndal and Nilsson (2008) identify 17 decision-making processes in which open sharing of cost data provides benefits. These decision-making processes relate to supplier selection procedures, pre-production decisions such as design characteristics and division of responsibilities, and full-speed production decisions including component redesign and technology investments. According to Kulmala (2004), inter-organisational cost management techniques are most likely to occur in relationships characterised by trust, high buying volumes, and buying power. Table 3-2 presents internal and inter-organisational control systems, as outlined in this section.

Table 3-2: Internal and relationship control systems.

INTERNAL CONTROL SYSTEMS	RELATIONSHIP CONTROL SYSTEMS
Performance measurements	Target costing
Budgeting systems	Trade-off techniques
	Activity-based costing
	Cost sharing policies

Summary of the Actor Layer

Figure 3-12 summarises the issues identified as important for organising related to actor involvement. The actor layer was explained as crucial for organising purchasing and supply management since the actors constitute 'who' is organising and, thereby, directly determine 'what' is organised across company boundaries. In these efforts, the multiplicity of actors implies that actors pursue multiple goals that may be conflicting. It was also argued that monitoring and mobilising suppliers is necessary to achieve an appropriate level of involvement in buyer-supplier relationships. Finally, control systems were identified as useful mechanisms that provide guidance and direction among the multiple goals of actors. Control systems were described as important both internally and in relation to specific suppliers.

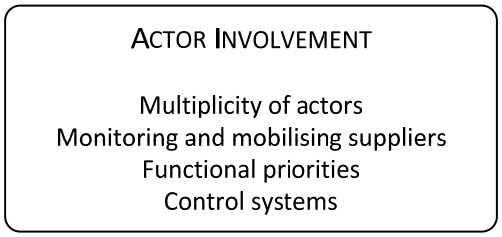


Figure 3-12: Organising issues derived from the actor layer.

Similar to the other sets of organising issues, it can be argued that actor involvement influences and is influenced by 'what' is organised. As already pointed out, actor involvement consitutes 'who' is organising. Having identified organising issues with the starting point in each of the three network layers, the next section summarises the analytical framework.

3.7 THE ANALYTICAL FRAMEWORK

The analytical framework developed in this chapter is used to analyse 'what' is organised and 'who' is organising purchasing and supply management across company boundaries. This analytical framework is depicted in Figure 3-13. It is emphasised again that, although this framework is theoretically derived, it is not a deductive product. Rather, the framework on which this study is based was developed systematically throughout the research, thus empirical data were as important as the literature for its development.

One part of the analytical framework represents the research problem under study. The preliminary research aim was to uncover the linking between internal organising and relationship organising. However, the framing of the organising concept in this chapter led to a revision of this research aim into (i) the issue of 'what' is organised across company boundaries and (ii) 'who' is organising these issues. The reason for this reinterpretation was the desire to shift the focus from the separating characteristics of company boundaries towards the organising taking place across

these boundaries. This first part of the analytical framework refers to the inner part of Figure 3-13.

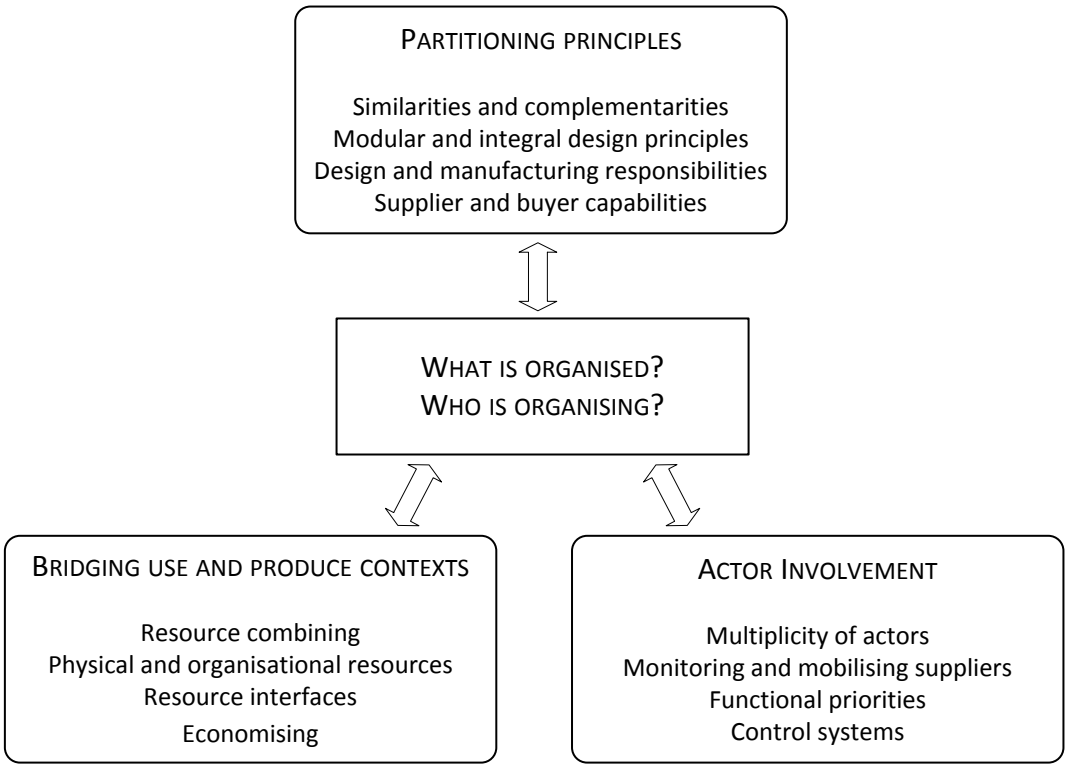


Figure 3-13: The three elements of the analytical framework.

The other part of the analytical framework includes central issues that are important to 'what' is organised and 'who' is organising. These issues, which are shown in the outer part of Figure 3-13, were derived from the three network layers of activities, resources and actors. The issues identified are not exclusive to the three network layers. Although the network layers are used as starting points for identifying these issues, each set of issues pertains to organising across all three dimensions. Since it can be argued that the interplay among the three network layers is inherent in the organising issues derived, the arrows between the network layers in Figure 3-7 have been removed in the resulting analytical framework.

The first set of issues, 'partitioning principles' were derived with the help of the activity layer. By exploring activity configurations, identification of organising issues included similarities and complementarities, design principles, design and manufacturing responsibilities and capabilities of buyer and supplier. Among the second set of issues, 'bridging use and produce contexts' was identified as important with the help of the resource layer. In the combining of resources across company boundaries, physical and organisation resources were identified as central together with the resource interfaces created between them. Economising was identified as the economic logic governing resource combining in general and mixed interfaces in

particular. Finally, 'actor involvement', the third set of issues, was derived with the help of the actor layer. It describes how actors constitute the organising force and how the interaction between actors determines how activities are configured and how resources are combined. Central organising issues include the multiplicity of actors that call for monitoring and mobilising of suppliers, handling of functional priorities and the control systems used for such management.

There is a two-sided relationship between the constituents of the inner and outer parts of the analytical framework, which is represented by the arrows between them. On the one hand, the partitioning principles applied, the bridging use and produce contexts that takes place, and the actor involvement in the buyer-supplier relationship all impact on 'what' is organised and 'who' is organising. However, there is a reverse impact in that 'what' is organised and 'who' is organising determines the opportunities for relationship developments. These developments, in turn, affect the partitioning principles, bridging use and produce contexts, and actor involvement.

3.8 DEFINING THREE RESEARCH QUESTIONS

Following the revised research aim, the industrial network model was used in order to identify factors that are significant for 'what' is organised and 'who' is organising. The conceptualisation of organising purchasing and supply management raises several significant issues to investigate further in an empirical study. On the basis of the resulting analytical framework, three research questions were defined, corresponding to the dimensions in this framework.

1) The first research question concerns the impact of the partitioning principles on *what* is organised and *who* is organising. This impact is analysed with regard to the similarities and complementarities in activity configurations, the design principles applied, the division of design and manufacturing responsibilities, and the capabilities of buyer and supplier.

2) The second research question deals with the impact of bridging of use and produce contexts on *what* is organised and *who* is organising. This impact is analysed with regard to economising and how this is related to resource combining of physical and organisational resources and their interfaces.

3) The third research question refers to the impact of actor involvement on *what* is organised and *who* is organising. This impact is analysed with regard to the multiplicity of actors, their control systems, the monitoring and mobilising of suppliers and the functional priorities of the buyer.

In this chapter, the analytical framework underlying the study was developed. On the basis of this framework, three research questions were defined. In the coming chapters, these research questions are addressed in the empirical enquiry.

4 SIGNAL SOLUTIONS

The empirical enquiry that this study is based on centres around the purchasing activities of a manufacturer specialising within a technology intensive industry related to signal transmission, hereafter referred to as Signal Solutions. The chapter is organised as follows. Section 4.1 describes the company and its offerings and Section 4.2 discusses its purchasing activities. This is followed by a description of the company's internal organising in Section 4.3. Section 4.4 focuses on three organising initiatives, targeted at improving the position of the purchasing function internally. Section 4.5 analyses the internal organising according to the analytical framework provided in Chapter 3. Chapter 4 concludes by introducing the four purchased systems on which the subsequent empirical enquiry centres.

4.1 COMPANY AND OFFERINGS

Signal Solutions is one of several business units in a large corporate group employing 13,000 people with a turnover of more than SEK20 bn. The group produces complex technical products for customers worldwide and in the course of more than 60 years in the particular industry, has delivered thousands of units to over 30 countries.

The offerings of Signal Solutions deal with signal transmission, implying transmitting and receiving signals as well as data processing. The offerings consist basically of three computers that are connected to each other. The first computer deals with actual signal transmission and reception, the offering's core process. The second computer manages the information forwarded by the first computer according to a number of different applications offered by Signal Solutions. The third computer manages presentation of the data produced by the first two computers. In other words, the first computer transforms the transmitted and received signals into manageable data; the second processes these data in accordance with specific software applications; and the third computer presents the transformed and processed data for the user. In each offering, these computers are encapsulated by a protective chassis. The offerings are complex and bulky, including more than 50,000 items of 5,000 different types. Each unit sold involves tens of thousands of man hours dedicated to its design. Figure 4-1 shows a simplified illustration of Signal Solutions' offerings.

The particular industry that Signal Solutions serves has many unique characteristics that influence Signal Solutions' operations. First, the customer base is limited, due to the nature of the products. When Signal Solutions was first established it basically had only one customer which prioritised Signal Solutions as its supplier for patriotic reasons. Currently, the company is involved in the open market in business

characterised by severe competition and a majority of its sales going to exports. The difference can be exemplified as a shift from nil export business to 80% exports. However, its customer base remains comprised of a few but large customers.

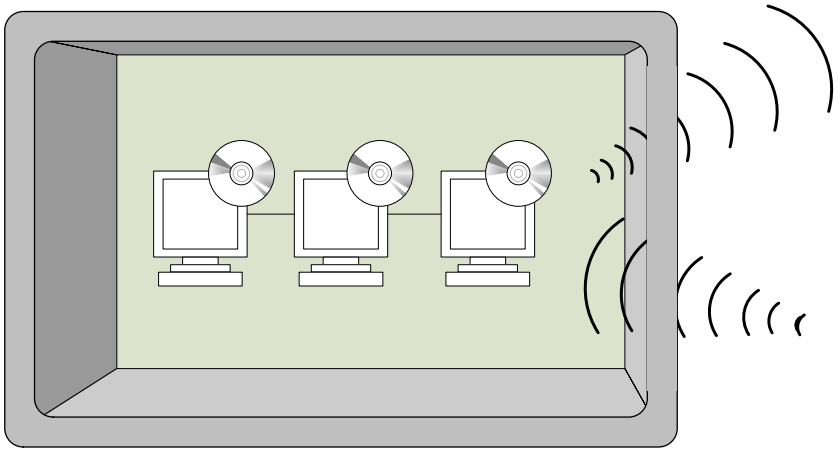


Figure 4-1: Simplified illustration of the product offerings.

Second, the company's portfolio of offerings includes five product platforms which record very low annual sales volumes. In three out of five platforms, a handful of products are sold each year; in the remaining two, sales occur less than annually. Each sale represents a large investment for the customer and is characterised by extensive customisation and lengthy development projects. Thus, operations are project-like, involving lengthy sales cycles and substantial customisation and product development. Each solution offered contains tens of thousands of items and, owing to long supply lead times and adjustments, the total time for development, assembly and delivery is more than one year. Sales cycles are even longer, often ranging over several years.

"We used not to consider whether it was needed, we just wanted the latest technology. Nowadays cost-efficiency has become much more important. "

- CUSTOMER REPRESENTATIVE

Third, there is a strong emphasis on technical requirements. Customers traditionally require high performance and functioning at the technological frontier. In addition, the diverse and extreme environments in which the products are applied, and their expected long lifetime, demand high quality. Because of these requirements, it has been obvious for company representatives that Signal Solutions should prioritise performance and technology over cost. However, in parallel with extension of the customer base, Signal Solutions has been exposed to competition, making cost a more important factor. Combined with this, there has been a general shift towards a cost efficiency focus in its customer base in recent years. The main reasons for this

shift are tighter budgets and escalating product development costs. Customers are trying to increase cost efficiency by lowering their requirements related to technological superiority, and increasingly are requesting more standardised solutions. These cost rationalisation requirements contrast sharply with historical conditions, when technology and performance were the unquestionable priorities.

4.2 PURCHASING ACTIVITIES

This section describes the purchasing activities of Signal Solutions. First, the general characteristics of purchasing and supply management activities are outlined followed by a summary of the most important features of the purchased items. Finally, the characteristics of the supplier base are described.

4.2.1 PURCHASING AND SUPPLY MANAGEMENT

Because of the complex technological characteristics of the offerings, it is impossible for Signal Solutions to manage all product development and production activities in-house and many of the systems included in the offerings are now outsourced to suppliers. However, this has not always been the case. Signal Solutions has a history of in-house operations and restricted use of suppliers. The need for a highly skilled workforce and substantial new product development in every customer project, means that purchasing costs, as part of total costs, are slightly lower than in other manufacturing industries. Instead, man-hours constitute the major proportion of total costs. In the 1980s, Signal Solutions' operations were still dominated by in-house design and manufacturing, with limited use of suppliers. However, the rate of technological development eventually made this impossible to sustain. One buyer representative describes how performance in some areas doubled each quarter. With such a pace of change, it soon became clear that it was not possible to maintain in-house design in all technology areas and Signal Solutions was obliged to rely more extensively on suppliers.

In an industry that is restricted by a complex legal environment, few suppliers can comply with the necessary standards and extensive documentation needed. Also, Signal Solutions' customer contracts normally include agreements on supply origin and countertrade. Thus, supplier alternatives differ from project to project depending on the combination of restrictions and requirements applying to the customer contract, although traditionally supplier alternatives are restricted. The situation has not been eased by the disappearance of many smaller suppliers specialising within the specific industry context of Signal Solutions, in response to competition from large scale global actors able to serve a broader customer category. In this environment, Signal Solutions often had to request special treatment and customised purchases. Due to the low buying volumes relative to other customers, Signal Solutions' requirements were rarely prioritised by suppliers, resulting in escalating costs and long lead times.

"Imagine walking into a supermarket to buy hotdogs and requesting one package with shorter ones and slightly different flavouring. What do you think the reaction would be?"

- PROJECT MANAGER, SIGNAL SOLUTIONS

By the end of the millennium, Signal Solutions reliance on standardised components had increased substantially, in an effort to depart as little as possible from the buying behaviour of other customers of its suppliers. However, this caused other problems. First, because of the strict requirements applying to Signal Solutions' offerings, it was necessary to source from a large number of suppliers to obtain all the necessary items. Maintaining such a large supply base was both complicated and resource demanding. In addition, component lifecycles are substantially shorter in other industries, compared to the needs of Signal Solutions where product lifecycles range up to 20-40 years for the most advanced offerings. Reliance on standardised components meant Signal Solutions frequently had to manage end-of-life purchases and redesigns owing to obsolete components.

Finally, the acquisition in 2006 of Signal Solutions by another corporate group had a further impact on purchasing operations. Before this, it had been possible for Signal Solutions to exploit the buying volumes of other business units in the corporate group on the basis of the condition that "if you want to become a supplier to this corporate group you must also serve Signal Solutions". The offers of the new corporate group limited this potential, partly because of lack of similarity in the suppliers used, but also because of its traditional emphasis on self-control and reduced coordination between business units. The loss of corporate group support deprived Signal Solutions of most of its bargaining power, causing the buyer to rethink its entire purchasing strategy.

4.2.2 THE PURCHASED ITEMS

The ratio of purchased items in relation to total costs is around 50:50. Approximately 8,000 unique article numbers are purchased on an annual basis, across all product platforms. However, the offerings from all product platforms are not sold each year, implying that the total number of purchased articles is slightly higher.

The level of refinement of purchased components varies, but is generally low. Although Signal Solutions once – not so long ago - bought sheet metal which it sent out to suppliers for drilling, cutting etc., it now tries to buy more complete systems. However, circuit boards are still manufactured in-house and purchased screws are still subject to surface treatments and length adjustments. The major problem is the difficulty to find suppliers willing to take full responsibility for delivering systems. For example, in the case of sheet metal components, the company has found a supplier that has agreed to purchase sheet metal and send it for cutting, bending and

drilling; however, this supplier will not take responsibility for quality issues that arise. This can be explained by the comparably strict requirements related to quality and performance which are foreign to many suppliers.

"For every new customer project, approximately half of all purchased components require design work, documentation or search for new suppliers."

- PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

Because of the high level of customisation required, the level of repeat purchases is low. A large proportion of the product hierarchy, from systems to components, includes customised solutions. In addition, modifications are often needed even for purchased items that are not subject to customisation. The low purchasing frequency and the short lifetime of components implies that purchased items become obsolete between customer orders. Therefore, specification and design concerning purchased components need modifications for each customer order. These tasks include updating certification documentation. Some suppliers may have gone out of business due to financial problems or mergers and acquisitions. To complicate matters further, regulations also change between customer orders. For example, at the time of the field work, new directives from the United Nations and the European Union and new environmental legislation had been issued since the previous customer contract had been signed. Thus, some components which are not obsolete, cannot be used.

4.2.3 SUPPLIER BASE CHARACTERISTICS

We next turn to the suppliers of these purchases. Signal Solutions finds that there are few suppliers to choose from when buying components. This is explained by two factors. First, there are complex technical requirements related to the components and suppliers due to the product environment and legal systems. Out of seven levels of the product hierarchy, the first five require suppliers accustomed to these special requirements. This restricts the choice. Second, the bought in components often have very detailed design specifications from the design engineers which leave little room for searching among alternative suppliers.

Currently, there are about 2,000 active suppliers in the supplier base. Because of the infrequent customer orders, only about 800 of these are used on an annual basis. A unique feature of this company's supplier list is that it keeps track of second tier suppliers in order to control which manufacturers are used, and their article numbers. About half of the 2,000 suppliers correspond to second tier suppliers – sometimes to avoid using manufacturers from particular countries. When possible or necessary, the company tries to establish direct contact with the manufacturers. However, because of very small purchasing volumes and to reduce the number of supplier contacts, it is often necessary to go through resellers.

Most suppliers are single source for practical reasons. For example, it would be too expensive to maintain several supplier relationships due to the high levels of customisation required. Also, there are often no alternative suppliers. The downside of a single supplier for each system or customised component is dependence and exposure to risk. This becomes especially problematic when Signal Solutions is not a prioritised customer. Some attempts have been made to standardise systems to allow for more supplier alternatives, and for standard components there are usually multiple sources. However, the costs of maintaining several suppliers are often higher than the price advantages gained. Therefore, there are ongoing efforts to reduce the number of suppliers of standardised components.

The supply base is relatively stable. Many supplier relationships are long term and were established a long time ago. There are several reasons for this. First, switching costs are high. It can be very costly to change suppliers due to the cost of integrating a new system or component into the offerings. Also, new suppliers often need lengthy learning phases to become familiar with the special requirements for documentation and component quality. Due to the low volumes involved, these switching costs could be higher than possible earnings. Despite this supply base stability, transactions are often on a case by case basis, with no long term commitments or frame agreements. This is due partly to the project focused operations which do not prioritise long term efforts. However, there is also reluctance on behalf of suppliers to commit to commercial terms in light of the low and infrequent demand from Signal Solutions.

Table 4-1 summarises the characteristics of the purchasing activities described above. The next section outlines the internal organising which, among other things, serves to coordinate these purchasing activities.

Table 4-1: Purchasing and supply management characteristics.

PURCHASING & SUPPLY MANAGEMENT CHARACTERISTICS
Increased reliance on standardised components
Challenges related to component obsolescence
Low priority due to low purchasing volumes
Few supplier alternatives and challenges related to finding system suppliers
Low level of refinement and high levels of customisation in purchased items
Low levels of repeat purchases
Stable supply base and single sourcing
High switching costs

4.3 INTERNAL ORGANISING

Signal Solutions has developed strong operating traditions stemming from the unique characteristics of its offerings and business environment. In this section, the internal organising related to these operations is described, with a particular focus on the implications for purchasing operations. First, the organisational structure is described. Second, the cross-functional interaction in a customer project is outlined. Third, the organising of the purchasing department is explained.

4.3.1 ORGANISATIONAL STRUCTURE

Signal Solutions has operations in three different locations. The organisational structure across the three sites follows a traditional line organisation that includes both centralisation and decentralisation. Beginning with the centralised operations, Figure 4-2 illustrates that apart from a few supporting functions, centralised decision-making functions across all three sites include sales and marketing, commercial and product management.

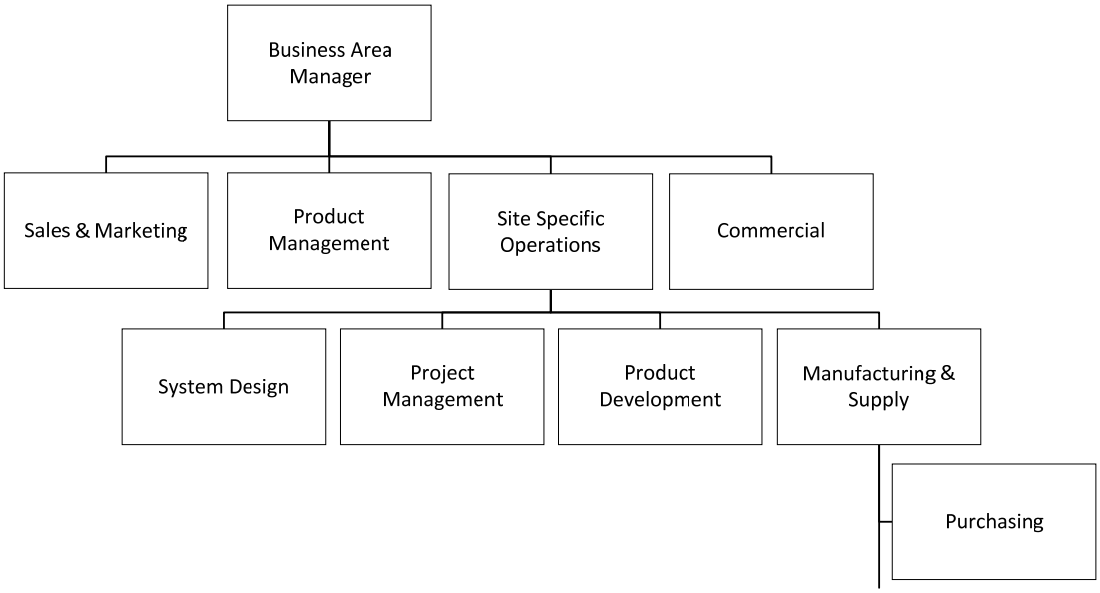


Figure 4-2: Organisational structure of Signal Solutions.

The sales and marketing department is responsible for customer contacts and sale of customer projects. The commercial department employs financial analysts who provide the business cases and are accountable for contract profitability. The product management department is responsible for the lifecycle of the product platforms and general product characteristics. However, this level of centralisation was only introduced in 2010 as a result of a merger between two business units. At the time of data collection, centralisation of these operations was new, and the functions were operating in a more or less decentralised manner. The product management function

was only established in 2000. Before that date, the entire organisation was structured according to separate product divisions with decentralised operations.

The remaining functions are organised under site specific operations (see also Figure 4-2). The project management capacity is concentrated in the project management department which is responsible for all project activities, ranging from customer contracts, delivery projects, internal product development projects to other internal projects. Engineering capacity is concentrated in the product development department where systems design, component design and software programming are performed, for both in-house production and purchased items. It should be noted that the system design unit that is not part of product development is not responsible for actual design activities; it guides and supports the engineers through a role similar to the product management function. Finally, manufacturing and supply are the responsibility of the manufacturing department, where both operational and strategic sourcing are organised within a supporting function serving in-house production. This implies that purchasing is only indirectly represented at board level via the manufacturing department.

The location of the purchasing department has changed over the years and there are many opinions internally regarding the most appropriate position. Many people express concern over its current location; it is argued that the supporting function to production results in little organisational autonomy and authority. For example, several purchasing representatives claim that the purchasing department adds little value to the manufacturing department in a company that emphasises engineering and customisation. A sales representative complained about the distant location of the purchasing department in relation to the demand side. Before 2000, the organisation was designed according to product divisions, with decentralised purchasing operations. This meant that purchasing representatives were closer to the technical design of the offerings and the specific needs of the product divisions. However, product development representatives describe how the limited coordination across product divisions complicated supply management, exemplifying how there could be halts in production because of delayed component deliveries when a neighbouring product division had plentiful supply of these components in storage. Purchasing representatives assert that the current centralisation of the purchasing department implies opportunities to consolidate and coordinate purchases across the product platforms. However, other interviewees claim that the opportunities for consolidation are limited because of the limited harmonisation of purchased components due to isolated product platform designs. At the time of writing, the current head of the purchasing department had requested that the purchasing department be dispersed across the different business functions in order to serve customer projects and business processes, but had been told that, due to the current organisational structure, such an approach was not feasible.

Despite the line organisation, most operations are governed by individual customer projects with substantial customisation. In this respect, although the project management department is included in the line organisation, the work performed within this department belongs to the individual customer projects. In order to coordinate the line function and the individual customer projects, two cross-functional business processes govern operations. The first business process is related to customer demand fulfilment and is closely related to the individual customer projects. The second business process maintains the lifecycle of the product platforms and serves the individual customer projects through this product portfolio.

Because of the proximity of individual customer projects to customers, the project management department and project needs are typically very strong in this cross-functional interaction. To exemplify, although the line functions have technical authority within their areas of expertise, they are financially dependent on funding from the individual customer projects in their product development activities. Since development activities to a large extent are financed by projects originating from customer orders, product design perspectives are short term. Unless there are advantages for an individual customer project, there are few incentives or means to make proactive and long term decisions that would benefit the development of the product portfolio in the long run.

These difficulties also apply to purchasing activities. In fact, the purchasing function is even more closely tied to the project environment than the line organisation in the process environment. In this process environment, sourcing is defined as a supporting process, emphasising the subordinate position of the purchasing function within the organisation. There is a specific sub-process that connects purchasing activities to fulfilment of individual customer projects. In fact, approximately 80% of purchasing department man hours are sponsored by individual customer projects. These statistics also apply to strategic purchasers. This prominence of individual customer projects makes it difficult for the purchasing department to attract financial resources in order to consolidate purchases or place advance purchasing orders in order to reduce lead times. Since buying volumes are relatively low, the costs of keeping inventories are often more than offset by the potential risks of delayed deliveries. However, because of the project centred budgets, such purchasing strategies are rarely achievable.

"We are spending from different compartments within the same wallet. There should be a shared compartment in it where all of us set aside resources. "

- PRODUCT DEVELOPMENT REPRESENTATIVE, SIGNAL SOLUTIONS

Because of the importance of individual customer projects, the next section describes the cross-functional interaction within these projects, from sales opportunity to order fulfilment.

4.3.2 CUSTOMER PROJECTS

There are four main departments involved in fulfilment of individual customer projects; sales and marketing, product management, project management, and product development. The cross-functional interaction between the representatives from these departments and their deliverables in the different stages of the customer project, are illustrated in Figure 4-3, and described below.

When a sales opportunity is identified by a salesman a team is formed, composed of people from sales and marketing, product management, and project management. The purpose of the team is to ensure that the sale meets both internal criteria and customer needs. The members of the team play different roles in this process. The salesman constitutes the link between Signal Solutions and the customer and represents the needs of the customer. The project manager is responsible for specifying a project that can be accomplished on time and within the specified budget. The product manager is responsible for the product platform to which the product in question belongs. This individual must ensure that any customised features are aligned with the long term direction of the product platform. Thus, the salesman and the project manager work on a time horizon extending the length of the customer project, while the product manager's time perspective spans the lifecycle of the entire product portfolio.

Before the customer contract is signed, the team negotiates with the customer and prepares tenders as well as decision support material for approval in formal forums. After the customer contract is signed, responsibility for the customer project is formally handed over to the project management department through an assignment specification (see Figure 4-3). This specification includes important details from the customer contract regarding functional requirements, accompanying maintenance and services, and sub-delivery information. The responsible project manager breaks down the assignment specification into a project plan (see figure), with input from other departments such as system design and product developers. The project plan includes information on the processes and accompanying decision points to be included in the project, as well as milestones and deadlines. Meanwhile, product management creates a product specification (see figure) from the specifications in the customer contract. The details of this product specification vary from overall product functionality, to detailed component specifications, depending on the contract content and the level of design control that product management wants to maintain in relation to the product platform in question.

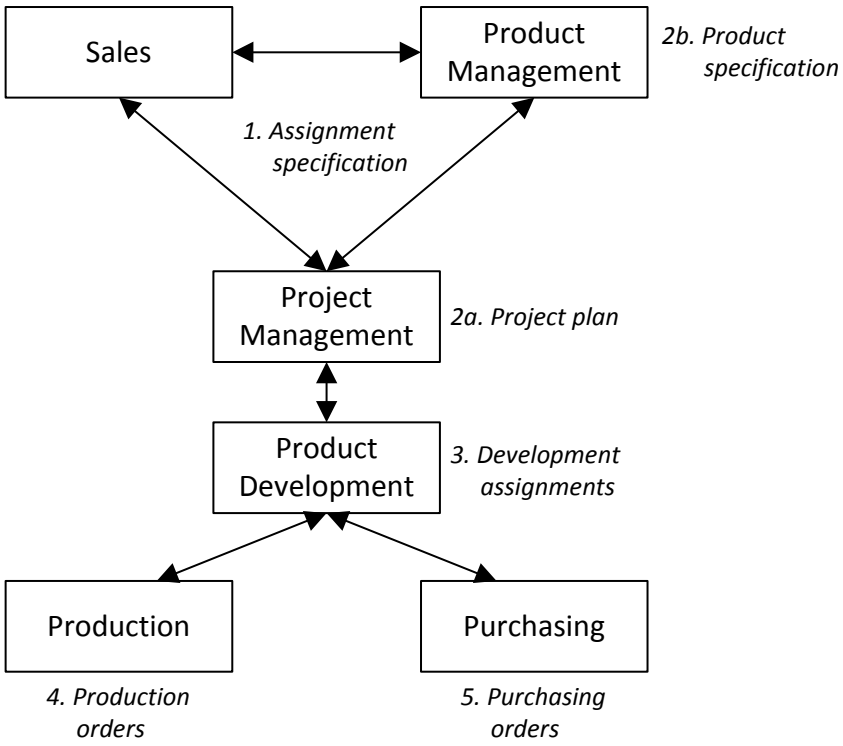


Figure 4-3: Cross-functional interaction in a customer project.

In analysing the product specification, some internal development is normally required as customers typically demand modifications in relation to existing products. Thus, the product specification serves as input to an internal contracting process where project management orders development assignments (see Figure 4-3) from the areas of expertise within the product development department. This process determines what product development units will be given what monetary resources in order to design the customised parts of the offering and integrate them into the final offering. In order to coordinate these tasks, technical sub-project managers interface between the project manager and the product development units. The development assignments within the awarded product development units are eventually broken down into specific design tasks for individual engineers.

Some of the new development results in internal production orders. However, some new product development requires purchasing of customised components or systems that have not previously been purchased. These articles are specified by the engineers in the product development units.

In parallel with new development, there are routine production orders (see Figure 4-3) related to items that have been developed and manufactured before. A limited number of the components for these manufacturing processes can be extracted from inventory since Signal Solutions has a restrictive warehousing policy and also buy many customised items. The production orders and the specified customised items

result in new and repeat purchasing orders (see figure). Eventually, all purchased items end up in production where the offering is assembled before delivery.

The purchasing department enters the process at a stage where most decisions have been made. While many company departments collaborate closely during product specification and development, purchasing representatives are formally involved only in the final stage in response to purchasing orders. Therefore, while the actual supply activities are carried out by purchasing department people, they only execute decisions about purchases that have been identified and specified by representatives of other departments. Some of these decisions derive from the customer contract which might stipulate product specifications and suppliers, either directly through specification of supplier brand or indirectly through details that limit supplier alternatives. Other decisions are related to the product specification developed by the product management department following signing of the customer contract. The remaining decisions are the responsibility of the product development units and individual engineers who specify the purchased components and systems.

During the interviews, representatives of several departments concluded that the purchased systems are overly detailed in their specification, and interfere with supplier selection since the choice becomes built into the design specification. It has been described that supplier alternatives are limited because of supply origin, legal documentation and component quality requirements. When options are further reduced by overly detailed specifications, Signal Solutions' dependence on its suppliers becomes severe. Furthermore, the lack of opportunities to inform and influence the product specification imply limited potential to standardise items or consolidate purchases in order to increase cost-efficiency in relation to the already small batches and high levels of customisation.

> *"The customer projects are like black boxes delivering purchasing orders."*
>
> - PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

Similarly, it is not possible to utilise the potential inherent in the supply base, since the purchasing department is not able to forward information about quality and performance potential identified. The late involvement of the purchasing department does not allow it to plan and coordinate its operations. Sometimes lead times are longer than the length of the customer project, and purchase needs are often identified or communicated very late. Shortening lead times results in escalating purchasing prices for rushed orders. The purchasing function is often occupied with short term solutions to secure supply, rather than issues related to long term planning and supply development. In order to increase cost-efficiency and awareness of supply market potential, the purchasing department strives to acquire more authority in relation to the specification of purchased items.

4.3.3 ORGANISING THE PURCHASING DEPARTMENT

The purchasing department employs around 40 individuals. The department is organised according to eight commodity groups, corresponding to the materials necessary to build the offerings, and indirect materials. For example, there is an electronics group and a mechanical group. The indirect material group includes administrative materials, IT equipment, machines and chemicals for in-house production. In addition to the commodity groups, there is a systems group that represents purchases of assembled components, cutting across all commodities. This group was established in 2009 to complement the component focus in the commodity groups and enable a coherent approach towards key suppliers. The Key Account Managers in Signal Solutions for the most important suppliers belong to this group in the purchasing department.

The purchasing department is split into strategic purchasing, operative purchasing and component responsibility. The strategic purchasing managers are responsible for the long term development of their commodity groups, especially related to commercial issues. Their job is to develop sourcing strategies that fit with the company's overall strategies and vision, and to identify improvement possibilities within their groups. The operational purchasing managers are responsible for fulfilling supply of necessary components and monitoring supplier relationships on a daily basis. The component responsibility role is more technically oriented. Tasks include investigation of whether a supplier can manufacture according to requirements, and whether specified and purchased components are production-friendly and cost-efficient. The organisation of these roles has differed over time. Originally, there was a clear division between strategic and operative purchasers within two separate groups. Recently, the strategic and operative purchasers have been co-located within the commodity and systems groups. Table 4-2 summarises the most important characteristics of purchasing activities.

Table 4-2: Internal organising of the purchasing function.

INTERNAL ORGANISING AND PURCHASING ACTIVITIES
Line organisation with purchasing as a supporting function to production
Focus on purchasing activities in individual customer projects
Late involvement of purchasing in specification and design activities
Purchasing activities characterised by lack of time and rush orders
Overly detailed specifications that limit supplier selection
Commodity-based organising with complementing system sourcing unit
Strategic and operative purchasers co-located within purchasing units

4.4 ORGANISING INITIATIVES

The above description of the internal organising reveals a number of challenges related to purchasing activities, as explained by company representatives from many different business functions. These difficulties derive from developments in the business environment making it necessary to add to the traditional focus on technology and performance, cost-efficiency objectives. An important element in this cost rationalisation has been the shifting of some authority from individual customer projects to long term development of the product portfolio and to include purchasing issues earlier in decision making. This section describes three organising initiatives that have been instrumental in this shift.

4.4.1 THE PARTNER MANAGEMENT GROUP

In order to improve the position of purchasing within the organisation, a Partner Management group within the product management department was created in 2007, consisting of four people originally occupying strategic purchasing roles. Formation of this group had several goals.

First, the fact that supply aspects were judged to be important enough to require a unit outside of production, and in a department responsible for many strategic decisions, was supposed to send an important message to the organisation. Second, the Partner Management group was supposed to complement the product development department with commercial and business competence, something that was perceived as lacking due to the heavy focus on technology within this function. Third, while the purchasing department at this time did not control its own budget, the Partner Management group was supposed to assist with such financing. The idea was to allow for evaluation of existing product structures through targeted allocation of financial resources, in order to identify opportunities for standardisation and consolidation of purchasing volumes, outsourcing opportunities and strategic partnerships. Taken together, it was hoped that these initiatives would put purchasing issues on the agenda, allowing them to enter the decision making process earlier.

Although there was more or less a consensus in the organisation regarding the original ideas behind the establishment of this organisational group, the Partner Management unit was dissolved after a few years. There were practical problems related to the division of responsibilities between this group and other departments, particularly strategic purchasers and commercial staff who felt side-lined. Also, the Partner Management function developed and initiated implementation of a number of initiatives, which, at the time, were somewhat premature and not supported by the rest of the organisation. The turbulence accompanying these efforts resulted in powerful opposition to the Partner Management group and contributed to its eventual disbandment.

"Although the ideas behind the Partner Management group were promising, their role was too fuzzy and interfered with others."
- HEAD OF PURCHASING, SIGNAL SOLUTIONS

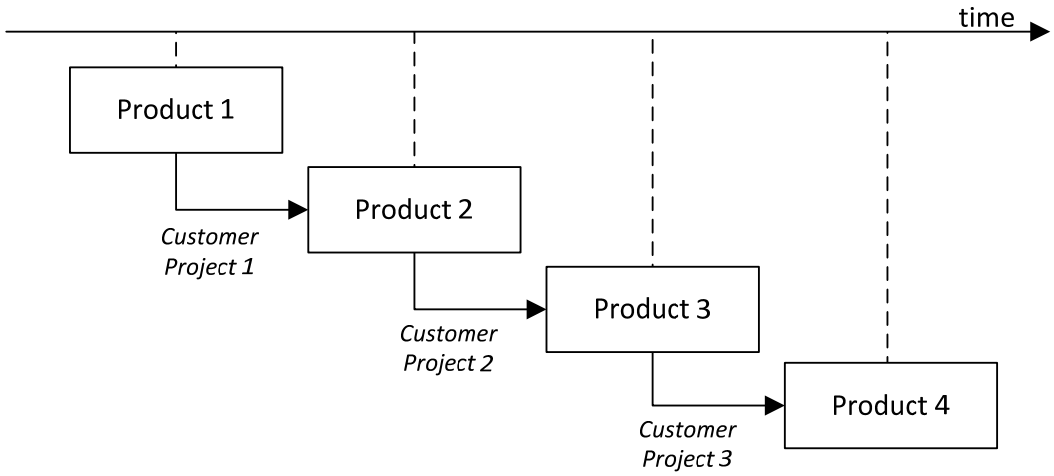
Despite its short existence, the work of the Partner Management group has left its mark on the organisation and continues to influence the development of the purchasing practices in Signal Solutions. First, some of its employees continued in the product management department, with the result that their knowledge and expertise were available to product managers. Second, during its short existence, the partner managers successfully launched and financed a number of redesign projects and supply market investigations in order to improve business acumen in purchasing operations. Many of these initiatives are ongoing and some have been copied elsewhere. Third, the Partner Management group contributed to the establishment of a new business model in which the focus was shifted from selling individual customer projects to product offerings. This initiative, which is described below, had been on the agenda for a long time. However, it was fuelled by the presence and efforts of the Partner Management group, which provided some crucial tools to enable the transition.

4.4.2 FROM PROJECT-BASED TO PRODUCT-BASED ORGANISING

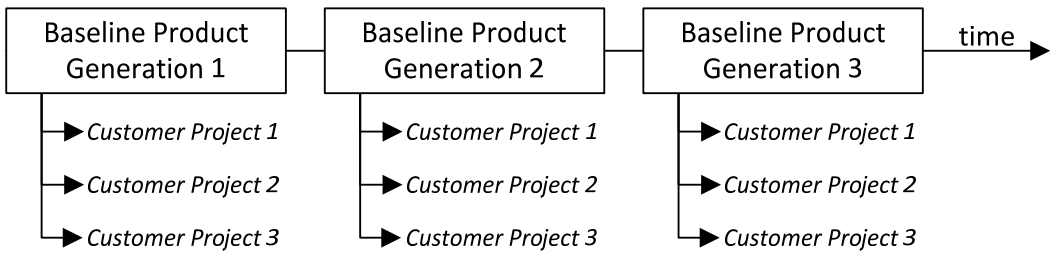
A major long term goal of Signal Solutions is to transform the formerly project-based organisation to a more product-based one. Historically, very limited product development activities have occurred independently from customer specific requirements and funding. When operations are governed by individual customer projects, product development within the five product platforms is performed with little effort to coordinate technological road maps either within or between product platforms. Product development in subsequent customer projects is often related - one project can pick up from where the previous project ended. However, offerings are developed incrementally and in parallel, in concurrent and succeeding projects rather than being managed in a unified and controlled fashion. When Signal Solutions was first established, this approach was feasible since customers paid the development costs through cost plus contracts. However, current customer projects are negotiated according to fixed prices. This shift implies that Signal Solutions is responsible for estimating the costs of each customised requirement and carries the risks related to their estimation. Because it is difficult to foresee the consequences of design changes, this approach is a risk for the company's profitability.

In order to reduce the risks associated with individual customer projects, and to increase the profitability of the product platforms, an alternative business logic was sought. The product-based approach implies that the product platforms are developed in response to general demands, but independent of customer specific solutions. In addition, this product development is funded internally rather than being financed by

individual customer projects. In other words, although customer specific adaptations are always necessary, the basic building blocks of each product platform should be similar across all projects, with additional and customer specific features to be funded by customers. In this approach, the roles of project managers and product managers are reversed. Rather than project managers governing product development, product managers control the product portfolio, which they develop in anticipation of current and future customer needs. Project managers buy and customise the offerings from this product portfolio in response to individual customer projects. The way that offerings are developed differs fundamentally between product-based and project-based organising, as does the financing of this development. These differences are highlighted in Figure 4-4.



a) Project-based organising with incremental development.



b) Product-based organising with periodic upgrades.

Figure 4-4: Project-based versus product-based organising.

Naturally, this substantial redirection of the business logic calls for changes to the internal organising. Rather than concentrating on unconditionally responding to the needs of every individual customer, the emphasis is on identifying similar needs across several customers, and figuring out how to balance variety and cost-efficiency. As already explained, the move from a project-based to a product-based business logic is within a long term vision that has been emerging slowly over a long

period of time. The internal organising has followed this trend. As a first step towards realisation of this vision, a product management function was established in 2000, to complement the project focus with a clearer emphasis on the technological and business aspects of the long term development of product platforms.

Another important step towards product-based organising is the base line concept that is being implemented in connection with development of the next generation of the product portfolio. For each product platform, a base line offering is developed, containing a number of customised options along a fixed number of variables. These basic offerings come with fixed prices for each option and dependent on purchase volumes. Customers can still request additional customisation, however, these requests need to be thoroughly analysed and the customer is charged for all the associated costs. Modularity is described as an important part of the base line offerings. In order to sustain a base line offering while still offering customers individual solutions, modularisation has become very important. When product platforms are approaching end-of-life and new generations are being developed, modular interfaces and standardisation across product platforms are being pursued.

Gaining control over the design of the product platforms implies opportunities for long term purchasing strategies and coordinated purchasing activities across product offerings. For example, the existence of a coherent product portfolio, with base line products and periodical upgrading, provides opportunities for standardisation and consolidation of many purchased items. In recognition of these opportunities, the purchasing department has its own budget, making it possible to negotiate frame agreements and plan for more cost-efficient purchasing operations across multiple customer projects. Also, the purchasing department has been invited to participate in two important forums where major decisions regarding the characteristics and development of offerings are made, allowing for consideration of purchasing issues. In addition, there have been pilot efforts to modularise and outsource selected systems in order to benefit from supplier capabilities and scale advantages, and release internal capacity to focus on systems integration and strategic matters.

At the time of data collection, Signal Solutions was in the process of finalising the transition towards product-based organising and the base line concept. Therefore, parts of the product portfolio still responded to a project-based focus while other parts were related to a successfully implemented product-based approach.

4.4.3 CORPORATE LEVEL INITIATIVES

Some organising initiatives that impact on purchasing activities extend beyond Signal Solutions' business unit. As described earlier, Signal Solutions was acquired by a new corporate group in 2006. This new group belonging initially had detrimental effects on its purchasing activities. Because of its low purchasing volumes, the company had relied on the business of other business units in their

negotiations with suppliers; its acquisition by a different corporate group meant most of these supplier contracts were lost.

The acquisition provoked organisational turmoil in adjusting Signal Solutions' operations to the new corporate belonging, and integrating the company with the rest of the corporate group. Traditionally, the business units in this corporate group had operated more or less independently of each other in terms of purchasing activities. However, soon after the acquisition it was decided to initiate coordination efforts regarding commonalities related to purchasing among other business functions. The merging of 16 business units into five business areas in 2010 was an important step in this direction. The mergers meant that Signal Solutions was combined with another business unit, a change that was accompanied by a modification to the entire organisational structure. With regard to purchasing operations, the original intention was to exploit the opportunity to improve the organising in the purchasing department and change its location. For example, it was decided to centralise the strategic purchasing department outside the manufacturing unit. However, this decision had to give way to practical issues. First, the strategic and operational responsibilities of purchasing staff in the other business unit coincided in the same employees, making it impossible to split these roles across different departments. In addition, in assigning responsibility for employees to senior managers, the purchasing department had to be split in a different way so that the number of subordinates answerable to each manager was more balanced. As a result, indirect material was organisationally co-located with system purchases, despite the few commonalities in terms of responsibilities.

Following the merger of the business units, top management decided to initiate efforts to consolidate purchases across the corporate group. Because of the comparatively large differences among business units, a centralised purchasing organisation could not be justified. Instead, a Procurement Council was judged a suitable compromise, composed of representatives from each business unit able to identify commonalities and guide the consolidation effort. An important effort of this Procurement Council was initiation of corporate wide commodities management. A number of common purchasing categories were identified by appointed members from across the corporate group. The objective within categories was to identify synergies in order to consolidate purchasing volumes, establish frame agreements, and reduce the supplier base. The work is led by an appointed commodity area manager – generally from the business unit with the largest share of purchases. At the end of the data collection period, indirect materials had been successfully consolidated and efforts were focused on direct materials such as lower level articles like nuts and bolts and circuit boards. Work has also started on identification of joint suppliers in order to establish long term strategic supplier relationships or partnerships. Partner Account Managers (from the business unit that has most contact

with the particular supplier) have been appointed for the most important suppliers. Both commodity area managers and Partner Account Managers report regularly to the Procurement Council.

This empirical enquiry examined Signal Solutions and its offerings, the purchasing activities related to these offerings, and the internal organising where these purchasing activities take place. It described incidents important for the development of the purchasing function. An overview of important organising episodes is provided in Figure 4-5. The timeline is also available in Appendix IV together with key events related to the buyer-supplier relationships that are described and analysed in coming chapters.

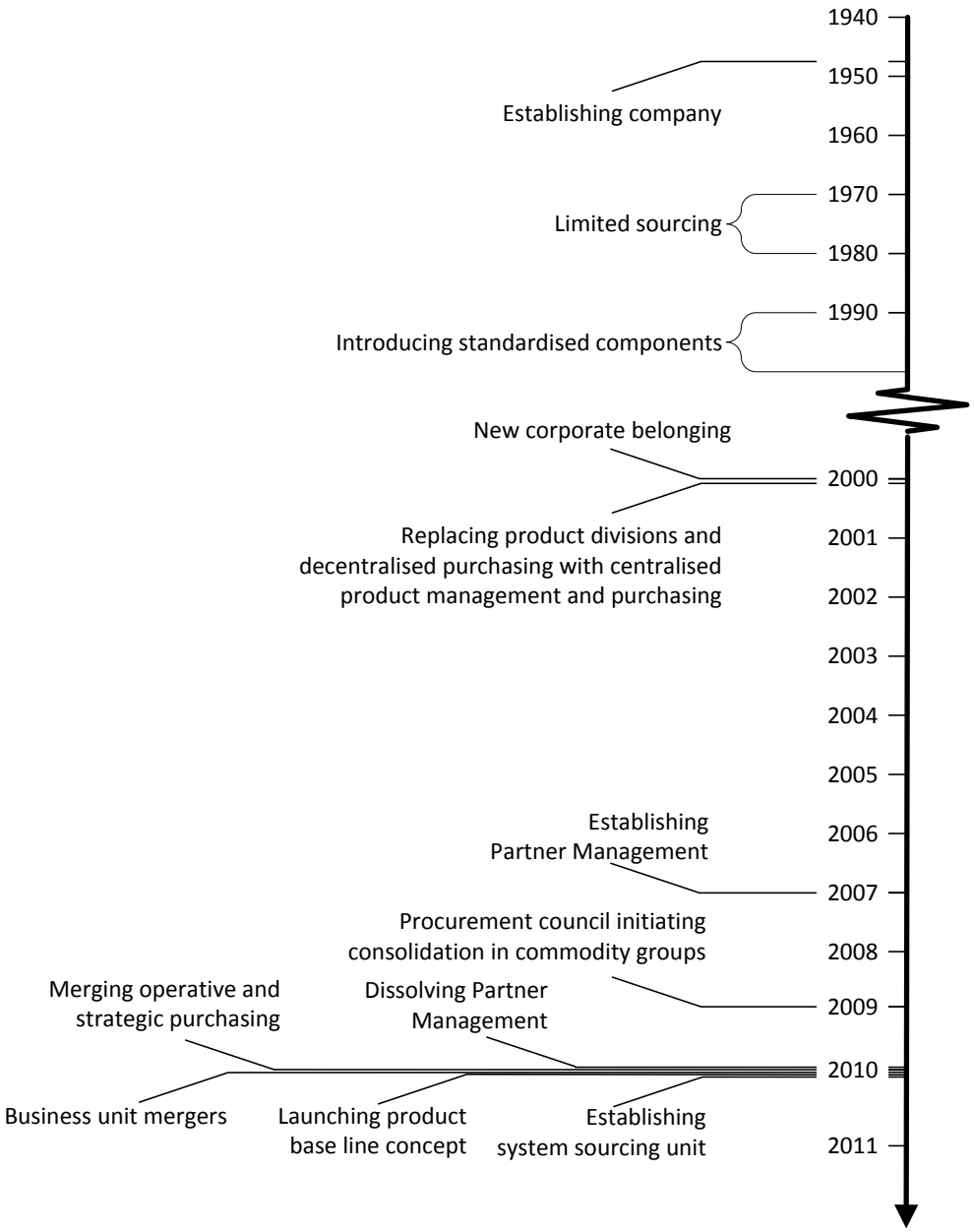


Figure 4-5: Timeline of key organising episodes at Signal Solutions.

4.5 CASE ANALYSIS

In order to analyse the organising that occurs across company boundaries, some insight is needed into how the internal organisational arrangements of Signal Solutions impact on purchasing and supply management activities in general. In this section, the internal organising of Signal Solutions is analysed, based on the organising issues related to actor involvement in the analytical framework. First, the current role of the purchasing function is examined in Section 4.5.1, uncovering changes to the company's business environment that call for modifications to this role. Second, the efforts of Signal Solutions to mobilise suppliers are analysed in Section 4.5.2, including the possibilities of the purchasing function to contribute to these efforts. Third, Section 4.5.3 addresses the conflicting functional priorities within the organisation along with how control systems serve to provide direction among these multiple objectives.

4.5.1 CHANGING ROLE OF THE PURCHASING FUNCTION

The buying behaviour of Signal Solutions resembles that of an 'order-taking' purchasing function that responds to and adapts to the needs of other company functions. Purchasing needs are identified and specified within individual customer projects, outside of the purchasing department, and with little involvement from purchasing expertise. Also, purchasing employees described how purchase orders that resulted from these customer projects often create difficulties for the purchasing function. These characteristics indicate that other functional needs are prioritised over purchasing activities. This role of the purchasing function derives from the former restricted use of suppliers in combination with prioritising quality and performance over cost-efficient purchasing operations. These internal conditions have placed the purchasing function in a less prominent position in the organisation compared to for example the project management and product development functions.

This 'order-taking' role of the purchasing function results in problems related to the company's supply side conditions due to the limited opportunities to bridge differences between the use and produce contexts of Signal Solutions and its suppliers. The most significant difference between these contexts lies in the simultaneous need for standardisation on the part of suppliers and customisation on the part of Signal Solutions. Also, while supplier operations benefit from large and stable production volumes, Signal Solutions' operations are characterised by irregular order patterns and low purchasing volumes. Also, Signal Solutions frequently requires specific quality and documentation compared to other customers, and suffers from frequent design changes due to longer product lifetimes compared to component lifecycles.

Previously, these differences between the use and produce contexts did not represent a major challenge for Signal Solutions which was able to transfer the associated costs

to its customers. It was not necessary to organise internal operations to prioritise the effects on purchasing activities. However, the increased cost awareness of its customers has made these problems more severe over time and internal efforts have been made to increase the cost-efficiency of purchasing operations. These efforts included standardising components whenever possible, avoiding too precise specifications, consolidating purchases across customer projects and product platforms, and involving suppliers in design activities to consider the manufacturability of purchased items.

These efforts make it possible to more cost-efficiently bridge some of the differences between the use and produce contexts. However, in order to achieve these changes, Signal Solutions' representatives maintained that the limited role of the purchasing function internally needed adaptation. While customisation in individual customer projects is still important, they explained that customised product development should be weighed against the associated costs. The supply side conditions must be allowed to impact on internal operations in cases where the benefits of standardisation and consolidation outweighed those related to customisation. This modified role of the purchasing function is consistent with the 'interactive' purchasing function described in the literature, which involves interaction among the various company functions in order to jointly specify purchasing requirements. The role of the purchasing function influences the opportunities to mobilise suppliers, as analysed next.

4.5.2 Organising for Mobilising Suppliers

Since the supply management activities at Signal Solutions are characterised by few supplier alternatives and long term relationships, the importance of mobilising these suppliers is accentuated. The conditions governing these mobilising efforts have differed over time. Analysis of the purchasing and supply management of Signal Solutions shows that the company is not an attractive customer for suppliers. The small purchasing volumes and special requirements imply that Signal Solutions is frequently considered a rather problematic customer. However, because of former corporate belonging, suppliers were forced to afford the company higher priority as a condition for winning the business of more attractive customers within the corporate group. Signal Solutions was successful in mobilising the interest of suppliers through its corporate belonging.

The new corporate belonging changed this scenario. Compared to the previous corporate group, there are no attractive business volumes to lean on following acquisition of Signal Solutions by the new corporate group. The new corporate belonging weakened Signal Solutions' position as a buyer and took away the possibility of piggybacking on larger orders from other business units. Signal Solutions has to achieve priority with suppliers in other ways.

The literature suggests that suppliers can be attracted by potential opportunities for technological development. Such opportunities require that some responsibility is transferred to suppliers so that they can utilise their capabilities. The level of refinement of purchased items increased over time. In addition, the establishment of a systems group within the purchasing department is an indication of the importance of managing more complex purchases in which suppliers take more responsibility.

Suppliers can also be mobilised by the offer of stable or long term business. Such commitment requires sufficient and stable purchasing volumes over time. The previous buying behaviour of Signal Solutions did not fit this pattern. However, the commodity-based organising coupled with centralised purchasing rather than the previous product divisions, provide opportunities for consolidation of order volumes across customer projects and product platforms. Also, coordination efforts at corporate level allow consolidation of purchasing volumes across several business units in selected commodity areas and with specific suppliers. These consolidation efforts provide opportunities for more attractive business commitments with key suppliers. They were enabled by lateral communication mechanisms in the form of a Procurement Council and group level commodity groups compensating decentralised purchasing activities.

It is important to emphasise that the opportunities to exploit centralised purchasing activities in order to consolidate purchasing volumes is determined by the role of the purchasing function internally. In order to coordinate purchases across product platforms, projects or business units, it is necessary for purchasing activities to be prioritised to allow standardisation and locking of design parameters. Grouping purchasing orders cutting across product offerings requires investment in purchasing activities. In order to realise these opportunities, Signal Solutions engaged in a number of organising efforts in order to improve the position of the purchasing function within the organisation. These efforts are analysed next.

4.5.3 Organising for an 'Interactive' Role of the Purchasing Function

The empirical enquiry outlines the four-dimensional organisation of Signal Solutions, reflecting multiple functional priorities. First, the company is organised according to a functional approach, emphasising the specialisation of individual business functions. Second, the operations within this organisational structure are organised around individual customer projects, stressing the importance of individual customers. Third, the comparatively recent increased product focus calls for proactive product management in order to secure the long term development of individual product platforms as well as coordination across them. Fourth, the cross-functional interactions between various company functions are facilitated by a process-based focus where the business functions collaborate to fulfil customer needs via the various product platforms.

The four-dimensional focus within the organisation makes management of these multiple functional priorities simultaneously rather ambiguous. The internal control systems influence prioritisation among the different interests, which clarifies the roles and responsibilities of various company functions in internal decision making. Traditionally, Signal Solutions was a company that prioritised individual customer projects and technological performance over commercial issues, indicating the prominence of the project management and product development functions. Control systems were crucial for emphasising these company functions. The budgeting system is the most influential tool in this respect. Most financial resources were allocated to customer projects which, in turn, directed other company functions in order to fulfil individual customer needs. With as much as 80% of strategic purchasers' time allocated to individual customer projects there was little room for strategic purchasing developments. Furthermore, long term investments were accompanied by debate over which departments should bear the costs of these ventures. These circumstances highlight the importance of the budgeting system in assigning priority to the shifting interests of various company functions. Signal Solutions has a strong historical tradition related to product development in customer projects, emphasising the solid position of the project management department in the organisational culture.

The analysis shows that changes to the control systems enabled the purchasing function incrementally to assume a different role internally. While the purchasing department is still organised as a supporting function to production, this weak hierarchical position in the organisational structure is compensated by other control mechanisms. First, the budgeting system was redesigned to emphasise internally funded product development over customer specific designs. Instead of allocating the majority of financial funds to individual customer projects, more was made available to the product management department in an effort to develop base line products from which individual projects could purchase product offerings. This modified budgeting system has empowered the product management department which has struggled to achieve organisational authority because of its rather recent establishment. With more resources allocated to proactive and long term management of product portfolio, opportunities emerged to establish effective and efficient purchasing practices related to these offerings.

Second, the establishment of the Partner Management function placed purchasing and supply management issues firmly on the product management agenda. The location of the Partner Management group within the product management department gave it the financial power to direct purchasing initiatives. Its establishment was also an important signal to the rest of the organisation about the increased importance of purchasing issues.

Third, the invitation for the purchasing department to be represented at two important decision forums denotes a form of lateral communication that increased the status of the purchasing function in the organisation. Participation in these forums allows the purchasing function to interact with other parts of the organisation and influence decisions that affect purchasing and supply management activities before they become purchasing orders in late stages of individual customer projects.

Finally, the consolidation efforts at group level, with both corporate spanning commodity groups and a centralised Procurement Council, demonstrate the commitment of top management to improving purchasing and supply management operations. When top management emphasised the need to increase cost-efficiency in purchasing and supply management of the corporate group, the organisational authority of the purchasing function increased allowing it to influence other functions to make the necessary adaptations to improve purchasing practices.

This section analysed the role of the purchasing function at Signal Solutions, and how it developed at a general level. The effects of this internal organising are addressed in more detail in connection with three buyer-supplier relationships, whose organising are described and analysed in Chapters 5-7. The purchased systems supplied through these relationships are introduced next.

4.6 INTRODUCING FOUR PURCHASED SYSTEMS

The remainder of the empirical enquiry is devoted to four systems exchanged in three buyer-supplier relationships. The relationships with these firms constitute three embedded cases in the organising of purchasing and supply management at Signal Solutions, as described in Chapter 2. These systems and their roles in relation to each other and the offerings in which they are included, are introduced here before the three chapters that address each individual system and accompanying relationships.

As outlined, all three suppliers deliver systems that are part of Signal Solutions' product offerings, according to Figure 4-6. Secure Communications supplies two systems, the other suppliers, High Tech Structures and Communication Platforms, supply one system each. As the figure indicates, the four systems are included in various combinations in the product platforms of Signal Solutions. Three of these platforms have similar characteristics in terms of use context, while the fourth product platform is very different. For example, although all offerings are low in terms of volume, the three similar product platforms are more volume intensive and more regular than the fourth product platform which is supplied less often than annually. Also, although all product architectures at Signal Solutions possess some integral characteristics, the systems are most heavily integrated in the fourth product platform. The structural frame is the only system related to this substantially integral

product platform, while electronic devices and data processor are included to various extents in the other three product platforms.

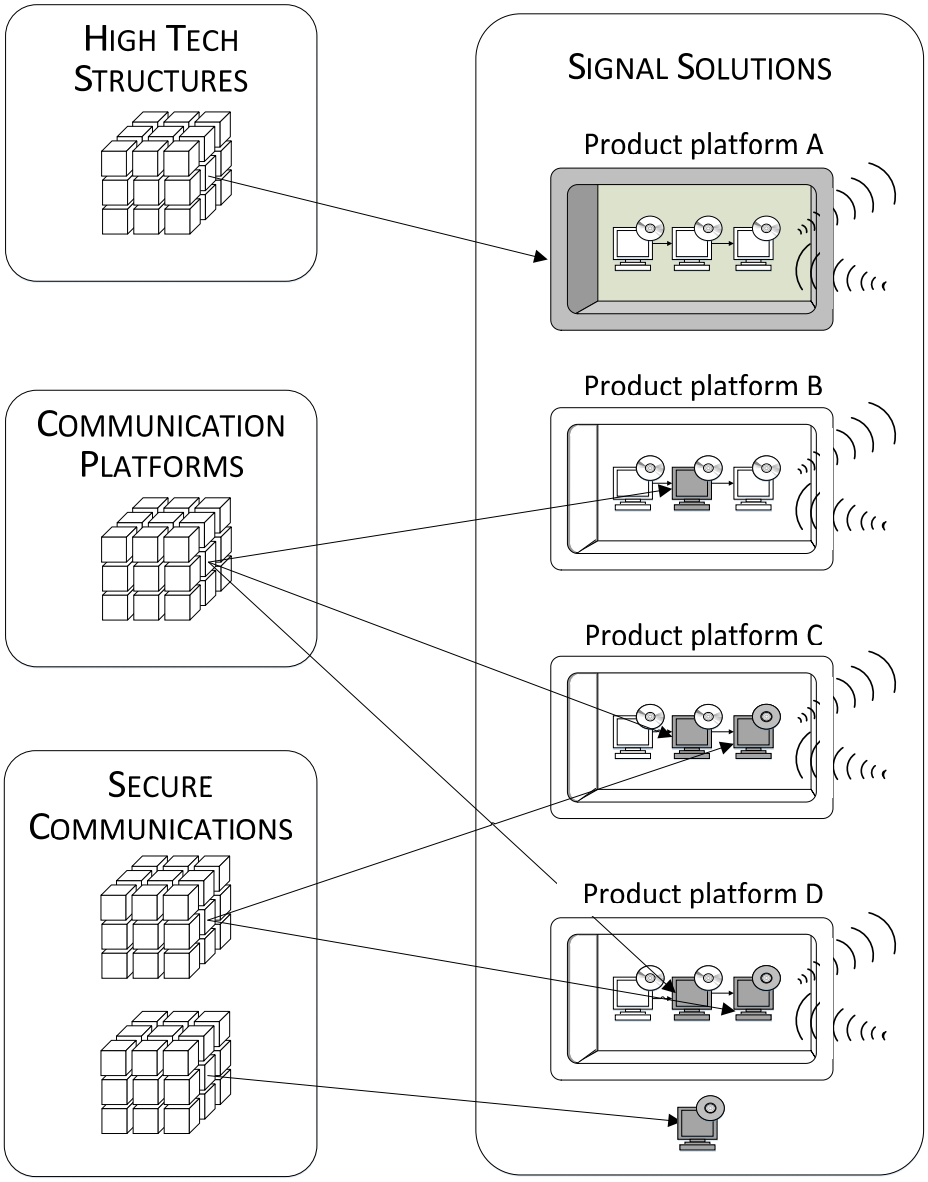


Figure 4-6: Suppliers, purchased systems and product offerings.

As will be described in Chapters 5, 6 and 7, the purchased systems play different roles in relation to the offerings of which they form a part, as illustrated in Figure 4-6. The structural frame provides the chassis encapsulating the actual offering. The standardised electronic device comprises the right-hand computer inside this chassis and the data processor comprises the hardware for the middle computer. The standardised electronic device and the data processor interact directly with each other inside the offerings. While the standardised electronic device deals with the signalling properties, the software that is uploaded onto the data processor manages the data that exits the standardised electronic device. Thus, the software that is

designed internally and uploaded onto the data processor constitutes the link between the standardised electronic device and the data processor. Finally, the customised electronic device is a separate application to the offerings of Signal Solutions, functioning as a complement to the offering rather than an integrated part of it.

As the above illustrates, the four purchased systems are physically related to each other, and are important to the offerings for different reasons. In Chapters 5, 6 and 7, the systems and the relationships in which they are exchanged are described and analysed.

5 THE STRUCTURAL FRAME

The structural frame purchased from High Tech Structures is the single most expensive item purchased by Signal Solutions. It is used to encapsulate the offerings in one of the product platforms. At the time of writing, the buyer-supplier relationship between Signal Solutions and High Tech Structures was the longest term commitment of both parties, and had been maintained for more than 20 years. However, although originally committed to this relationship, representatives of both buyer and supplier expressed an interest in ending it.

The chapter is organised as follows. First, the structural frame is described in Section 5.1, followed by a description of High Tech Structures and its operations in Section 5.2. Section 5.3 describes the contractual arrangements between buyer and supplier. In Section 5.4, the relationship organising is outlined. In Sections 5.5-5.7 the escalating costs and lead times which are at the heart of the problems in this relationship are discussed, along with improvement barriers and the tensions raised by these issues. The chapter concludes with an analysis of the relationship and its organising, in Section 5.8.

5.1 SYSTEM FEATURES

As described above, the structural frame corresponds to the system encapsulating one of Signal Solutions' product platforms. It is composed of a laminate material that is shaped into a number of sections. These sections are assembled together with some cables and metallic components that are moulded into the system. This system has two functions which are illustrated in Figure 5-1. First, the main function of the structural frame is to encapsulate and protect the offering. Second, this offering deals with signal transmission, meaning that the frame must allow these signals to pass through its surface. Because of this dual functionality, the focal system cannot be designed in isolation and needs to be coordinated with the rest of the product design.

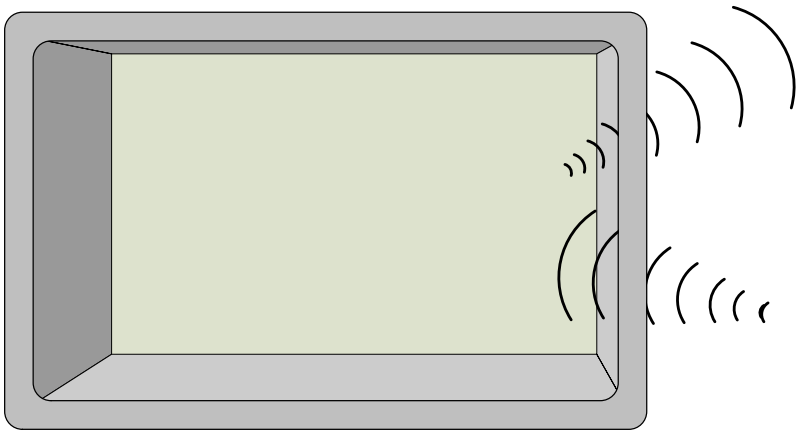


Figure 5-1: Simplified illustration of the structural frame.

All Signal Solutions' product platforms include encapsulation similar to the structural frame, and these systems are purchased from the same supplier, High Tech Structures. Due to the different sizes and shapes of these product platforms, the physical characteristics of these systems differ from one platform to another. However, the design is rather stable among individual customer projects, involving only minor design changes depending on the particular customer. Also, the variety is fixed since there are limited design alternatives. The particular product platform to which the structural frame applies is one of the more bulky offerings of Signal Solutions, involving a very large structural frame that can only just be accommodated within a large truck. Figure 5-2 illustrates the relative size of the system.

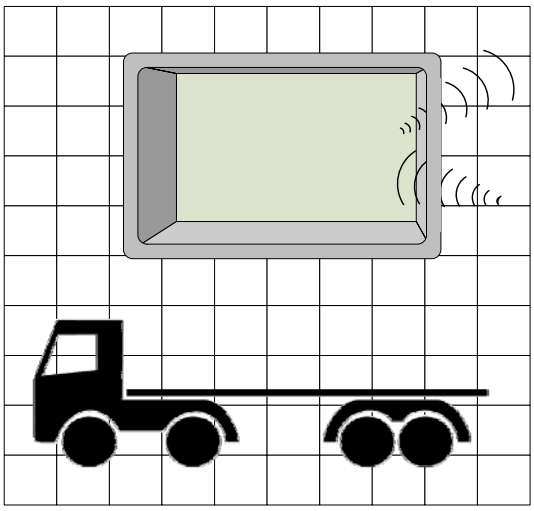


Figure 5-2: Relative size of the structural frame.

In relation to Signal Solutions' offering, the structure is peripheral but very important. On the one hand, the functionality and core offering are housed inside rather than being part of the structure. On the other hand, the system is single-sourced and customer specific, making Signal Solutions heavily dependent on the supplier of the structure to secure supply and fulfil its own orders. Most importantly, the structural frame is a crucial cost driver since it is the single most expensive purchased item across all product platforms. Finally, the structural frame is needed in order to initiate final assembly. Since all components and systems are mounted inside the structural frame, assembly cannot take place unless the system has been delivered.

5.2 HIGH TECH STRUCTURES

High Tech Structures is a manufacturer specialised in producing customised structures from laminate materials. The supplier serves a limited customer base with structures of different shapes and sizes, and varying extent of subassembly requirements. High Tech Structures offers both subcontracting activities according to

detailed manufacturing schedules, and engineering services related to product design concerning their different laminate structures.

The supplier's operations are very resource intensive due to the specialised machinery required for the manufacturing of the laminate structures. The main production steps include cutting and preparing laminate materials, baking the laminates into hardened structures, then testing, painting, and finally assembling the metallic components into the finished structures. Note that there is no assembly line. While the production facility has been designed to optimise production flow, each piece of machinery is individual and it is possible to manufacture very different structures by combining production steps and machinery in different ways. Typically, each structure follows the same flow, but the specific activities undertaken at each work station vary depending on the requirements of the particular structure.

According to the supplier's representatives, the structural frame fits the production context of High Tech Structures very well. Apart from some minor differences in the amount of assembly work, and the metal versus laminate ratio, the equipment used and production process followed is identical for all structures produced by High Tech Structures. Because of these characteristics, the structural frame contributes to improved resource utilisation in the supplier's production facilities. In addition, the skills and competencies of the supplier's employees can be utilised across the entire customer base. Signal Solutions' business is negligible compared to the supplier's more frequent customers. However, because of its small customer base, Signal Solutions is considered very important to the supplier, especially in light of its long term commitment.

There are some important differences between the structural frame and other laminate structures, in relation to supplier operations. First, the operations at High Tech Structures are dominated by high-volume serial production, to ensure full capacity utilisation of expensive equipment. The small volume and infrequent demand related to Signal Solutions' offerings are not well aligned with such operations. Second, the structural frame is the most complex structure produced by the supplier, implying more assembly operations relative to other laminate structures. These two differences, as well as the size of the structural frame, imply that the supplier's production planning is disrupted by every order from Signal Solutions. More importantly, there is unused capacity between customer orders. The financial consequences of these differences are evident in the contractual arrangements, which are described next.

5.3 CONTRACTUAL ARRANGEMENTS

As outlined above, the structural frame supplied by High Tech Structures represents the most long term commitment of Signal Solutions. Originally, the structural frame

was produced internally at Signal Solutions. However, after production of a handful of systems the decision was made to outsource and High Tech Structures became the supplier. Over the years, additional structures have been added to the relationship, and in terms of volume, these structures are more important. However, because of its expensive price tag, the structural frame corresponds to the most value.

The structural frame is customer specific and build-to-order, as are all systems supplied by High Tech Structures. There is clear division of responsibilities. At the time of writing, all business related to Signal Solutions was strictly build-to-print, meaning that Signal Solutions was design responsible, and High Tech Structures manufactured only according to these specifications. The main reason for this setup is the buyer's need to maintain control in-house in order to adapt the product design to customer requirements. Although customer specific modifications inside the structural frame rarely affect the actual structure, substantial coordination and integration efforts are required after every modification in order to ensure and certify functionality in documentation. The supplier has autonomy over the organisation of production and supply, and ownership of manufacturing schedules and assembly instructions. It can choose any suppliers and production methods as long as final output complies with the design specifications. Note that Signal Solutions supported and trained the supplier to set up the original production after the outsourcing decision. Therefore, it influenced the manufacturing schedules.

Signal Solutions orders systems in response to individual customer projects, to ensure that no systems are ordered that cannot be sold. Forecasting demand is difficult, and order patterns are uncertain and fluctuating, due to a very uncertain demand side. Production volumes are extremely low, with orders for structural frames occurring less than annually. These individual transactions are governed by a frame agreement which is renegotiated periodically. However, this frame agreement mainly regulates general legal liabilities and contains standard business clauses. Since Signal Solutions cannot commit to a particular purchasing volume, High Tech Structures cannot commit to a fixed price. Costs fluctuate significantly from order to order due to the low and irregular demand. With no commitment to specific quantities from the buyer, the supplier cannot estimate a fixed price. To compensate for the unpredictable quantities, the supplier has requested exclusivity from the buyer. Although Signal Solutions is not interested in a multiple sourcing strategy, its customers have sometimes asked about the origin of supply of the structural frame. The peripheral importance of the system, coupled with its visibility means the structural frame can become subject to countertrade discussions. For this reason, Signal Solutions wants to avoid exclusivity since this might jeopardise future business.

The variable pricing includes materials and labour costs related to the structural frame. In addition, the frame agreement stipulates some compensation for the

inconvenience associated with the irregular demand pattern. Signal Solutions is subject to a monthly rental fee related to the assembly facilities. This amount is based on covering the costs of unutilised production capacity. Signal Solutions is also responsible for the cost of scrap materials. Laminates are perishable goods with a limited lifetime. The minimum order quantities of material suppliers combined with the low demand imply that a signigicant quantity of the purchased material is not used. The frame agreement also regulates limited liability on behalf of High Tech Structures related to advance purchasing orders and pre-manufacturing. At times, Signal Solutions is forced to order a structural frame before having sealed the customer order, in order to reduce lead time. The frame agreement includes a step-by-step compensation model related to such events, payable to the supplier until Signal Solutions places the firm order.

Finally, the frame agreement regulates the notice period for termination of the frame agreement between renegotiation periods. At the beginning of the data collection period, this notice period was shorter than the lead time for a structural frame. The buyer's representatives described this agreement as risky, since it made it possible for the supplier to end the relationship before delivering already placed orders. There is also a clause that states that High Tech Structures can cancel delivery of a signed order if the contract is terminated by Signal Solutions. This right to cancel orders makes it too risky for Signal Solutions to look for alternative suppliers. The elements of the frame agreement are summarised in Table 5-1.

Table 5-1: Frame agreement with High Tech Structures.

FRAME AGREEMENT ELEMENTS
Short notice period
No volume commitments
No exclusivity
Variable prices
Reimbursement for assembly line rental and scrapped material
No shared risk for advance orders

5.4 RELATIONSHIP ORGANISING

This section discusses how the relationship between Signal Solutions and High Tech Structures is organised. The regular contact pattern involves a small number of people - four supplier representatives and two buyer representatives. The departments involved are depicted in Figure 5-3. In addition to these regular contacts, three people on the technical side of Signal Solutions and one purchasing

representative from High Tech Structures are involved occasionally. The contact pattern is identical across all structures in the relationship. The roles of these representatives are described next.

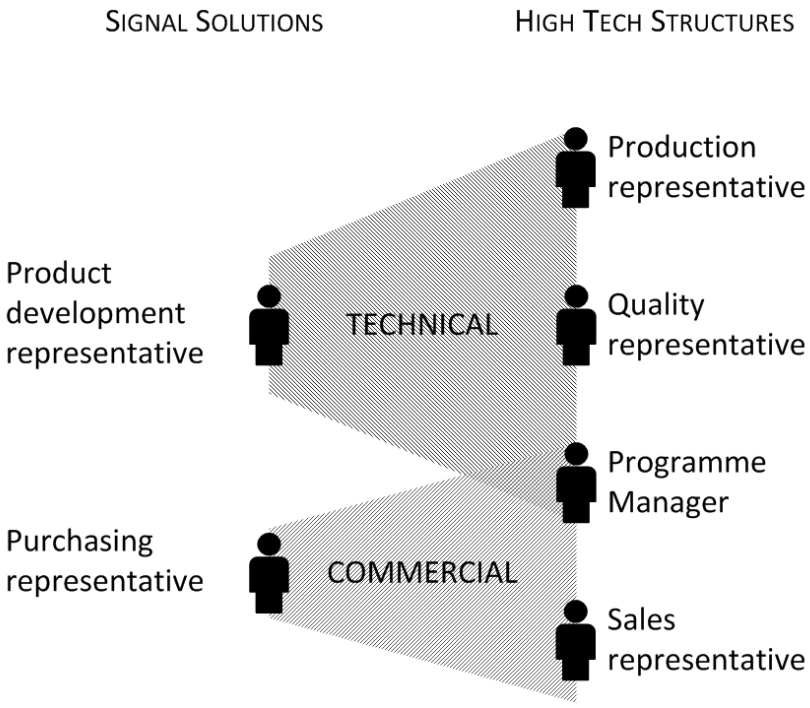


Figure 5-3: Contact pattern with High Tech Structures.

The representatives of Signal Solutions include one member of the purchasing department who is the Supplier Account Manager and focuses on commercial aspects, and a member of the product development department who coordinates technical design of the structural frame, responds to incident reports and conducts delivery inspections.

In High Tech Structures, there is one person responsible for commercial issues related to the sales process, and a programme manager (similar to a Key Account Manager) who coordinates the ongoing relationship. There are also two representatives from production control and quality management. Considering the technical complexity of the structural frame, the contact pattern is simple. However, both parties are satisfied with this contact pattern, claiming that it facilitates identification of who to contact and speeds up response times and every day decision making.

The contact pattern has a clear division between commercial and technical matters. The technical representatives of both buyer and seller emphasised that they have no authority or interest in commercial issues. They deal strictly with technical matters and leave contract and cost discussions to their colleagues. This was apparent during

supplier visits when the technical and commercial people dealt exclusively with their respective issues. The technical representatives expressed satisfaction with this separation; freedom from commercial responsibilities facilitated a more relaxed atmosphere and easier and closer collaboration to resolve technical issues. There is also a distinction related to project duration. From a somewhat simplified view, it can be said that the purchasing and sales people dominate the relationship before orders are placed and thereafter the technical representatives take over. Both buyer and supplier are satisfied with this setup. They claim that a stable design coupled with no expected development tasks requires low levels of coordination between the commercial and technical sides. However, it is interesting that the programme manager at High Tech Structures has responsibility for aligning the technical and commercial sides of the relationship through interaction with both buyer representatives, while the Signal Solutions representatives interact separately with the supplier and had met only infrequently before the observed supplier visit.

During the execution of an order, buyer and supplier are in contact more or less daily to discuss design adjustments, incident reports and costs. This communication occurs mainly via email. Depending on the status of the sales and delivery processes, face to face meetings occur two or three times annually, typically at supplier facilities in order to be close to production. When there are orders in production, the parties will meet more frequently. All face to face meetings is directed by an agenda describing the topics to be addressed and whose presence is required for each item. The visits end with a written summary of decisions made, and deliverables due before the next meeting. These meetings typically are related to individual customer orders and details about contracts, system design, production techniques, warehousing strategies and delivery inspections.

Signal Solutions and High Tech Structures are involved in less intense communication than in the early stages of the relationship. The initial transfer of production from Signal Solutions to High Tech Structures required quite intense technical coordination. Following implementation of the manufacturing schedules at the supplier, less interaction is needed to coordinate the ongoing relationship and the contact pattern was narrowed. There is a hierarchical imbalance between the two parts of the contact pattern. The representatives from High Tech Structures include the head of operations, however Signal Solutions does not have representation even from a departmental head.

In addition to changes to the numbers of people involved in the contact pattern over the long term, both buyer and supplier representatives mentioned the high turnover in the contact people, especially during recent years. In Signal Solutions, eight different people have occupied the position of Supplier Account Manager over a 20 year period, four of these during the two years before the fieldwork, during a period of internal turbulence. On the technical side, there has been more continuity with

involvement of three different people over the course of the relationship. On the supplier's side, the technical representation has been stable with only one change due to retirement. On the commercial side, four different people have been involved over the course of the relationship, most of the changes occurring as a result of recent reorganising. Both parties claim that personal chemistry between individuals is important and agreed that there had been too many changes recently. Several referred to personnel turnover combined with lack of documentation as reasons for losing knowledge about historical events and agreements. However, it is also mentioned that changes of personnel can be an efficient way of creating some momentum, especially on the commercial side where it was claimed that "too good" and "too comfortable" relationships are "bad for business".

5.5 ESCALATING COSTS AND LEAD TIMES

Signal Solutions was one of the first customers secured by High Tech Structures. In the early days of the relationship, High Tech Structures had few other customers. At that time, managing the low volumes and infrequent orders that characterised Signal Solutions' operations represented everyday business for High Tech Structures. However, the demand side of High Tech Structures developed towards large scale operations and the supplier's work processes adjusted accordingly. This development contrasts with the characteristics of Signal Solutions business environment, causing High Tech Structures to perceive Signal Solutions' demand pattern as increasingly problematic.

The inherent stop-start production of the structural frame incurs substantial extra cost for High Tech Structures compared to other customers, since Signal Solutions' orders only occasionally fill up production capacity. Also, not all employees are capable of operating the comparably extensive assembly operations related to the structural frame, which necessitates that the same individuals are used every time. The higher ratio of assembly is not a problem in itself. However, the lack of continuity implies that assembly tends to resemble project-based production, and each order implies a substantial ramping up effort to free up dedicated manpower and prepare the facilities. This issue is covered commercially within the compensation clause included in the contractual arrangements.

The infrequency of the orders is inconvenient for High Tech Structures' sourcing operations. One supplier representative explained that in today's 'world market', suppliers expect to receive large order quantities and often require minimum order quantities. These minimum order quantities correspond to several structural frames, and this particular system is not ordered in such volumes. Due to the limited lifetime of the laminate materials, High Tech Structures needs to scrap large amounts of material. This imposes unnecessary costs that the supplier charges to Signal Solutions. In addition, the infrequent orders result in long delivery times for

materials because most secondary suppliers focus on continuous orders and do not prioritise low volume requests.

Overall, the cost drivers related to the structural frame stem not only from the actual materials and assembly time costs, but from the surplus charges related to the supply management, inventory management and resource management. The combination of a low volume of orders, uneven demand and a large amount of waste forces High Tech Structures to offer Signal Solutions products with longer lead times and at higher prices than for its other offerings. The buyer has always been aware of this cost structure and been willing to compensate High Tech Structures for the inconvenience. However, recent escalations in prices and lead times have led to some dissatisfaction on the buyer's behalf.

For example, the price has increased radically, by approximately 160% over the course of the relationship, with the majority of the increase concentrated in the last ten years. According to the supplier, some of the increase is due to the higher costs of handling the uneven demand pattern and reserving vacant capacity for the structural frame. Some of the increase is explained by more expensive sourcing operations; High Tech Structures claims it has to pay a premium in order to secure supply for the particular structure. However, a large proportion of the price increase is due to internal reorganisation at High Tech Structures, organising its internal operations around individual customer programmes. According to the supplier, this reorganisation has resulted in greater visibility of the costs associated with each particular customer. In light of these developments, High Tech Structures has allocated some previously unallocated costs to Signal Solutions' price in order to maintain a decent profit margin.

In relation to lead times, factory throughput time is about one month for most systems produced by High Tech Structures. However, the lead time for a structural frame is almost two years. About half of this time is due to ordering lead times from material suppliers. Due to the continuous production of the other systems, the sourcing process does not add to the lead times for other customers. In addition, the extensive assembly activities related to the structural frame increases lead times further. Thus, the lead time for a structural frame is significantly longer than for other systems. Also, because of longer sourcing processes, this lead time is increasing. At the time of data collection, the lead time for a structural frame was not synchronised with the delivery times required by Signal Solutions' customers. The throughput time for internal assembly of the offerings related to the structural frame is approximately eight months. Since the official delivery time for these offerings is 24 months, the order for a structural frame has to be placed approximately four months before there is a signed customer contract in order to achieve delivery on time. This lead time problem is illustrated in Figure 5-4.

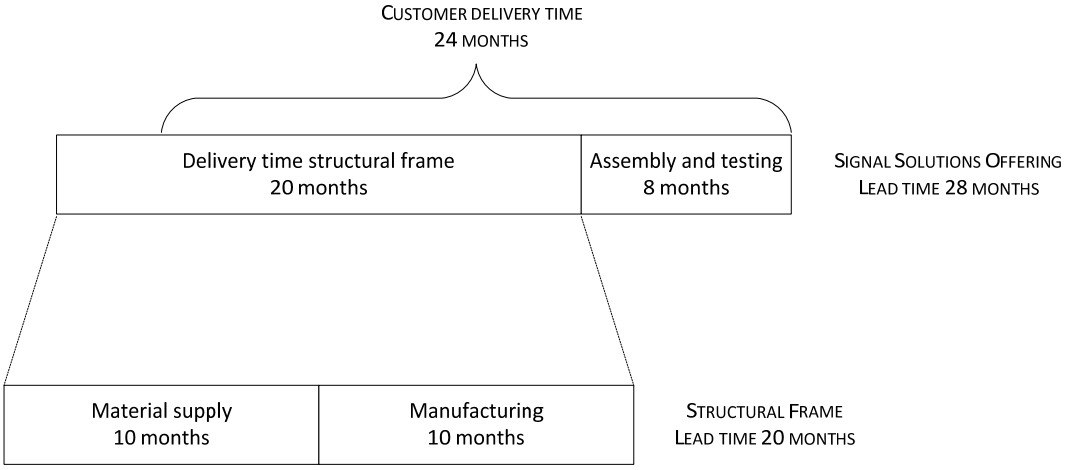


Figure 5-4: Lead times exceeding customer delivery times.

As indicated by the description above, many of the cost and lead time issues originate with the suppliers of High Tech Structures. The choice of material for the structural frame constitutes the main problem in this respect as described below.

5.6 THE MATERIAL PROBLEM

Since the structural frame was originally manufactured in-house, Signal Solutions independently specified and designed the system according to its own capabilities and needs. At the time, the material specified was according to industry standard. Following outsourcing of the structural frame to High Tech Structures, the supplier was purchasing similar materials for all its customer relationships. However, over time, other customers have upgraded their materials as the technology has developed, but Signal Solutions has stayed with its original design specification. Refraining from updating the design works for the isolated context of Signal Solutions. However, over time, Signal Solutions has become the only user globally of the particular material, forcing the supplier to coordinate material supply for the structural frame separately from supply for other customers. High Tech Structures is finding it difficult to manage the variety of materials. It experiences problems related mainly to the cost of ordering several small batches, especially the small volumes related to the structural frame. Because of the high switching costs related to different batches, material suppliers are increasingly unwilling to supply the material and frequently prioritise other customers. To make matters worse, this problem applies to many of the structures supplied by High Tech Structures to Signal Solutions. The product platforms to which these structures apply have all been designed independently and materials differ across the systems. As a result, High Tech Structures needs to handle not one but several unique materials in relation to Signal Solutions. The supplier explained that the material choices constitute a major cost driver in the current design of the structural frame.

In order to reduce the system's costs and lead times, discussions have taken place about whether to change the material specified in the design. The main difference between the original and the new materials is the impact on manufacturability in terms of required temperature and pressure when producing the structures. Therefore, it would be possible for Signal Solutions to change material. This potential redesign would provide major advantages if it resulted in all structures purchased from High Tech Structures comprising similar material. However, the costs of altering the design specifications would be substantial and relate to the testing and documentation needed to verify and certify the modifications. The certification would be challenging because the structural frame needs to be able to transfer signals across its surface. The unique application area means that neither test data nor knowledge regarding these reflectivity properties is available from the material suppliers. In order to perform a material change, Signal Solutions would be forced to collaborate closely with High Tech Structures in order to test the material's characteristics. Signal Solutions possesses crucial knowledge regarding signal transmission, while High Tech Structures could contribute with expert knowledge regarding the laminate materials. Currently, neither buyer nor supplier has expressed interest in engaging in such collaborative efforts and the small purchasing volume of Signal Solutions would make investment in redesigning the structure very risky. The business case demonstrates that for a material change to be profitable, the new material needs to apply for a minimum of 20 years. Previous materials have not had such a long life. It has been concluded that redesign would make sense only if it secured supply. Therefore, the decision has been made to continue with the original material until it is no longer available. When this time comes, representatives from Signal Solutions were clear that the organisation will face huge pressure to execute a redesign effort.

> *"When the material becomes obsolete, all hell will break loose."*
> - PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

To compensate for the difficulties related to the unique material, other attempts have been made to reduce costs and lead times. It has been estimated that lead times could be reduced by nearly half by advanced purchasing orders. In addition, allowing High Tech Structures to pre-manufacture the structural frame and make later customer specific adjustments according to orders would result in further halving of the lead time. This strategy would also reduce costs since less material would be scrapped and the supplier would have more opportunity to plan production. However, both advance purchasing orders and pre-manufacturing rely on formal purchasing commitments, either continuous or in terms of volume, with compensation clauses in the frame agreement. For Signal Solutions, it is not clear how it could finance such commitments or manage the tied up capital. Currently, the project-based financing implies that each customer order has its own budget and the project management

department gives the purchasing department the go ahead to initiate purchases of the structural frame. This isolated project budget hinders initiatives that do not include specific customer orders because the financial resources are not available. This fragmentation would have stalled a material change, even if the business case had been more promising. Although representatives from Signal Solutions referred to the possibility of obtaining finance to fund alternative initiatives, they described decision making outside the established business process as extremely slow, resulting in proactive solutions rarely being accomplished.

5.7 TENSION AND TURBULENCE

Signal Solutions' awareness that its own demand patterns and design specification are driving costs, means it long refrained from asserting pressure on High Tech Structures. The perception in Signal Solutions used to be that the contractual arrangements were necessary to maintain the relationship. However, the fluctuating prices for structural frames were causing serious problems for Signal Solutions relations with its own customers. Since its customers require fixed prices for their tendering processes, Signal Solutions is forced to approximate a structural frame price in its negotiations with the customer. Since the structural frame is the single most expensive system in the offering, these estimates are decisive for the outcome of the customer project. An underestimation substantially impacts on Signal Solutions profit margins while risk avoidance by quoting a higher price could result in lost business.

The failed attempts to alleviate the escalating costs and lead times, coupled with increasing commercial pressure from its own customers, have resulted in frustrations that are eroding the previously well-functioning relationship. The escalating prices for the structural frame are rendering the situation unmanageable. Based on its experience of manufacturing the structural frame, Signal Solutions has estimated the costs associated with its production. After deducting the estimated labour and equipment costs from the price of the structural frame, it is left with concerns that High Tech Structures is becoming too commercially focused. It was suggested that the supplier is deliberately overcharging the company by applying an extremely high profit margin in its calculations. These concerns have been forwarded to the supplier together with a request to share the internal cost structure in order to demonstrate that it is not overcharging Signal Solutions.

"How much can a roll of material cost?"
- PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

High Tech Structures has rejected this request. Its opinion is that the cost structure is proprietary information and that information sharing is suitable for stable business and large volumes since this is where opportunities to jointly shave costs are the

largest. Instead, the supplier argues that it is sufficient to maintain an open discussion regarding the characteristics of the cost structure, without revealing exact figures. According to High Tech Structures, its customer is hiding behind their accusations, refusing to suffer the consequences of its product design and demand characteristics. It is implicated that while Signal Solutions does understand that the low volumes and unique materials mean extra costs, it is drastically underestimating the financial impact of these challenges. The supplier has expressed concern over Signal Solutions' complacency related to the outdated design of the structural frame. Among the representatives of High Tech Structures, it is incomprehensible that its customer is not devoting resources to upgrade the design. They feel that Signal Solutions are preoccupied with short term deliveries when they should be focusing on long term solutions. Furthermore, it was argued that the price fluctuations would be less problematic if Signal Solutions collaborated to assist High Tech Structures with its production planning. While Signal Solutions does share plans, estimations and forecasts with High Tech Structures, the supplier claims that these forecasts are highly pessimistic until the moment the contract is signed. Then a pessimistic forecast, becomes a rush order.

> *"The prognoses provided are so pessimistic that it is justified to question whether there is a relationship at all."*
> - HEAD OF OPERATIONS, HIGH TECH STRUCTURES

A series of events caused these latent tensions to erupt, and in 2009 the relationship was seriously jeopardised. It started with a decision by senior management in Signal Solutions to formally investigate alternative suppliers and expose supply of the structural frame to competition. This decision was prompted by the identification of a neighbouring business unit to Signal Solutions as a potential supplier. It was expected that this alternative supplier would be able to offer better prices and contribute to risk sharing related to advance purchase orders. This neighbouring business unit expressed interest in taking on supply and was invited to take part in a tendering process. Meanwhile, the project management department at Signal Solutions decided to be proactive in the relationship with High Tech Structures because the escalating costs were jeopardising the target costs in customers' projects. In an effort to exert some authority in the relationship, it informed the supplier that it was now in competition with other suppliers.

High Tech Structures reaction was immediately to formally notify Signal Solutions of its intent to terminate all contracts. The head of operations describes the reasons behind this tough move. Before the price increases, the sales figures compared to the inventory and work in progress were not acceptable. In his opinion, the business would not have been at all profitable had High Tech Structures not increased the commercial focus in the relationship. In this context, Signal Solutions message was

very disturbing. It caused the supplier to question the possibility of maintaining a well-functioning relationship and to emphasise this concern, the supplier felt obliged to respond strongly to the exposure to competition. High Tech Structures was also well aware of the problems that would be inherited by any replacement supplier. As specialists in laminate production, High Tech Structures could accurately identify its major competitors and was very able to estimate the costs associated with switching supplier. On the basis of this knowledge, the supplier was comfortable in pursuing its commercial standpoint. In case this strategy backfired, it was anticipated that a more stable customer could be found that would better contribute to filling production capacity. While the Signal Solutions contract contributed to overall costs in the facilities, the supplier had since long been considering to not extend the frame agreement, should an opportunity arise to replace Signal Solutions with long term serial production.

Meanwhile, Signal Solutions began to realise that switching suppliers would be difficult. First, switching costs were unexpectedly high, corresponding to 150% of the price of a structural frame, based on the need for an alternative supplier to develop new manufacturing schedules, assembly instructions and test rounds. These switching costs were not in harmony with small production volumes, rendering the business case for changing supplier far from promising. Second, the alternative suppliers' prices were similar to those of High Tech Structures and were accompanied by a list of restrictions that reduced the attractiveness of their offers. The quotes were indicative of the fairness of High Tech Structures' prices, making it difficult to justify a change. Third, the potential neighbouring business unit lost interest because it was taken aback by the costs associated with the structural frame. It transpired that it was difficult for the alternative supplier to develop a good business case.

Having formally jeopardised the relationship without succeeding in changing suppliers, Signal Solutions was obliged to renegotiate its frame agreement with High Tech Structures. Fortunately, the renegotiations made it possible for both parties to address some of their concerns related to the previous agreement. For example, at the time of writing, High Tech Structures has exclusivity of supply for the existing systems. However, Signal Solutions was able to limit these terms to exclude contracts conditioning supply origin, and there is a contract clause that states that High Tech Structures will transfer manufacturing documentation to the other supplier in these cases. The contract termination clauses have been updated to reflect delivery lead times and allows placement of a final order in case of termination. Finally, High Tech Structures have agreed to fixed prices for all structures except the structural frame. In exchange, the contract specifies a certain order volume and requires Signal Solutions to pay a premium if the agreed order quantities are not realised. The elements of the revised frame agreement are presented in Table 5-2.

Table 5-2: Elements of the renegotiated frame agreement.

REVISED FRAME AGREEMENT ELEMENTS
Longer notice period and obligations upon termination of either party
Order quantities with compensation clause
Exclusivity with some restrictions
Fixed prices except for the structural frame
Reimbursement for assembly line rental and scrapped material
No shared risk for advance orders

The revised frame agreement was signed in late 2010. Following the negotiations, tensions have subsided. Although many of the terms in the new contract constitute major improvement, the root causes of the difficulties remain. For example, the new contract has an expiry date, and the risk remains that High Tech Structures will find a customer that better contributes to filling production capacity. Similarly, Signal Solutions is still considering changing supplier after the next contract period. Finally, the material supplier could terminate production of the outdated material at any point in time. If the material becomes obsolete, Signal Solutions has a serious problem. The critical incidents over the course of the relationship between supplier and buyer can be found in the timeline in Appendix IV.

This chapter has described the dealings between Signal Solutions and High Tech Structures. Despite a long term commitment between buyer and supplier a great deal of tension built up over the course of the relationship. Both parties are questioning the relationship. The case analysis aims to make sense of these problems drawing on the analytical framework developed in Chapter 3.

5.8 CASE ANALYSIS

Analysis of each of the three relationships in this study is structured in line with the three research questions, with minor deviations. Because of interplay between the organising issues, some of them are analysed together. For example, the similarities and complementarities of activity configurations are addressed in connection to division of design and manufacturing responsibilities. Furthermore, although the analyses mainly stay within the respective sets of organising issues, some overlap occurs between the sets and in relation to the theoretical framework on internal and relationship organising. For example, the nature of the buyer-supplier interface that constitutes an important issue in relationship organising is used to explain the similarities and complementarities in the activity configurations. In addition, it should be emphasised that although all organising issues are relevant to each of the

three studied buyer-supplier relationships, each analysis focuses on the most relevant issues in the relationship, in order to avoid unnecessary repetition.

First, the impact of the partitioning principles on 'what' is organised across company boundaries is analysed in Section 5.8.1. Second, the influence of bridging use and produce contexts on 'what' is organised across organisational boundaries is analysed in Section 5.8.2. Third, actor involvement and its effect on 'who' is organising is analysed in Section 5.8.3, taking account of the findings from the analysis in the previous sections.

5.8.1 PARTITIONING PRINCIPLES

To recap the definition of partitioning principles in Chapter 3, they refer to similarities and complementarities in activity configurations, division of responsibilities between buyer and supplier, design principles applied and capabilities of buyer and supplier. In this section, the partitioning principles are analysed in terms of their implications for the organising of manufacturing activities across company boundaries and the connection between design and manufacturing activities.

Organising Manufacturing Activities Across Company Boundaries

In the case of the structural frame, the design of the system was determined long ago, when the system was still manufactured in-house. When manufacturing of the structural frame was outsourced to High Tech Structures the supplier received detailed instructions on how to manufacture the system. Signal Solutions maintained design responsibility while the supplier performed manufacturing activities according to detailed directions, much like a subcontractor. Such relationship characteristics are described in the literature as 'specified' interfaces. This division of responsibilities was explained by the fact that system design had to be coordinated with the remainder of the product offerings, due to the integral design characteristics of the structural frame and the offering of which it forms part.

The division of labour between Signal Solutions and High Tech Structures has consequences for the activity configuration related to the offerings of Signal Solutions. Since the design of the structural frame is an internal matter, the boundary spanning activities are related to manufacturing activities. Figure 5-5 shows that manufacturing activities of the structural frame (denoted by the letter M), must be coordinated with subsequent assembly of the product offering at Signal Solutions (represented by the letters A). Because of the encapsulation role of the structural frame in Signal Solutions' offerings, it is not possible to initiate assembly activities at the buyer before delivery of the structural frame. Therefore, there are complementarities between the manufacturing activities of the supplier and the assembly activities of the buyer. Moreover, because of the customer specific features of the structural frame and the order-based production system of the supplier, there is

close complementarity between the activities. The other arrows in the figure describe the manufacturing of other systems that are assembled into the structural frame. While the assembly operations related to these systems have to succeed manufacturing of the structural frame, they can be manufactured independently of it.

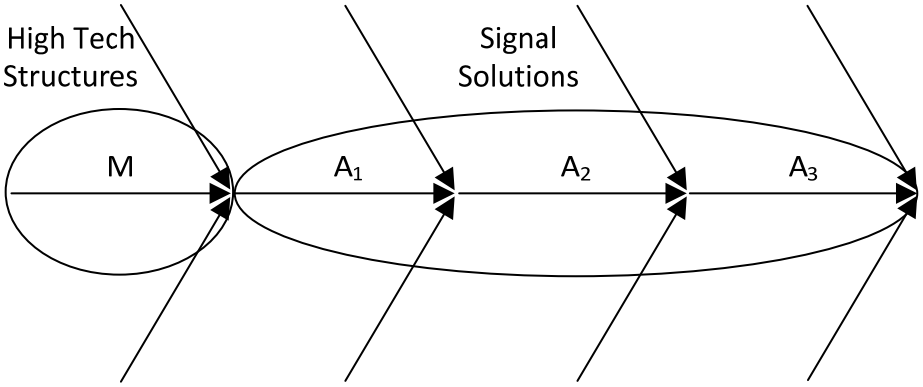


Figure 5-5: Closely complementary manufacturing and assembly activities.

The close complementarity between the manufacturing activities of High Tech Structures and the assembly activities of Signal Solutions has consequences for the coordination of these activities with one another. The close complementarity implies that the operations of buyer and supplier are tightly interlinked such that assembly activities at Signal Solutions are heavily dependent on manufacturing activities at High Tech Structures. Because of the long supplier lead times, it is difficult to coordinate these activities. For example, interviewees described how material supply accounts for approximately half of the total lead time for a structural frame. These lead times derive from the close complementarities between the manufacturing activities of High Tech Structures and their suppliers because the material used to make the structural frame is unique to Signal Solutions.

Buffering systems would facilitate the material supply that caused the long lead times. The logic behind this reasoning is that the close complementarity between the manufacturing activities related to the material and the subsequent manufacturing of the structural frame could be alleviated through inventory management. Alternatively, representatives of Signal Solutions and High Tech Structures discussed the possibility of pre-manufacturing the structural frame in order to reduce the close complementarity between the manufacturing and assembly activities. These potential initiatives represent adjustments to administrative activities to modify current activity configurations. However, as discussed later, the current actor involvement does not allow for such activity adjustments.

Since many upstream suppliers favour order-based production and lean manufacturing principles, lead times could become extreme. For many purchased

systems, the sourcing operations of suppliers represented most of the delivery lead time.

Organising the Connection Between Design and Manufacturing Activities

Many of the challenges related to the manufacturing of the structural frame derive from the design of the system. From the perspective of Signal Solutions, the system design is well adapted to the overall product architecture and prevailing business conditions. The buyer decided to spend as little as possible on stabilising the design from one customer project to another, arguing that low volumes increase these costs disproportionately compared to additional expenditure on integrating adaptations manually from one case to the other. There is no coordination across product platforms to consolidate design features since the need to maintain flexibility in relation to customers and the large redesign costs are not perceived to be offset by cost savings.

However, in relation to the characteristics of supplier operations, the design of the structural frame is not effective. The 'specified' interfaces between Signal Solutions and High Tech Structures imply that the specification and design activities (denoted by the letters S and D) of the buyer are directing the manufacturing (represented by the letter M) activities of the supplier, as illustrated in Figure 5-6. These detailed directions imply that the manufacturing activities of the supplier have to be adjusted to the design activities of the buyer rather than the other way around. In the case of the structural frame, the unique features of the system design reduce the similarities in the operations of High Tech Structures. While there are similarities in terms of the general manufacturing activities necessary across all the systems produced by the supplier, the unique material and higher level assembly work related to the structural frame call for differentiation in manufacturing activities. This differentiation is responsible for the escalating costs and lead times.

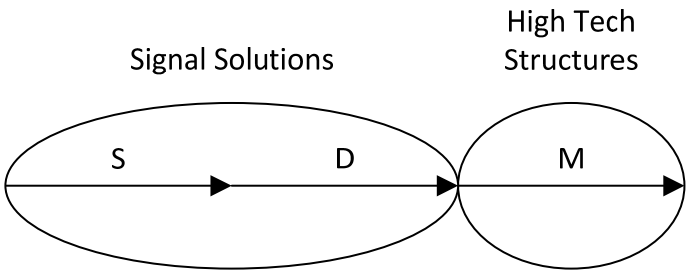


Figure 5-6: Specification and design activities directing manufacturing activity.

Because of the implications of the design activities in relation to manufacturing activities, adjustments to design activities were identified as a potential way to improve the activity configuration related to the structural frame. For example, both Signal Solutions and High Tech Structures emphasised that redesigning the system to include a more standardised material option would radically reduce both costs and

lead times. However, because of the integral design characteristics of the structural frame, it is unclear how such a change would influence the offering of Signal Solutions. Furthermore, there are limited opportunities to accomplish a redesign due to the low order volumes which would make it difficult to attain a return on such an investment. In this respect, the limited potential for commonality across product platforms, caused by the unique features of the size and shape of the structure across the offerings, makes it difficult to influence the business case.

The analysis shows that the capabilities of Signal Solutions and High Tech Structures are crucial for the activity configuration, in relation to both past developments and current opportunities. Buyer and supplier both possess capabilities that support the current division of responsibilities and have contributed to its existence. Beginning with Signal Solutions, it is specialised in the functional characteristics of the structural frame and how to integrate it into its offerings. Also, the buyer's previous production related capabilities have dissipated over time following outsourcing of the manufacturing of the system. High Tech Structures possesses expertise in laminate materials and their production, implying that it understands how to realise a design, but has limited capabilities related to the design functionality. Since Signal Solutions is responsible for the design, it can be argued that the structural frame has been designed without considering its effect on the manufacturability of the system. This reasoning is supported by the problems associated with the current activity configuration. In order to redesign the system, the capabilities of High Tech Structures are important to complement Signal Solutions' knowledge relating to functionality and integration. The supplier possesses vital knowledge regarding material characteristics and production expertise necessary for the design of the structural frame to be improved.

Having analysed how the partitioning principles impact on 'what' is organised across company boundaries, the next section analyses bridging between use and produce contexts related to the structural frame.

5.8.2 Bridging Use and Produce Contexts

The bridging of use and produce contexts concerns the combining of physical and organisational resources and mixed resource interfaces. The analysis in this section focuses on physical resource combining across company boundaries. First, the differences in use and produce contexts are analysed together with the adaptations necessary to bridge these differences. Second, the opportunities to economise on scale and scope and integration are analysed in relation to the structural frame. Organisational resources are closely associated with actor involvement. Therefore, connections between organisational entities and their impact on physical resources are addressed in Section 5.8.3.

Organising Physical Resources Across Company Boundaries

Since the design of the structural frame is controlled by Signal Solutions, the buyer controls the technical and functional features of the system. While the physical resource characteristics of the structural frame are decided by Signal Solutions, these product features impact on the capabilities and facilities of suppliers, because of resource combining across companies. These resource constellations spanning several companies constitute the need to align physical resources in order to bridge use and produce contexts. When analysing the use and produce contexts of the structural frame, several differences between the two emerge. On the produce side, the capital intensive equipment used makes it necessary to utilise the production resources as much as possible. As a result, both High Tech Structures and its suppliers have arranged their operations around large batches and serial production in order to achieve economies of scale and scope. On the use side, production volumes are low and characterised by substantial customisation and irregularity. These differences drive costs which are passed on to Signal Solutions. This analysis shows that although the laminate structures that are produced by the supplier are unrelated to each other, they become interdependent due to the fact that they share production facilities. Similarly, the characteristics of the material used in the structural frame are translated to requirements in the facilities of the material supplier that are also used for other purposes.

The differences between use and produce contexts have increased over time due to developments outside the relationship between Signal Solutions and High Tech Structures. While the physical resource characteristics of the structural frame have remained similar throughout the relationship duration, developments have occurred in the business environment of High Tech Structures. The importance of the supplier's other customers has increased over time, causing High Tech Structures to continuously adapt its facilities towards a mass production environment that is less suited to the production of the structural frame. Furthermore, the evolving product specifications of other customers have rendered the material specified into the structural frame outdated. Since these materials share production facilities at the material supplier, these developments represent disadvantageous for Signal Solutions. Hence, while the use context and the relationship arrangements between buyer and supplier have remained unchanged, developments in the produce context have reduced the opportunities for the structural frame to contribute to resource utilisation in suppliers' facilities. These developments highlight the importance of the network context of relationships.

Organising and Economies

In the bridging of use and produce contexts, economising was identified as a crucial aspect in the analytical framework. It was explained how three different economic logics apply to the resource combining across company boundaries.

The structural frame purchased from High Tech structures is an example of reliance on economies of scale and scope. Although the structural frame is manufactured exclusively for Signal Solutions, it still contributes to the capacity utilisation of the supplier because of similarities related to the operations of High Tech Structures. The original motivation for outsourcing the manufacturing of the structural frame was that the supplier could produce the system more cost-efficiently compared to Signal Solutions, due to overall cost sharing in the facilities of the supplier. However, while contributing to overall resource utilisation in the resource base of High Tech Structures, the potential for economies of scale and scope differs depending on the level of detail in the specification underlying the structural frame. An overly detailed specification can still provide more economies of scale and scope than the buyer could have achieved with its own resource collection while still including unexploited opportunities for scale advantages. The material specified for the structural frame is an example. Not only does the unique material require High Tech Structures to conduct supply operations independently of other customer needs, the lack of durability of the materials results in huge amounts of scrapped material between orders. In addition, the relocation of manpower that is required to respond to each new order interrupts the supplier's operations. The lack of shared resource utilisation has caused prices to more than double, emphasising the importance of economies of scale and scope in the operations.

Both buyer and supplier representatives discussed the possibility of modifying the physical resource characteristics of the structural frame in order to improve resource utilisation in High Tech Structures. Improved resource utilisation applies to both the manufacturing equipment and the capabilities of the supplier in terms of work procedures. Because of the unique physical properties of the structures that are purchased from the supplier, it is not possible to consolidate the designs across all product platforms of Signal Solutions. However, there are opportunities for harmonising certain components. The material specification was identified by relationship representatives as the most promising area for improvements in the resource utilisation of the supplier, either across the offerings of Signal Solutions or also in relation to other customers of High Tech Structures. However, investment in redesign activities is costly, and the low volumes related to the structural frame make it difficult to see a return on such investment. Although redesign would increase the resource utilisation of the supplier, it would be difficult for the buyer to achieve sufficient scale advantages related to the redesign effort to justify the initiative.

Economies of integration also constitute an opportunity in the production of the structural frame. The escalating lead times are a result from unexploited opportunities to benefit from the coordination of physical material flows. An improvement discussed by relationship representatives was to initiate a more regular order flow in order to enable High Tech Structures to better plan its operations.

Coordinated activities would make it possible to reduce lead times because advance purchasing orders would allow the supplier to utilise its resources more freely in relation to the activities of Signal Solutions. The improved economies of integration that would follow from such activity adjustments would improve both delivery precision and costs by avoiding rush orders at premium prices. Furthermore, both High Tech Structures and the material supplier could schedule their operations related to the structural frame for when there was available capacity. The increased resource utilisation that would follow from such opportunities would further reduce the costs related to the structural frame. These findings apply to all three studied relationships.

The opportunities to exploit economies of scale and scope and economies of integration are dependent on the organisational resources in terms of the social and administrative features that allow for adaptations to physical resources constellations. The actor involvement in the organisational entities with the power to make such resource adaptations is analysed next.

5.8.3 ACTOR INVOLVEMENT

As outlined in the analytical framework, the interactions among actors enable social and administrative connections between organisational entities. Actor involvement determines 'who' is organising activities and resources across company boundaries.

The analysis of actor involvement comprises three sections. First, actor involvement required to mobilise the supplier is analysed in terms of the interests of buyer and supplier and the control mechanisms used to handle these priorities. Second, the connections between organisational entities across company boundaries are addressed to analyse the functional priorities that are governing the relationship. Third, the role of actor involvement in combining physical and organisational resources in mixed resource interfaces is discussed.

Mobilising the Supplier

The actor interactions between Signal Solutions and High Tech Structures can be characterised as a long term, low involvement commitment relationship. There is a substantive relationship in terms of relationship specific investments between buyer and supplier because of the customised design of the structural frame. However, this investment is not protected by inter-organisational control mechanisms. The only control mechanism in place between buyer and supplier is the contractual arrangement between the two parties. This contract does not include social or administrative features that serve the interests of Signal Solutions or High Tech Structures. For example, there are no volume commitments, no fixed prices, no sales forecasts, and no exclusivity clause. Although there are indications of shared cost drivers between buyer and supplier, there is no open book policy, cost split-ups or trade-off techniques to reduce costs.

The current level of interaction and involvement between Signal Solutions and High Tech Structures provides limited opportunities to resolve the problems of escalating costs and lead times. Both parties have discussed whether to increase involvement in the relationship by investing in joint problem solving. In order to increase resource utilisation in the supplier's operations, it has been suggested to either redesign the structural frame or allow for pre-manufacturing and advance purchase orders through volume commitments and more transparent planning. However, such endeavours would require buyer and supplier respectively to share sales forecasts and cost split-ups respectively. Also, more 'interactive' interfaces would be required to improve the design of the structural frame through mutual adaptations. At the time of writing, neither buyer nor supplier was interested in engaging in the heavy relationship investments needed to realise these opportunities. There was not sufficient incentive for Signal Solutions and High Tech Structures to share proprietary information and commit additional resources. As a result, the relationship is in a deadlock. In order to improve the relationship, extended interaction would be required to share information across company boundaries. However, the current actor involvement is blinding the parties to the benefits of such extended interaction.

The analysis reveals that the interest between two parties in a relationship is determined by their concurrent interaction with other actors in the business network. Thus, the position of the relationship in the business network impacts on the mobilising efforts necessary between buyers and suppliers. High Tech Structures' interest in the relationship with Signal Solutions depends on the commitments with other customers. Initially, Signal Solutions was its most important customer and the supplier was willing to centre its operations around this business, and saw no problem with Signal Solutions' dictating design and business conditions. Over time, other customers have become increasingly important which has made it difficult for Signal Solutions to mobilise the interest of the supplier. Changing priorities in planning and executing their operations caused the costs related to the structural frame to escalate. Since Signal Solutions is very dependent on High Tech Structures, the supplier is able to transfer any extra costs incurred to the buyer. The situation is the same for material supply. The other customers of the material supplier indirectly affect the opportunities for High Tech Structures to secure material supply for the structural frame. The more material that is ordered by these other customers, the less priority is given to the special material for the structural frame. The material orders of other customers are increasing the lead times and price for Signal Solutions' material.

Actor Interaction Across Organisational Entities

The interaction between Signal Solutions and High Tech Structures involves several organisational entities. Six people from different departments at buyer and supplier interact with each other on a regular basis. In terms of the breadth and depth of the

interaction, the analysis reveals a rather narrow contact pattern. At Signal Solutions, only two departments are represented in the relationship with High Tech Structures. The functional priorities in these interactions centres on operational matters related to individual orders rather than strategic issues.

The contact pattern between buyer and supplier can be described as 'stratified' because of the separate communication channels between technical and commercial issues. The majority of the interaction involves communication between the respective Account Managers. Although the relationship includes a technical representative from Signal Solutions, there is limited coordination between this person and the Signal Solutions' Supplier Account Manager, within or outside of the relationship. The purchasing representative is responsible for the relationship, while the technical representative claimed to have more of an operational role with no decision making authority. At the time of data collection, there was no steering committee or other cross-corporate forum in place for communicating commercial and technical matters for which the Supplier Account Manager and technical representation are responsible.

It could be argued that there is a 'marketing coordinated' contact pattern since the Key Account Manager in addition to commercial issues also oversees technical content as programme manager for the structural frame. This is a rather recent development. Before the internal reorganisation at High Tech Structures, its internal organising implied 'stratified' communication patterns. The supplier representatives argued that this more cohesive organising has made the costs associated with individual programmes more visible so that the supplier has allocated more overhead costs to its customers.

At the outset of the relationship between Signal Solutions and High Tech Structures, there were more actors involved in the interactions across company boundaries. During the transfer of manufacturing activities from buyer to supplier, contact patterns between the two companies were elaborate. Following the substantial knowledge transfer accompanying the outsourcing of the structural frame, the interactive buyer-supplier relationship was scaled down to just managing the simple procedures related to commercial deals and quality inspections. This is because supply is considered more stable since the initial implementation of specifications and production schedules. A narrow contact pattern is considered sufficient and requires fewer resources to organise the relationship. The involvement of fewer people in the relationship interface makes continuity more important. Reference was made to the high turnover in the contacts involved over the years. Both buyer and supplier representatives claimed that this turnover of personnel had resulted in problems related to coordinating social and administrative features between the companies.

The narrow contact pattern between Signal Solutions and High Tech Structures requires that subsequent coordination internally is well functioning in order for information and decision making to be appropriately communicated within the contact pattern. While it can be assumed that the link between internal organising and inter-organisational interactions is always important, it is especially crucial in the case of a narrow contact pattern. Figure 5-7 depicts the restricted connection between cross-functional interaction and cross-corporate interaction. The left side of the figure denotes the cross-functional interaction at Signal Solutions and is recapitulated from the description of a customer project in Chapter 4. The right side of the figure signifies the contact pattern between buyer and supplier as described in Section 5.4.

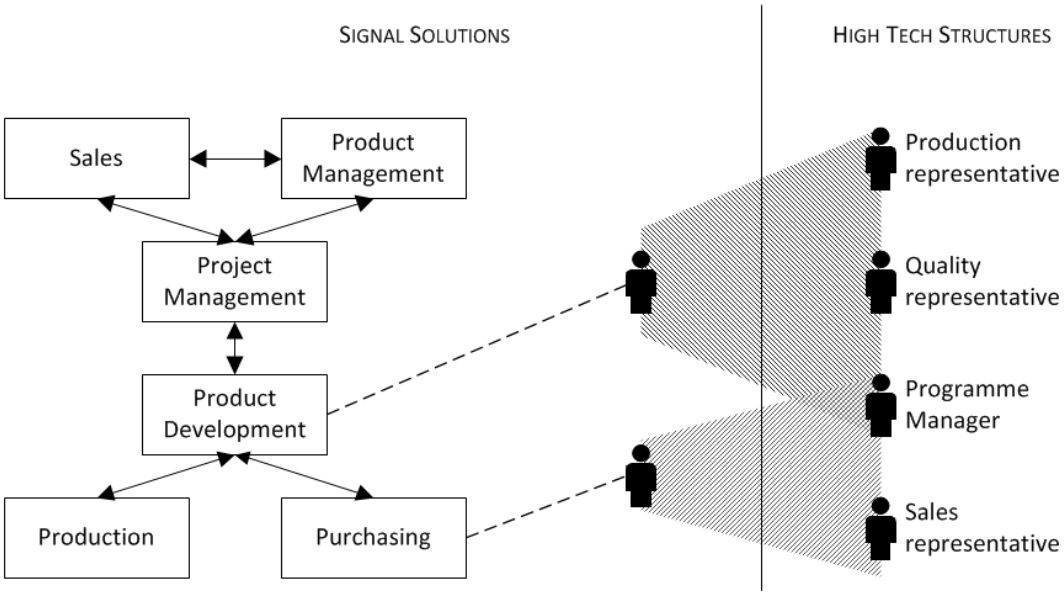


Figure 5-7: Cross-functional interaction restricting cross-corporate interaction.

The cross-functional interaction related to the structural frame represents the traditional prioritisation in Signal Solutions since the latest organising initiatives have not influenced the relationship with High Tech Structures. Figure 5-7 shows that the buyer's representatives are from the product development and purchasing departments, company functions that are mainly directed by financial assets and instructions provided by the project management department's functional priorities. This implies that the individuals involved in contact with High Tech Structures have limited authority and status within the organisation and lack connections with the functional areas that emphasise long term, strategic decision making, such as the product management department. For example, the purchasing representative is involved in the contact pattern with High Tech Structures to secure supply and negotiate prices and commercial terms, often on the basis of individual customer projects. Project managers do not have the financial power to authorise minor investments such as advance purchase orders in order to meet their project deadlines,

unless they have a signed customer contract and then only within individual customer projects. This limitation makes major redesign efforts unrealistic even if they would be profitable in the long run. Therefore, although daily communication in the relationship with High Tech Structures is well-functioning, the absence of people auhtorised to make decisions limits the opportunities for strategic change.

There is no close coordination internally between commercial and technical aspects. Work processes are clearly divided into 'before contract' and 'after contract'. The emphasis is on individual customer projects, so few people possess the knowledge required to connect technical and commercial matters across individual projects. The product management department is the organisational entity responsible for these matters. However, as Figure 5-7 shows, they are not involved in the relationship with High Tech Structures, either directly or through social and administrative links. Unofficial company representatives occasionally interfere on their own initiative in order to solve problems or insert authority into the relationship. Due to lack of coordination internally regarding the connection between commercial and technical matters related to the structural frame, these initiatives are not always well informed as exemplified by the project managers who decided to expose High Tech Structures to competition. These actions contributed to tensions between buyer and supplier and jeopardised the relationship.

Organising Mixed Resource Interfaces

The organising that takes place as a result of actor interactions across organising entities plays an important role in the development of mixed resource interfaces. This is because the development of physical resource constellations is dependent on social and administrative features that are enabled by organisational resources. For this reason, the connections across organisational entities analysed above can be related to opportunities and limitations in the physical resources.

First, the current connections between cross-functional communication and cross-corporate interactions, fragments understanding about how technical requirements influence commercial terms, an important mixed resource interface. Signal Solutions is unaware of the requirements that drive costs and developments in the external business environment of High Tech Structures. The main source of dissatisfaction in the buyer is lack of understanding about how the system design and lack of planning opportunity affect the supplier's bottom line. This lack of awareness on behalf of the buying company makes it difficult to identify problems in the relationships. Had the internal coordination at Signal Solutions been better, the commercial impact of the technical problems might have been more visible allowing more potential to exploit supplier resources.

Second, the current relationship setup provides limited opportunities for the supplier to exploit economies of scale and scope related to the structural frame, and the

current actor involvement provides few opportunities for improvement. Regardless of the knowledge enabled by the current interaction patterns, the internal budgeting system of Signal Solutions reduces the opportunities for changes to the current resource constellation. The low level of coordination across projects and product platforms makes it difficult for relationship representatives to attract the funding necessary to invest in design changes that would increase the resource utilisation of High Tech Structures and the material supplier. The buyer representatives in the relationships are neither responsible for the design of the structural frame, nor do they possess the financial assets necessary to establish administrative adaptations that might compensate for problems in the resource constellation. The strong project focus hinders redesign of the structural frame. Without judging the appropriateness in not harmonising the material choice in the structures purchased from High Tech Structures, the absence of commitment from product management is pivotal to this outcome. Similarly, the unexploited potential for economies of integration is explained by the lack of a budgeting system that would enable pre-manufacturing, advance purchase orders and volume commitments.

Third, the limited relationship involvement between High Tech Structures and Signal Solutions has prevented proper diagnosis of the problems underlying the escalating costs and lead times. The narrow contact pattern between the parties reduces the opportunities to adapt the buyer's and supplier's resources to achieve a more favourable arrangement. Because of the limited contact pattern, neither buyer nor supplier has the opportunity to acquire a better understanding of the problems experienced or the perspectives of the other party in relation to combining resources across company boundaries. This lack of understanding has contributed to growing tensions and frustrations in the relationship. For example, Signal Solutions expressed concern over price increases, questioning the rationale for the costs associated with using a unique material. High Tech Structures expressed frustration regarding the limited resources committed to maintaining and upgrading the design of the structural frame. These views are grounded in a lack of understanding of the logic behind economies of scale and scope in the respective parties' resource bases. More importantly, the limited interaction between Signal Solutions and High Tech Structures makes it difficult to change the current resource constellation, since there is not enough involvement between Signal Solutions and High Tech Structures to affect the accompanying investments and sacrifices. Neither party is currently willing to share proprietary information or engage in collaborative efforts to exploit each others' capabilities jointly. While it makes sense to commit less resources to organising a stable relationship, this case analysis illustrates that very limited contact patterns restrict the opportunities to explore and exploit opportunities for further resource adaptations. In this respect, there is a trade-off between organising for routine communication and problem solving versus organising for strategic and long term concerns in the organising of contact patterns.

5.8.4 'WHAT' IS ORGANISED AND 'WHO' IS ORGANISING?

This section summarises the relationship analysis in terms of 'what' is organised and 'who' is organising across company boundaries.

Beginning with 'what' is organised, the analysis shows that in relation to the structural frame, it is the manufacturing and assembly activities that require organising across company boundaries. In the organising of these activity links, the design of the structural frame was shown to be important because of its substantial impact on the opportunities for the supplier to benefit from economies of scale and scope in the exploitation of its facilities and capabilities. In this case, Signal Solutions was directing the design, thereby influencing the manufacturing activities of High Tech Structures and limiting the opportunities for resource utilisation in the latter's facilities. The analysis reveals how these circumstances contribute to escalating costs and lead time.

In terms of 'who' is organising, the analysis identifies a narrow 'stratified' contact pattern between Signal Solutions and High Tech Structures. A more extensive contact pattern would be necessary to jointly accomplish adjustments to the current activity configuration and resource constellation. The analysis shows that the strong project focus in Signal Solutions impacts on the organising of resources and activities across company boundaries. Although the purchasing department and technical representation were most influential in the contact pattern, their limited organisational authority internally made it difficult to effect strategic change in the relationship.

While the current combining of physical and organisational resources in the relationship between Signal Solutions and High Tech Structures enables routine communication and problem solving within individual customer projects, the analysis shows that there are limited opportunities to develop operations outside this context.

6 THE TWO ELECTRONIC DEVICES

The two electronic devices purchased from Secure Communications play a key role in the offerings of Signal Solutions. The buyer-supplier relationship between Signal Solutions and Secure Communications is one of Signal Solutions most recent ones. Its intentions were strategic and initially the relationship seemed to be promising. However, internal turbulence at Signal Solutions caused an unexpected turn in the relationship and even jeopardised the business with the supplier.

The chapter is organised as followed. First, the two electronic devices are described in Section 6.1, followed by a description of Secure Communications and its operations in Section 6.2. Section 6.3 describes the business arrangements between buyer and supplier and Section 6.4 discusses the relationship organising. In Sections 6.5-6.7, the design problems and lacking sales volumes, leading to the formal breach of contract, are outlined. The chapter concludes with an analysis of the relationship and its organising in Section 6.8.

6.1 SYSTEM FEATURES

Both of the electronic devices supplied by Secure Communications deal with data management and signalling and have similar characteristics to a computer. The devices comprise hardware and software and an encapsulating chassis.

The standardised electronic device consists of four electronic subsystems that are assembled into a metal box casing, and a user interface with buttons and handles, and also sockets and connectors for cables and electric power. The standardised electronic device provides half of a functionality that is crucial for Signal Solutions' offering and, therefore, interacts closely with its main features which are designed and manufactured in-house. For this reason, the standardised electronic device needs to be integrated into the offerings after delivery. Since the space inside the structures is limited, the physical size and shape of the standardised electronic device needs to be coordinated with adjacent systems. There is also an electronic interface. This interface converts the voltage of the electronic device and ensures that the information derived from the electronic device can be interpreted and used by the other systems. This requires the design of the electronic device to be coordinated with the product platforms in which it is integrated. After design specification, little coordination is necessary between the production activities of buyer and supplier. The standardised electronic device can be mounted at almost any point in time.

The customised electronic device is a data management tool that interfaces between sending and receiving signalling devices. It constitutes a separate and complementary application to Signal Solutions offerings and is sold separately. Although the customised electronic device is able to communicate with Signal Solutions'

offerings, it does not require any internal assembly or integration after delivery. The customised electronic device has similarities with the standardised electronic device in consisting of electronic components and a user interface. However, in the customised electronic device these are enclosed in a plastic rather than a metal housing, and there is also a separate visual display. The features of the two electronic devices and their roles in Signal Solutions' offerings are illustrated in Figure 6-1. The standardised electronic device is depicted to the left and the customised electronic device is portrayed to the right.

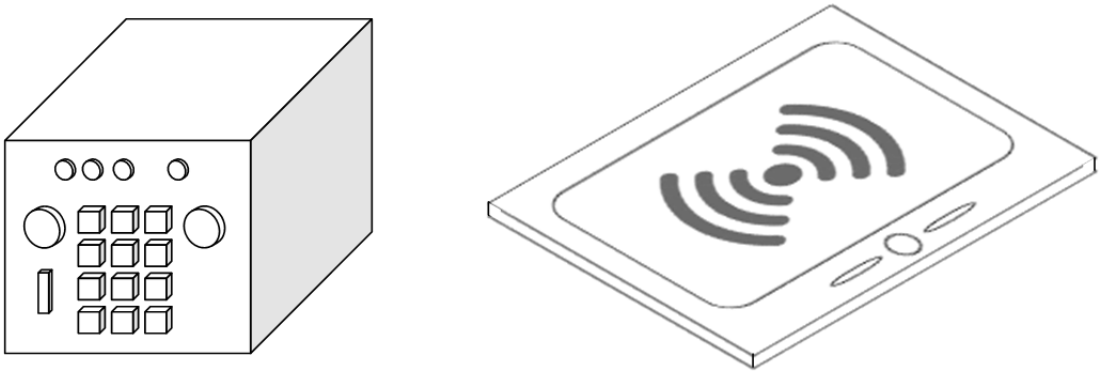


Figure 6-1: Simplified illustrations of the electronic devices.

The electronic devices belong to different product platforms from the structural frame. The standardised electronic device is used in three product platforms, which differ in their design requirements and how they are physically integrated into the offerings. In one product platform, the electronic device is closely integrated with adjacent system interfaces and, therefore, single sourced as part of a long term buyer-supplier relationships. In the other two product platforms, the design is less integrated, making it easier to switch suppliers depending on customer and price requirements. At the time of writing, Secure Communications was supplying both these product platforms. A handful of offerings from these product platforms are delivered annually, with the result that there is much more regular supply of the electronic devices compared to the structural frame. Signal Solutions has two other active supplier alternatives that are used in parallel with Secure Communications because the standardised electronic devices constitute such an important part of the offering, which means that regularly rather than exceptionally the product specifications include details that directly or indirectly govern supplier brand.

As a result of lack of industry standards, Signal Solutions has to make adaptations to the electronic configuration and software interfaces when integrating the standardised electronic devices into their offerings. These integration efforts represent huge investments for each new supplier brand. It has been suggested that in order to reduce these costs, a standardised box could be designed that would transform the variable design parameters while simultaneously representing a

physical fit with adjacent systems in the product offering. However, at the time of writing the business case for such a solution was not viable due to low sales volumes. This problem is not unique to the electronic devices, but is a recurring agenda item. Meanwhile, Signal Solutions' new base line offerings include a fixed number of standardised electronic device brands suggested as options and the condition that the customer pays for all deviations related to this base line. The standardised electronic device purchased from Secure Communications is included in the base line offerings.

The customised electronic device currently applies to only one product platform, but there are plans to modify it to operate with other product platforms. Although the one current product platform is one of the more frequently ordered ones, the customised electronic device constitutes an application to this offering that not all customers are interested in. At the time of data collection, the customised electronic device had been developed for one specific customer project, and only one additional customer had expressed interest in purchasing it. Since this electronic device is customised, it is single sourced.

6.2 SECURE COMMUNICATIONS

Secure Communications is a global actor supplying communication solutions for a range of industry settings. These solutions include both hardware and software, and they range from individual items to large networks of connected devices. Secure Communications distinguishes between private ventures and customer funded projects. It has a portfolio of products that are offered globally and includes the standardised electronic device that is supplied to Signal Solutions. The supplier also offers customised product development and systems integration for individual customers, which includes the customised electronic device that was designed and developed for Signal Solutions. Secure Communications is well accustomed to both types of businesses. Although its customers include a large variety of industries, the supplier is very familiar with the particular industry of Signal Solutions – and has an entire business segment dedicated to similar customers.

All Secure Communications' operations rely on more or less build-to-order production; no items are sold off the shelf. Even the standardised portfolio items require customer configuration. However, the supplier relies on modular solutions as much as possible in order to be able to deal with variety cost-efficiently. For example, the hardware in the standardised electronic device is standardised so that all configuration applies to the software. The software is modular to allow all functionalities to be available for activation through a fixed set of adjustments, depending on specific customer needs. Also, although there is currently only one version of the customised electronic device, the supplier proactively designed it to be reconfigurable to interface with many different communication devices.

The main characteristic of Secure Communications' production is the flexibility that is designed into its operations. The production facilities are dominated by assembly activities and testing procedures designed in manufacturing cells and ranging from small scale operations to mass production, depending on customer requirements. Most production is outsourced to suppliers. Apart from some automated test equipment there is little heavy machinery. There are opportunities to shift between manual and automated production, depending on the scale of the operations. The two electronic devices supplied to Signal Solutions illustrate the variety inherent in the supplier's operations. The standardised electronic device is produced in a large scale manufacturing cell with rather advanced testing procedures. Due to the standardised design, economies of scale and scope are ensured because the expensive testing equipment is shared across all customers. In comparison, the customised electronic device represents a very small contract. It is a less complicated item with the number of ingoing components in the hundreds rather than the thousands related to many other products. The assembly of this device is completely manual, including testing procedures. Considering the comparably small volumes purchased by Signal Solution, this operational environment is described as well suited to its needs, especially in relation to the customised electronic device.

To ensure flexibility and efficiency of operations, Secure Communications has adopted lean manufacturing principles as have many of its suppliers. These principles imply that there are negligible buffers in the production system, with the result if Signal Solutions places an order for a system that is not in active production, there are no components in stock in many supplier tiers. It was explained that at least 80% of current lead times stem from sourcing and subcontracting operations. The continuous production flow for the standardised electronic device implies few problems in relation to the lean manufacturing principles. However, for the customised electronic device the minimal inventory levels extend lead times since a ramp up is required for every order. Signal Solutions representatives claimed that, being a small customer, their orders are not usually prioritised by Secure Communications and their suppliers. On the contrary, they suspect that their orders are constantly used to rush deliveries for more volume intensive customers. According to supplier representatives, they often collaborate with the customers by sharing the risks and costs inherited with advance purchases and consolidated stock orders when lead times constitute a problem. However, Signal Solutions has so far had limited ability to contribute a share of financial resources for such joint efforts.

6.3 CONTRACTUAL ARRANGEMENTS

The business relationship between Signal Solution and Secure Communications is a recent one. It was established in 2006 as the result of a chance meeting at a trade fair, of two of these companies' representatives. The people in question quickly recognised that their respective companies' needs matched, and decided to initiate an

interaction. Thus, the idea of the relationship was not based on any particular product or contractual obligation.

Following some initial discussions, it was evident that the relationship was promising since both parties had the potential to complement one another and satisfy one another's demands. On Signal Solutions' part, the objective was to rationalise the supply base and become less dependent on individual suppliers. In this respect, Secure Communications constituted an alternative supplier for technologies where current suppliers were underperforming, both technically and commercially. Signal Solutions explicitly desired to secure supply through more long term and stable collaboration with a new supplier. Also the corporate belonging, previous investments and large product portfolio of Secure Communications provided the opportunity for Signal Solutions to benefit from its technical capabilities in future development projects. On Secure Communications' part, the supplier wanted to reduce its dependence on the regional market and considered a connection with Signal Solutions as providing an avenue to business in Signal Solutions' domestic area and associated export markets. In this respect, the potential of business opportunities within the wider corporate group of Signal Solutions was particularly attractive. This expectation of mutual benefits moved the initial relationship quickly towards partnership. It was decided that Secure Communications would support Signal Solutions in developing their technological needs, while Signal Solutions would open the door to new markets. As partners, it was agreed that market information, revenue streams and future development opportunities would be shared. The relationship progressed rapidly and the first contract for the standardised electronic device was signed in 2008. Shortly afterwards, the customised electronic device was added to the relationship content.

The relationship with Secure Communications was established at a time when Signal Solutions had decided to develop a set of standard contract terms that would apply to all its suppliers rather than the separate negotiation and transactions formerly in use. Secure Communications was one of the first suppliers to agree to the frame agreement, which consisted of an umbrella agreement with general trading terms that included for example exclusivity arrangements and termination clauses, and a special purchasing agreement relating to volumes and fixed prices. The supplier found this setup attractive, since it could be used for all business units within Signal Solutions' corporate group. It was considered that such an agreement would improve the potential for additional business with other business units.

Although both electronic devices operate under the same frame agreement, the division of labour and financial arrangements differ slightly between the two electronic devices. The standardised electronic device belongs to the internally funded product portfolio of Secure Communications, implying that it is responsible for both design and manufacturing. After Signal Solutions specifies its needs, Secure

Communications identifies and suggests the most appropriate device from its existing product portfolio. There are no volumes stipulated in the purchasing agreement for the standardised electronic device. However, in exchange for exclusivity, in all situations when a specific supplier brand is not requested, Secure Communications has agreed to fixed prices based on the volume indications provided by Signal Solutions.

In contrast, the customised electronic device is based on a detailed design specification from Signal Solutions. Secure Communications is responsible for realising the design and developing a manufacturing plan. This development task is included in a fixed price agreement, where Secure Communications covers all the costs associated with development in exchange for a long term commitment and a small development grant. In order to improve the business case beyond the estimated volumes expected from Signal Solutions, the contract stipulates that Secure Communications can offer the device to other customers. The most important elements in the formal and informal agreements between buyer and supplier are summarised in Table 6-1.

Table 6-1: Business arrangements with Secure Communications.

FORMAL AND INFORMAL ARRANGEMENTS
Supplier fulfilling future technology needs in exchange for access to new markets
Potential for more business with neighbouring business units
Shared market intelligence
Fixed prices and informal volume commitments
Exclusivity with restrictions
Buyer funding part of design of customised electronic device

6.4 RELATIONSHIP ORGANISING

The contact pattern between Signal Solutions and Secure Communications consists of a strategic steering committee that governs the relationship, and day to day interactions between individuals.

Beginning with the cross-corporate steering committee, its composition has changed over time, which has caused problems in the relationship between Signal Solutions and Secure Communications. In this section, the original setup is described, while the changes to it and their implications are discussed in Section 6.6. The steering committee, originally composed by three representatives from each side of the relationship, represents the formal connection between buyer and supplier. Signal

Solutions' membership included one commercial representative from the newly established Partner Management function within the product management department. This person was responsible for the initial contact with Secure Communications and was the internal point of contact at Signal Solutions. There was also a representative from the purchasing department, who was responsible for developing the frame agreement. The third member was from the product development department and was responsible for technological coordination of the electronic devices.

Secure Communications' membership included two salesmen, one dedicated to new sales and one responsible for fulfilment of ongoing projects, who also represented the Key Account Management role. The third member was from engineering and had responsibility for technical aspects. The members of the original steering committee and their interaction are depicted in Figure 6-2.

The steering committee meets around three times a year, usually in a neutral venue located geographically between buyer's and supplier's facilities. The meetings always include all six steering committee members, and both technical and commercial matters related to individual orders are discussed, as well as more strategic and long term matters. When buyer and supplier representatives were asked for their views on the composition of the original steering committee, they described constructive discussions that enabled both technical and commercial matters, and good interaction based on good match of knowledge areas, seniority and personal chemistry.

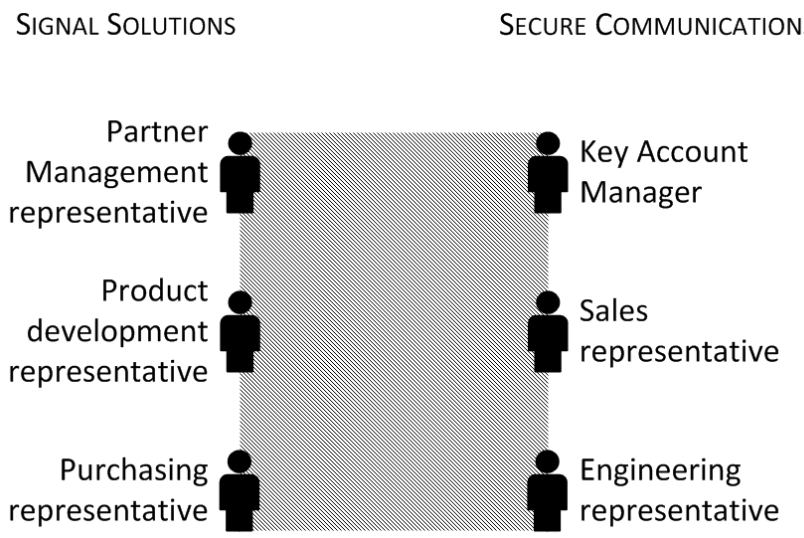


Figure 6-2: The original contact pattern with Secure Communications.

Informal connections involve several individuals who interact on a daily basis. These contacts include direct communication between individuals, and interactions predominantly between project managers and engineers. According to

representatives of both parties, there are several well-functioning individual relationships across company boundaries. To illustrate, one of the supplier's representatives had more than a dozen business cards from people employed by the buyer. Most of the associated relationships were informal. However, the steering committee can also promote contacts between people or summon employees to attend steering committee meetings as necessary. Communication between Signal Solutions and Secure Communications is daily on average, via either telephone or email. However, the extent and nature of the interaction varies depending on the status of ongoing projects. In proximity of customer orders, deliveries or problems, interactions are likely to be more detailed and more frequent. Also, early in the relationship, negotiation of satisfactory design specifications involved substantial cross-functional and cross-corporate interaction. The objective of interactions related to the standardised electronic device was to ensure that the supplier understood the technical specifications required to allow the system to be integrated in the offerings. Communication related to the customised electronic device centred mostly on finding a good balance between design specification and manufacturability.

Finally, there are corporate group level connections which are important for the relationship between Signal Solutions and Secure Communications. After the Procurement Council in Signal Solutions' corporate group took the decision to identify strategic suppliers, Secure Communications was appointed a group partner. The appointment is based partly on the business with Signal Solutions, but is related mostly to its contribution to the development of a new product generation in one of the core business units. The contract was awarded to Secure Communications based on the introduction and recommendations from Signal Solutions. The fact that Secure Communications is a group partner has consequences for relationship organising at business unit level. First, there is a Partner Account Manager who is responsible for coordinating the relationship at group level. In this particular case, the Supplier Account Manager at Signal Solutions was appointed to this position. However, it could have been a person from a completely different business unit. Second, this partner account manager reports directly to the Procurement Council which has decision autonomy, implying that neither the members of the steering committee nor Signal Solutions has the final say in the relationship. Third, at the time of data collection, there were expectations of the appointment of a centralised group level steering committee with connections to top management. It was this expectation of group level coordination that was persuasive in Secure Communications forging the initial relationship with Signal Solutions. The appointment of Secure Communications as a group partner has had an impact on the relationship with Signal Solutions, as described in Section 6.7.

6.5 PROBLEMS WITH THE CUSTOMISED ELECTRONIC DEVICE

Despite a promising start to the interaction between Signal Solutions and Secure Communications, the relationship has not developed in line with the original intentions.

The problems started when Secure Communications was approached by Signal Solutions and asked to bid for the development of the customised device. The supplier initially turned down the offer as it was judged to be too risky an endeavour to develop this particular product at the set fixed price and lead time. Secure Communications anticipated major design problems because of the product specification and the short time span. It was only after a great deal of persuasion that the supplier agreed to take on the task. Secure Communications decided that its agreeing to taking on this assignment would signal its intent to partner with Signal Solutions to supply future technological developments. It decided to honour the agreement in anticipation of future benefits from the partnership.

"We said no but they came back and said that it was the wrong answer – three times."

- KEY ACCOUNT MANAGER, SECURE COMMUNICATIONS

However, development of the customised electronic device has been rife with problems mainly related to failed quality inspections and environmental tests which demonstrated that the system did not fulfil the design specifications. Problems were experienced with humidity related to the separate visual display, and overheating in the hardware. The effect of these problems and their solution has been to delay final delivery of the customised electronic for more than a year. At the time of writing, the system had been delivered but was still plagued by quality problems.

Although the supplier formally assumed full responsibility for the problems experienced, the supplier's representatives claim that many of the issues could have been resolved earlier had the supplier been allowed to follow their familiar standard procedures related to realising customer specific designs. However, Signal Solutions pressured the supplier to shorten its standard development time and rush the delivery. This meant that Secure Communications skipped the prototype phase including its normal trial and error procedure. When later discovering that the pressure for a short lead time was agreed in the negotiation with the final customer, the supplier stated that it would have reconsidered its offer had it been privy to this information.

"We are responsible for our shortcomings. But they pressured us to cut corners in our development processes."

- HEAD OF ENGINEERING, SECURE COMMUNICATIONS

In addition to the problems related to short development time, Secure Communications asserts that there were other problems for which it should not be held accountable. Although formally responsible for realising the design, the supplier claimed there were ambiguities in the design specification which make it difficult to assign full accountability to the supplier. In addition, most of the problems experienced derived from a purchased component that Secure Communications claims was chosen in collaboration with Signal Solutions. For these reasons, while accepting responsibility for remedying the quality problems, the supplier wants more investigation into why these quality problems arose in the first place, especially since it had foreseen the difficulties and had been hesitant about assuming the design task. According to the supplier's representatives, Signal Solutions' response was far from satisfactory; the buyer's representatives laid most of the blame on Secure Communications asserting that the supplier was simply unable to deliver according to design specifications. The buyer's representatives were eager to emphasise the awkward position that these failures had put them in, in relation to their customer.

The quality problems incurred a substantial additional workload not anticipated when the fixed price agreement was formulated. These extra costs have significantly worsened the business case related to the customised electronic device. This has been exacerbated because the delays also resulted in missed business opportunities for the customised device, causing Secure Communications to lose additional business that would have contributed to compensating their investment. The supplier explained that these substantial losses would have resulted in bankruptcy were the company not part of a larger corporate group.

"It's been a mixed bag, but mostly very disappointing."
- PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

At this point in time, Secure Communications was confident that honouring its commitment would be rewarded in the long run. It was anticipating future benefits from the relationship that would more than offset the problems experienced in the development of the customised electronic device. However, the supplier's representatives expressed unhappiness about Signal Solutions' willingness to honour its part of the agreement.

6.6 LACKING ORDER VOLUMES AND CHANGED CONTACT PATTERN

Following the chaotic situation surrounding the delayed delivery of the customised electronic device, Secure Communications was expecting orders to come in that would enable some level of financial recovery from the initial investment in the relationship with Signal Solutions. According to the supplier, it was the volumes promised informally that made the initial investment worthwhile.

However, it was soon apparent that the forecasted volumes had been exaggerated. At the time of data collection, the actual order volumes for both devices amounted to 10% of what had been indicated. Part of this deviation can be blamed on the delayed delivery of the customised device and the global financial crisis. However, the supplier claims that these elements do not account for the entire shortfall and believes that the sales volumes were grossly overestimated in order to achieve a promising business case. Its suspicions were confirmed in part by Signal Solutions. Representatives of the buying company describe how the forecasted orders suggested to Secure Communications far exceeded sales even in a really good year. It also seems not to have communicated that the exclusivity agreement was more a formality than a real guarantee since the set standard has been overruled in almost every customer project. For example, a major customer of Signal Solutions recently asked it to rank supplier brands. According to the frame agreement, Signal Solutions ranked Secure Communications as number one, but the customer decided to go for the supplier ranked 8th in the list. Such occurrences make it even less likely that Signal Solutions will reach the overestimated volumes. Since the volume commitments are outside the formal contract, there are no penalties attached to failing to realise them. However, the fixed price was based on this anticipated order level, which leaves Secure Communications in the lurch, and obliged to supply at costs that are unrealistic in the face of actual business volumes.

Meanwhile, the steering committee membership changed unexpectedly, causing Secure Communications to question Signal Solutions' intentions concerning the relationship. Following the dissolution of Partner Management, the Supplier Account Manager on the steering committee was replaced by a strategic purchasing representative. Since the Partner Management group had been the driving force of the relationship, this change was not negligible. At about the same time, the purchasing representative, who had been pivotal in development of the frame agreement, left the company and was replaced by someone else. Figure 6-3 illustrates the shift in Signal Solutions' steering committee membership.

"We are told that it is business as usual and that there are no changes. But it sure feels that way. All the good intentions sort of fizzled out."
- KEY ACCOUNT MANAGER, SECURE COMMUNICATIONS

According to representatives from Secure Communications, many informal commitments left the relationship with the loss of these people. They also said that the attitudes of the new members contrasted sharply with those of their predecessors. The supplier asserts that the nature of the relationship changed to the detriment of all collaborative intentions. The purchasing representatives are described as following the terms and conditions by the letter, with a much more short term and tactical focus than their predecessors. Although the level of seniority has remained the same, the

supplier's representatives claim that the new contact people lack both organisational power and internal communication channels. The supplier claims to have lost all of its former channels of communication over long term technological development and access to market intelligence. Secure Communications is convinced that the change can be explained by the differences in departmental membership of the new and old representatives. It is interesting that although their levels of seniority are the same, the product development representatives of the supplier refer to those of the purchaser as more junior.

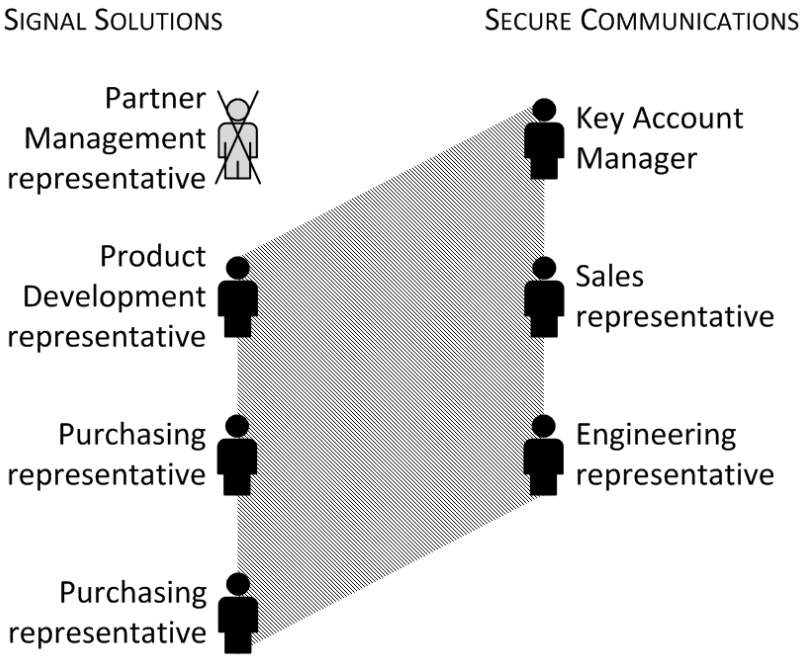


Figure 6-3: Changed contact pattern with Secure Communications.

However, the new buyer representatives reject this. They claim that their organisation is built on a number of roles that operate regardless of departmental belonging. According to the new members, nothing is different in the relationship.

6.7 FORMAL BREACH OF CONTRACT AND RENEGOTIATIONS

Over time, the unfolding relationship has implied increasing frustration on the part of Secure Communications. To the supplier, it is clear that Signal Solutions' behaviour contrasts sharply with the initial declarations. According to supplier representatives, there are many incidents that demonstrate that there is no partnership. For example, despite all the unexpected costs associated with the customised electronic device, Signal Solutions refused to pay anything towards alleviating the supplier's liquidity concerns until the final customer had formally approved the product. Furthermore, although at the outset it had been promised that Signal Solutions would share market knowledge with Secure Communications, the latter quickly found that it was difficult to obtain information about future orders and needs. Finally, despite the low volume

orders and problematic beginning, Signal Solutions has proved far tougher than many other customers over commercial terms, technical performance, delivery precision and customer support requirements. Although the supplier is complying with all its requirements, it feels insecure about future business from Signal Solutions.

"They promised us a partnership and now they are treating us with this subcontractor bullshit."

- SALES REPRESENTATIVE, SECURE COMMUNICATIONS

For the above reasons, what was once considered a promising partnership, at the time of data collection was described by Secure Communications as a superficial relationship. The supplier's representatives find it incomprehensible that such a promising and formalised initiative could have gone so wrong. What is most disappointing is not the changes that have occurred, but the frustration of the complete lack of communication on the matter from the buyer despite the many obvious signals that something is wrong. According to the supplier the partnership relation that was realised was definitely one-sided, and there are many unresolved issues and much bad feeling. In light of the diminished relationship that Secure Communications claims it is experiencing, the supplier describes feeling deceived.

Secure Communications faced financial difficulties. Its top management had begun to question the relationship with Signal Solutions and to criticise the deal related to the customised electronic device. They were putting pressure on the supplier representatives to increase their commercial focus and cut corners in relation to the investment. In addition, negotiations with a neighbouring business unit to Signal Solutions had reached a crossroads and there was uncertainty about whether Secure Communications would be awarded a long term contract. Up to that point, the supplier had been tolerant of the absent order volumes because of this future business opportunity. However, when this became uncertain, Secure Communications decided to put pressure on its relations with Signal Solutions.

The relationship began really to deteriorate when Signal Solutions wanted to buy a spare part for an outdated standardised electronic device at the agreed fixed price. Although the contract clearly stipulated that the buyer was entitled to order single units at a fixed price, Secure Communications decided to reject the order. The explanation given was that it had promised to deliver single units because the expected high future volumes would cover the extra costs incurred. In light of the missing volumes, it was not possible to honour the agreement without losing even more money. The decision not to deliver was a formal breach of contract. The buyer was offered the chance to cover the actual costs of resuming production of the outdated device. This event is the first visible demonstration of the supplier's discontent with Signal Solutions. Signal solutions, for their part, instead of conceding

that their overestimation of volumes clearly made the legal terms unrealistic, threatened to enforce the contract.

The second demonstration of discontent occurred shortly thereafter when Signal Solutions notified Secure Communications of its intent to configure the customised device to be compatible with additional products. In order for Signal Solutions to negotiate with its customers, it requested Secure Communications to provide it with cost estimations. Normally, the supplier would supply cost estimations free of charge. However, this time it required Signal Solutions to either commit to an upcoming order or pay for all the costs incurred by this enquiry. A similar course of events followed Signal Solutions' request for a quotation for supplying the standardised electronic device for another product platform.

The third demonstration came when Secure Communications declared that it would no longer supply the electronic devices at the fixed prices in the purchasing agreement. The supplier claimed that the umbrella agreement was developed on the basis of a partnership. In the absence of any signs of a partnership existing, the contractual terms were judged as unrealistic. Instead of fixed prices, the supplier required that each sale would require traditional commercial arrangements and case by case negotiations. In these negotiations, Secure Communications decided to escalate its prices by more than 100% to reflect actual costs. Owing to customer requirements and the recent investment associated with integrating a new standardised electronic device, Signal Solutions had little choice but to accept the new terms. Describing the relationship as anything else than highly infected at this point in time would be an understatement.

"We asked them to give us a quotation and they came back with a go-to-hell offer."

- PURCHASING REPRESENTATIVE, SIGNAL SOLUTIONS

In response to all these events, Signal Solutions initially decided to act tough, and turned to other suppliers thus exposing the relationship to competition. At the first opportunity, Signal Solutions responded to the inflated quotation from Secure Communications by declaring its intent to award the contract to another supplier. Unfortunately, this declaration turned out to be somewhat premature. After closer examination, it was found that the alternative supplier brand differed so widely that the integration costs would far exceed the higher price offered by Secure Communications. Also, the alternative offered lower performance, implying that not all future customers would find it satisfactory. To confuse matters even more, the Procurement Council reacted to the tension between Secure Communications and Signal Solutions and signalled to the Partner Account Manager that maintaining a well-functioning relationship was crucial. It was decided to approach Secure Communications in an attempt to renegotiate the frame agreement.

After lengthy discussions, both parties agreed to give the relationship another chance. The frame agreement and accompanying fixed price arrangement were adjusted. First, the prices were increased by some 25% and actual volumes were stipulated in the contract. This guaranteed compensation to Secure Communications should promised order volumes not materialise. In exchange, the agreement was extended, committing the parties to a longer contractual relationship than in the original agreement. At the time of data collection, Signal Solutions had signalled its willingness to compromise by awarding Secure Communications 'authorisation to proceed' for a number of orders although they had not formally been placed.

The most important events in the relationship between Signal Solutions and Secure Communications are depicted in the timeline in Appendix IV. In the next section, these events are analysed with the help of the analytical framework.

6.8 CASE ANALYSIS

Similar to the first relationship analysis, analysis of the relationship between Signal Solutions and Secure Communications follows the structure of the three domains in the analytical framework. First, Section 6.8.1 analyses the partitioning principles in terms of their effect on 'what' is organised. Second, the analysis focuses on bridging between use and produce contexts in Section 6.8.2. Third, actor involvement and its impact on 'who' is organising across company boundaries is addressed in Section 6.8.3, taking into consideration the findings from previous two sections.

6.8.1 PARTITIONING PRINCIPLES

The analysis of partitioning principles in relation to Secure Communications focuses on organising of design activities in line with the division of labour between buyer and supplier. Following this, the connection between these design activities and manufacturing activities is analysed.

Organising Design Activities Across Company Boundaries

Both the standardised and the customised electronic devices are systems whose design is outsourced to Secure Communications. Therefore, the boundary spanning activity links in relation to these offerings concern design activities that require coordination across company boundaries. The nature of these activity links differs between the two systems, depending on relationship interfaces between buyer and supplier.

For the customised electronic device, Signal Solutions provided Secure Communications with rather detailed specifications and the supplier was responsible for realising the design accordingly. Hence, the supplier is more than a subcontractor that manufactures according to specifications, but design still originates from Signal Solutions. While there are opportunities for the supplier to provide feedback on the specification, Signal Solutions has full decision control over the final design. This

setup resembles a 'specified' buyer-supplier interface more than a 'translation' one. Although the customised electronic device constitutes an application applied to the offerings of Signal Solutions rather than being an integrated part, the buyer directed the design of the system in order to maintain control over the communication between the system, and the offerings with which it interacts. As a result of these 'specified' interfaces, the design of the offerings at Signal Solutions directly impacts on the design of the customised electronic device at Secure Communications, via the design specification. The adjustments to design activities in the supplier are depicted in Figure 6-4 which shows how the design activities (represented by the letters D) of the buyer govern the design activities of Secure Communications. While the supplier is accustomed to realising designs and creating manufacturing plans, the limited opportunities to adapt the specifications, initially made Secure Communications reluctant to take on the design task. In addition, the short time frame forced the supplier to cut corners and deviate from its standard procedures. It is plausible that these issues contributed to the subsequent quality problems in the design operations.

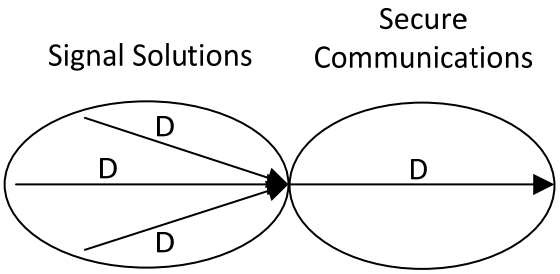


Figure 6-4: Buyer's design activities directing supplier's design activity.

For the standardised electronic device, design of the system is carried out independently by Secure Communications as part of its standardised product portfolio. Signal Solutions purchases the system by selecting the appropriate device from this portfolio. While all systems are calibrated for each customer before delivery, these relationship characteristics resemble that of a 'standardised' buyer-supplier interface. This setup allows the supplier to benefit from similarities in its operations, and these conditions translate to cost-efficient systems purchased for Signal Solutions. However, as illustrated in Figure 6-5, standardised design activities on behalf of the supplier imply adjustments to the design activities related to the buyer's product offerings. For example, adjacent systems have required redesign in order to fit with this particular standardised electronic device. These activity adjustments impose challenges because of the many supplier brands requested by customers. Since the functionality of the standardised electronic device is both important to and highly integrated into the key value as perceived by customers of Signal Solutions, the brand and specification of the system are subject to individual customer requirements. Therefore, although the supplier's design activities are

standardised, design activities at Signal Solutions often need adjustments from one customer project to the other, to integrate different types of systems.

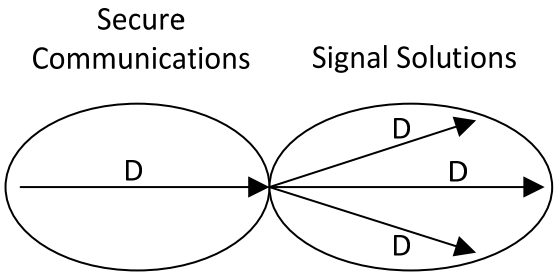


Figure 6-5: Supplier's design activity directing buyer's design activities.

Because of the integral design principles applied in the offerings of Signal Solutions, design adaptations affect all its offerings, making adjustments to design activities a particularly cumbersome task. The integration of new devices into the offerings is associated with countless man hours. In fact, for the most integral offerings, integration work becomes so extensive that buyer representatives expressed reluctance to switch suppliers despite poor supplier relationships, in order to avoid additional adjustments to design activities. In contrast, Secure Communications is able to satisfy different customer requirements with similar design activities, due to modularity in its electronic devices. The supplier does not have to adjust its design activities from one customer to another.

Organising the Connection Between Design and Manufacturing Activities

The specification and design activities are not only related to each other, they also have connections with the manufacturing of the electronic devices. For both systems, the supplier's manufacturing operations are flexible and therefore characterised by similarities despite customised manufacturing activities.

In terms of the standardised electronic device, all systems follow the same manufacturing procedure. Since Secure Communications maintains control over specification, design and manufacturing activities (represented by letters, S, D and M in Figure 6-6), the supplier has been able to adjust these activities to fit perfectly with each other. The openness of the design specification is important in this respect as the supplier is able to adjust the design activities to the manufacturing activities and vice versa. Also, the modular design principles allow the supplier to offer variety based on similar manufacturing activities. Thus, modularity reduces close complementarity, since manufacturing activities become closely complementary only after final configuration for the individual customer.

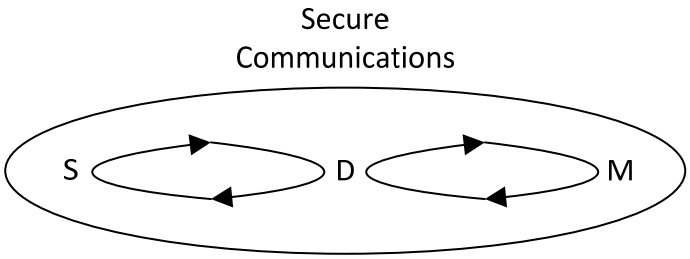


Figure 6-6: Mutual adjustments between specification, design and manufacuring activities.

There are fewer similarities in these operations for the customised electronic device compared to the standardised electronic device, due to the customer specific features of the former system. Moreover, with Signal Solutions controlling the design specification, it is much more fixed with limited opportunities for the supplier to adjust design and manufacturing activities to each other. However, because of the flexibility inherent in Secure Communications' operations, they are accustomed to managing customised designs in their manufacturing facilities. This flexibility means that their operations do not require continuous production, and the supplier is therefore not impacted negatively by small purchasing volumes and irregular demand. Some problems arise on the supply side of Secure Communications because of the close complementarity in customised designs. Since many upstream suppliers adhere to order-based production and lean manufacturing principles, the suppliers' sourcing operations account for most of the lead times. Figure 6-7 shows how the customised specification activity (represented by the letter S) on behalf of Signal Solutions directs the design activities of the supplier (denoted by the letter D) which influence the adjustments necessary to manufacturing activities (characterised by the letter M).

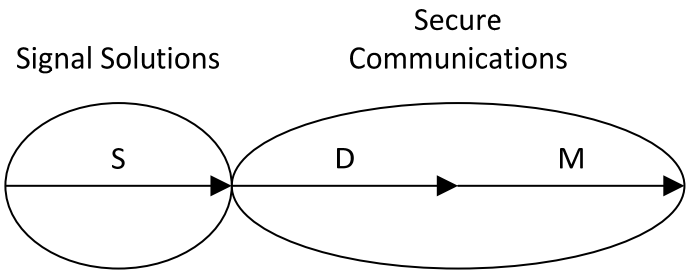


Figure 6-7: Specification activity directing design and manufacturing activities.

Finally, the complementarities between the supplier's manufacturing activities and the buyer's subsequent assembly activities are not significant. First, since the customised electronic device constitutes an application to other offerings, there are no assembly activities related to this system at Signal Solutions. Second, as the standardised electronic device can be assembled into the offerings at almost any

point, there are no crucial activity interdependencies to be considered in relation to the connection between manufacturing and assembly activities.

This section analysed the impact of partitioning principles on 'what' is organised across company boundaries; the next section addresses bridging of use and produce contexts related to the two electronic devices.

6.8.2 BRIDGING USE AND PRODUCE CONTEXTS

As in the previous relationship, the analysis here focuses on the physical resource characteristics; the organisational resources associated with these constellations are addressed in the section on actor involvement.

Organising Physical Resources Across Company Boundaries

The resource constellation related to the standardised electronic device is an example of resources that are aligned across company boundaries in order to bridge use and produce contexts. It has been shown that the use side is characterised by low production volumes and customised features. Compared to the previous relationship analysis, the produce context in this case involves a wide range of production volumes, a flexibility that derives from the fact that operations are not particularly capital intensive. Thus, the supplier's operations are not dependent on maintaining full capacity utilisation which is beneficial for a customer with low production volumes.

Furthermore, the standardised electronic device shows how a customer can facilitate bridging of use and produce contexts through internal adaptation. The standardised electronic device is part of the standardised product portfolio of Secure Communications. In response to this wide customer base, the standardised design requires customers to adapt to the produce context of the supplier not vice versa. In these circumstances, it would be more costly for Signal Solutions to request the supplier to make adaptations to its operations than to make resource adaptations internally. Therefore, the electronic device is purchased standardised. The subsequent internal adaptations when integrating the systems into the offerings constitute the bridging between use and produce contexts.

The physical properties of Signal Solutions' offerings have consequences for the adaptations necessary to integrate the standardised electronic devices. Because of the integral nature of the product offerings, there are substantial resource ties across adjacent system interfaces, making adaptations time-consuming and costly. These physical resource interfaces consist of both physical and functional features that require adaptation. Since the electronic device is standardised all adaptations have to take place in adjacent system interfaces. The magnitude of these adaptations is increased by the fact that Signal Solutions is forced to offer a range of standardised electronic device brands in order to satisfy customer requirements. With little

standardisation across product offerings, substantial adaptations are needed from one customer project to another. Furthermore, because of lack of standards related to the electronic devices each integration effort is difficult.

Compared to the standardised electronic device, the customised electronic device does not provide the same opportunities for bridging use and produce contexts. Instead of Signal Solutions adapting its resource base to Secure Communications, the buyer directs the characteristics of the customised electronic device so that the system impacts on the resource base of Secure Communications. Therefore, it is the supplier that assumes responsibility for bridging use and produce contexts related to this system. This is accomplished by building capability to handle customised design in the operations of the supplier.

The physical properties of the customised electronic device differ from those of the standardised electronic device in that the latter system is not integrated into the product offerings of Signal Solutions. The customised electronic device constitutes an application that communicates between the offerings of the buyer and their customers' products. This application is used by customers of Signal Solutions. However, although the customised electronic device does not require any physical adaptations to fit the offerings of Signal Solutions, there are functional features that need to be considered.

Organising and Economies

In organising the connection between physical resources across company boundaries, the relationship between Signal Solutions and Secure Communications relies on both economies of innovation and economies of scale and scope.

Beginning with economies of innovation, the supplier's knowledge was important to design the customised electronic device. These design capabilities were the main reason for including Secure Communications in the system. On the supplier side, the technical development related to the system is not particularly significant. However, the development opportunities in terms of accessing new business opportunities were pivotal to the decision to commit to design of the customised electronic device. In retrospect, the 'specified' interfaces involved in the division of responsibilities between the two parties implied limited opportunities for the supplier to contribute with its design capabilities. Because of this limited design freedom in the product development process, the collaboration resulted in economies of scale and scope in the design capacity of the supplier rather than economies of innovation. In terms of economies of innovation, the joint problem solving efforts in response to quality issues following the design phase, constituted learning as a side effect.

In relation to economies of scale and scope, the operations related to the standardised electronic device rely on these principles. The standardised design allows the

supplier to fully exploit similarities in the operations related to this system. Furthermore, the supplier's modular design principles increase the scale advantages further. Although the standardised electronic device is build-to-order and requires configuration for each customer, the modular system implies that all manufacturing activities - including configuration - follow a standard procedure. These standardised operations increase the exploitation of economies of scale and scope. For Signal Solutions, resource utilisation in the supplier's facilities contributes to cost-efficient purchasing operations at Signal Solutions. However, the many supplier brands used by Signal Solutions reduce the opportunities for economies of scale and scope related to the standardised electronic device. The importance of this problem is exemplified by the many internal discussions about creating a box with standardised interfaces that allows either of the electronic devices to be inserted. Such an initiative would reduce the integral nature of the product offerings and increase the economies of scale and scope in resource adaptations by Signal Solutions.

Economies of scale and scope are also important in relation to the customised electronic device. It has been explained how Signal Solutions relies on the supplier to design the system in order to benefit from scale advantages related to the latter's design capacity. Secure Communications can exploit its established design capabilities for each customised design, but the supplier needs a certain sales volume to cover the initial investment in each design task. The small sales volume following the design investment reduces the opportunities for Secure Communications to benefit from economies of scale and scope related to the customised electronic device. The unexpected quality problems further aggravated this problem since they added to the costs, which were not balanced by bigger sales volumes.

The nature of these physical resource characteristics, and how they align across company boundaries, depends on the organisational resources deployed through actor involvement. These matters are analysed next.

6.8.3 ACTOR INVOLVEMENT

This section analyses the actor involvement determining 'who' is organising activities and resources across company boundaries. First, mobilising the supplier is addressed in terms of the current involvement between Signal Solutions and Secure Communications. Second, the connections across organisational entities with different functional priorities are analysed. Third, the impact of these connections on the development of physical resources is addressed by analysing mixed resource interfaces.

Mobilising the Supplier

Since it was not possible for Signal Solutions to mobilise Secure Communications based on purchasing volume, they had to offer other benefits to the supplier. The relationship between the two parties was therefore set up with a collaboration in

mind. The idea was to develop a close relationship with high involvement beyond individual transactions, by engaging in joint product development and sharing strategic market intelligence. The potential access to new markets was the main motivator behind engaging in business with Signal Solutions, signifying Secure Communications' interest beyond the immediate business opportunity.

Although Secure Communications mainly engaged in the relationship with Signal Solutions for strategic reasons, it was still important for the supplier that its involvement in the development of the customised electronic device should be profitable. The contract related to the supply of this system constituted an important control mechanism that played a crucial role in the unfolding relationship. Because of the high costs preceding the first business transaction between Signal Solutions and Secure Communications, it was important for the supplier that the costs associated with design efforts should be offset by reduced risk through exclusivity clauses and volume commitments. Although the contract did not stipulate order volumes, the frame agreement and development grant were considered to represent a long term commitment to mobilise the supplier to take on the design responsibility. However, the fixed prices stipulated in the frame agreement were based on informal indications about order volumes which turned out to deviate by as much as 90%, causing Secure Communications to suffer financially from the contractual arrangement. This difference in the reality from what was expected from the relationship resulted in greatly reduced interest on the part of the supplier in conducting business with Signal Solutions, and, eventually, formal breach of the legal agreement.

The relationship relied also on other actors in the business network working to mobilise interest in each other. Signal Solutions' motivation for engaging in a high involvement relationship derived from its weak position in relation to the rest of the supply base. Its bad experience of relationships with suppliers of electronic devices, resulted in the perception in Signal Solutions that the opportunities for better quality and prices would increase if they were in a partner-type relationship. Secure Communications was encouraged to engage in a relationship with Signal Solutions in order to attract business from other customers in adjacent business units. Since it was accustomed to relying on its connections with potentially more promising customers, the buyer used these connections to mobilise the supplier. The relationship resulted in business opportunities that otherwise would not have emerged. A customer project involving a business unit neighbour to Signal Solutions is currently one of Secure Communications' main development initiatives. However, the analysis shows also that uncertainty regarding securing long term business from adjacent business units caused the supplier to react to the much less than expected order volumes from Signal Solutions. Had this business opportunity been less turbulent, Secure Communications may have been more patient.

Actor Interaction Across Organisational Entities

The relationship between Signal Solutions and Secure Communications is coordinated through a regular joint steering committee. The steering committee functions as a hub for many communication channels between buyer and supplier. Initially, the steering committee was set up to coordinate technical and commercial aspects within a single forum, rather than coordinating these aspects separately. Although daily contacts are separate from the steering committee interactions, the committee encourages and coordinates them. This contact pattern is referred to in the literature as 'purchasing and marketing coordinated'.

It should be emphasised that Signal Solutions' representation on the steering committee has changed during the course of the relationship. Analysis of the differences over time shows that the departments represented in the contact pattern determine the nature of the interactions between buyer and supplier.

At the outset of the relationship, Partner Management group representation was found in the contact pattern, as illustrated in Figure 6-8. This initial representation provided opportunities to complement an otherwise restricted connection between cross-functional interaction and cross-corporate interaction. Partner Management, located within the product management department, focuses on long term product strategies, with a special emphasis on close collaboration in partner-type relationships. The Partner Management group was established specifically to strengthen the functional priorities of the purchasing function in the customer projects. Secure Communications was identified as a potential supplier as the result of evaluation of the supplier base, and the financial assets allocated by Partner Management provided opportunities to invest in a new buyer-supplier relationship. Representation of Partner Management on the steering committee implied that the contact pattern with Secure Communications was infused with these visions and priorities among functional priorities. In addition, as members of the product management department, partner managers were familiar with the demand side of Signal Solutions and were able to provide Secure Communications with important information regarding future technological needs, as well as market intelligence. The proximity to the demand side of the organisation of the product management department is visible in the figure. At this point, interaction in the contact pattern could be described as both broad and deep.

At the time of writing, the Partner Management group had been dissolved and a second purchasing representative had been appointed to engage in the contact pattern between Signal Solutions and Secure Communications, as illustrated in Figure 6-8. With no involvement of Partner Management in the relationship or internal organisation, other functional interests took precedence in the relationship. Compared to the previous Partner Management group, purchasing representatives are disconnected from strategic decisions and the demand side of the company. The new

representative is involved only in individual customer projects and late on in the purchasing processes. As indicated in the figure, and also discussed in Chapter 5, the purchasing representatives are from a department with different internal connections compared to product managers. As a result, Secure Communications has lost access to both information channels and decision authority in Signal Solutions. The figure shows that there is no direct connection between the existing and previous steering committee members, adding to the problems related to loss of product management representation in the relationship. The new setup means that all such communication and decision-making are the responsibility of project managers, implying a shift in functional priorities in the relationship. Although the representatives have the same level of seniority as Partner Management, Secure Communications representatives said that they did not have the same organisational power. This demonstrates that the perception of organisational authority is related not only to seniority but also depends on organisational status and internal contact patterns.

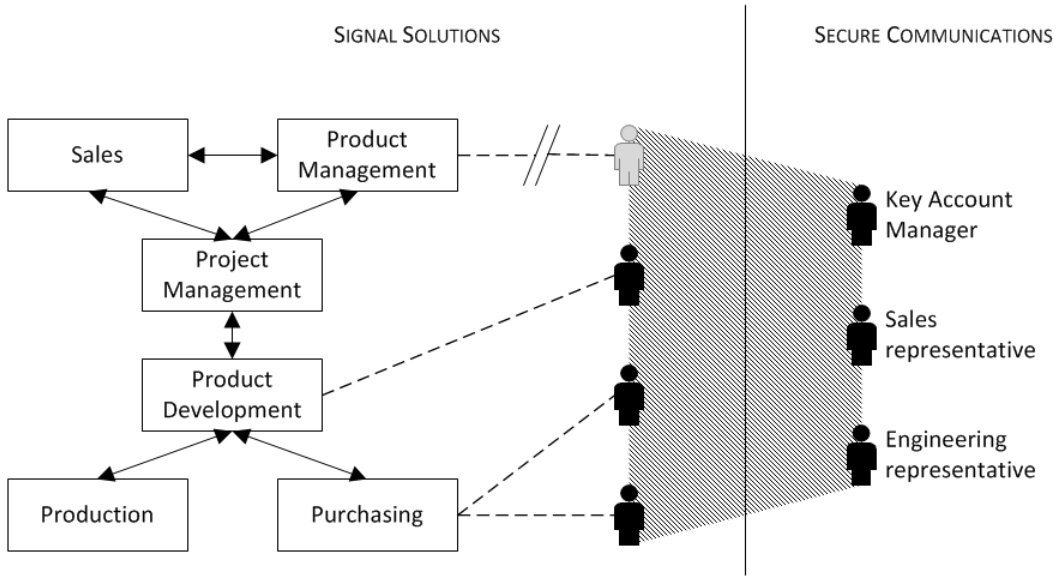


Figure 6-8: Changing cross-corporate interaction limiting opportunities in relationship.

Analysis of these changes in the contact pattern reveals why the changes in steering committee representation were detrimental to the relationship. The changes in the organisational arrangements changed the nature of the interaction between Signal Solutions and Secure Communications, in what was described by supplier representatives as a change from a strategic partnership towards a regular subcontractor relationship. These changes apply not only to actual changes in access to information and decision autonomy. Supplier representatives said that the change in representation in the contact pattern between Signal Solutions and Secure Communications signalled the intentions of the buying firm. These findings emphasise the importance of actor involvement in organising purchasing and supply management across company boundaries.

In addition to steering committee communication, there are other connections outside this central forum. The analysis shows that the nature of the interaction differs depending on current organising needs, and from the standardised electronic device to the customised electronic device. For example, the role of the product development department differs across the two systems. For the standardised electronic device, the product development department operates as the dispatcher of a system specification, implying more or less unidirectional communication between this department and the supplier. Since many details including supplier brand are frequently stipulated in customer contracts for this device, the product development department is involved only in specifying the functionality associated with the system, in order to ensure that it can operate in connection with adjoining systems in the total offering. In comparison, design of the customised electronic device is characterised by interaction between product development representatives and supplier representatives, through supplier involvement in cross-functional teams. These differences demonstrate the need to adapt the nature of the contact pattern to the physical resources under development.

Apart from the steering committee and everyday connections between Signal Solutions and Secure Communications, the case exemplifies actor involvement at senior levels in the organisational hierarchy. With limited organisational seniority represented in the steering committee, more influential stakeholders sometimes intervene in the relationship. After a long time of losing financially on the relationship with Signal Solutions, Secure Communications was instructed by top management to increase its prices although this went against the formal agreement developed by the steering committee. As a result of these price increases, senior managers at Signal Solutions decided to intervene in the relationship and try to settle the disagreements. These interventions were suboptimal. While some projects benefited from the price pressure exerted on the supplier, the resulting conflict harmed other customer projects. As in the case of the previous relationship analysed, outside intervention is not always based on facts or complete perspectives. In this relationship, information about total costs and comparisons among suppliers' offerings were lacking, and proved problematic when Secure Communications was exposed to competition.

The corporate group level connections resulted in the Procurement Council awarding Secure Communications group partner status. This implies an additional level of contact in order to coordinate relationships across the entire group level. Currently, the Partner Account Manager is a member of the steering committee which should facilitate communication between the two forums. Although well-functioning communication flows are important, it is also crucial to coordinate intentions and strategies between the various organising levels. In the case of Secure Communications, intentions have not been clear. At one point, the firm's

management discussed replacing Secure Communications while at corporate level it was identified as group partner and one of the most important suppliers. This provided a simultaneous stop-go signal, and shows the importance of consulting among different contact levels over relationships.

Organising Mixed Resource Interfaces

Actor involvement across organisational entities is important for the development of physical resource constellations. The connections across the organisational entities analysed above can be related to opportunities and limitations in physical resources.

Within Signal Solutions, it seems that the organisational resources were designed to allow customisation, both within specific customer projects and between various product platforms. This organisational design had consequences for the bridging of use and produce contexts. The integral design principles and costs of subsequent integration of different electronic devices stemmed from the project focused organisation. Furthermore, although there is no control over customer specific requirements, the buyer representatives identified a number of problematic physical resource interfaces in relation to the standardised electronic device. The project focused organisation and lack of coordination across different product platforms limit the opportunities for managing different types of electronic devices. In order to create the interface box that had been discussed, an organisational setup would be needed that allowed for such a development. Currently, the internal budgeting system would not accommodate this redesign task. An important step towards more cost-efficient management of customised features is the new base line concept in which the standardised electronic device is one of the options.

In actor involvement spanning company boundaries, the initial contact patterns were promising in terms of representation of the Partner Management group. This representation provided the foundation for establishing a long term relationship with Secure Communications and had contributed to developing the original frame agreement. This frame agreement presented an opportunity to engage in a long term relationship with a supplier despite less than promising circumstances related to the current resource constellation. This long term relationship reduces the switching costs and administrative burden associated with negotiating transactions on a case by case basis, all of which is advantageous when the purchasing volume does not allow these costs to be split. The loss of Partner Management from the contact pattern means the current relationship representatives do not have the power to allow the relationship with Secure Communications to affect internal operations. This applies to the development of physical resources and also to the consequences of the differences between use and produce contexts. Since the purchasing department dominates the contact pattern under direction of individual customer projects, the focus is on lowering prices in individual transactions at the expense of long term cost-efficiencies. The appointment of Secure Communications as group partner has

attracted top management attention to the relationship, and reinstated some of the long term intentions in the relationship through some compromises in the renegotiated frame agreement.

6.8.4 'WHAT' IS ORGANISED AND 'WHO' IS ORGANISING?

This section summarises the relationship analysis in terms of 'what' is organised and 'who' is organising across company boundaries.

In 'what' is organised, design activities are organised across company boundaries in the relationship with Secure Communications. These design activities refer to the connections between design of the purchased systems and the offerings of Signal Solutions, and they apply to both the standardised and the customised electronic devices. In the standardised electronic device, the supplier's design affected internal operations while the reverse occurred in the customised electronic device. The analysis reveals that the integral design principles applied by Signal Solutions imply costly and time consuming integration efforts in order to adapt resource interfaces. In both electronic devices, however, Secure Communications could benefit from economies of scale and scope related to their facilities and capabilities.

In terms of 'who' is organising, the analysis identified a 'coordinated' contact pattern between buyer and supplier that allows for simultaneous organising of the connection between commercial and technical aspects. An important shift in the representation in this 'coordinated' contact pattern changed the nature of the interaction between buyer and supplier, emphasising the importance of departmental representation in the contact pattern. While the presence of product management perspectives in the relationship allowed for a long term and strategic relationship, the purchasing department's direction of the relationship implied a heavier emphasis on price negotiations in individual customer projects. These differences derive from different internal contact patterns related to the relationship representatives.

7 THE DATA PROCESSOR

The outsourcing of the data processor to Communication Platforms represents the first attempt by Signal Solutions to redesign and outsource a system across multiple product platforms. The data processor also corresponds to the first modular system to be included in Signal Solutions' offerings. The relationship with Communication Platforms was established solely for these purposes and the organisational arrangements surrounding this relationship mark an important milestone in the history of Signal Solutions.

The chapter is organised as follows. Section 7.1 introduces the data processor and its role in Signal Solutions' offerings. Section 7.2 describes Communication Platforms and its operations and Section 7.3 discusses the contractual arrangements between buyer and supplier. In Section 7.4, the relationship organising is outlined and Sections 7.5-7.7 describe how the redesign of the data processor unfolded. The chapter concludes in Section 7.8 with an analysis of the relationship and its organising.

7.1 SYSTEM FEATURES

The data processor is a system that is needed in order to manage the software included in the offerings of Signal Solutions. It comprises a sheet metal rack on which all the other components are assembled, including hard drives, software drives, processors or computer cards, power supply, fibre optics and communication interface technology. The functionality of the data processor is similar in many ways to an advanced computer. In Chapter 4, reference was made to the offerings of Signal Solutions in terms of three interconnected computers, and that the data processor constitutes the hardware in the second computer connecting the first and third. Depending on the software that is uploaded after delivery, the data processor can communicate in an infinite number of ways. To compare it with a home computer system, the data processor is the computer that would be purchased from Dell or HP for example. The software that is uploaded onto the computer is the operating system, for example Windows, and the programs that are used, for example Office. Figure 7-1 illustrates the role of the data processor in the offerings of Signal Solutions. Because of its central role in the offerings, the data processor is part of all four product platforms.

Since it is the data processor that interfaces between the other two computers that comprise Signal Solutions' offerings, it is not surprising that the system is highly integrated with the core elements of these offerings. This was the original reason for designing and manufacturing the data processor in-house. In fact, Signal Solutions' offerings would be inoperable without the data processor, which also includes several functional interfaces with adjacent systems. Thus, the interfaces between the

hardware in the data processor and adjacent computers are important, but also there are several crucial interfaces between the hardware and the internally developed software. Since the software applications form part of the core offering and are customised for individual customers, the data processor in its original design had to be adjusted for each customer project. In addition, the electronic components included in the hardware represented one of the commodity groups where Signal Solutions encountered most problems with redesign due to obsolete components. Because of the project-focused nature of the development activities, the design differed from one product platform to another and even between individual customer projects. Due to the many variants acting simultaneously, each redesign effort was complicated and costly.

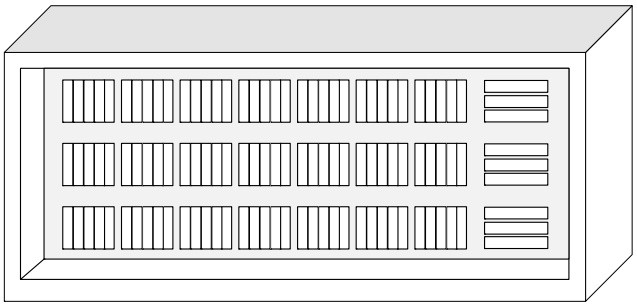


Figure 7-1: A simplified illustration of the data processor.

Due to the need for frequent redesign, the data processor was a constant source of frustration within the company. The problems increased over time, with customers demanding ever shorter lead times, which allowed little time to make the necessary changes. In order to alleviate the problems and reduce the costs associated with managing the data processor, it was decided to standardise the interface between the hardware and software applications in the data processor. This redesign offered two advantages. First, the decoupling would facilitate software customisation without interfering with the hardware. Second, component obsolescence would no longer require changes to the software applications. In fact, it was considered that this redesign would allow the hardware to be outsourced to a supplier better equipped to manage end-of-life problems, at lower cost and with shorter lead times. In the past, Signal Solutions had found it difficult to justify the costs associated with redesign efforts. However, in this proposed redesign two factors improved the business case. First, the data processor applies to all four product platforms, and in three of them with very similar characteristics and designs. Second, unlike the case of the standardised electronic device, customers never dictated specification of the data processor. In fact, most customers did not highlight the data processor element in the offerings. These circumstances made it realistic to invest in a redesign effort to ease some of the problems experienced. Figure 7-2 illustrates the changes to the design of the data processor.

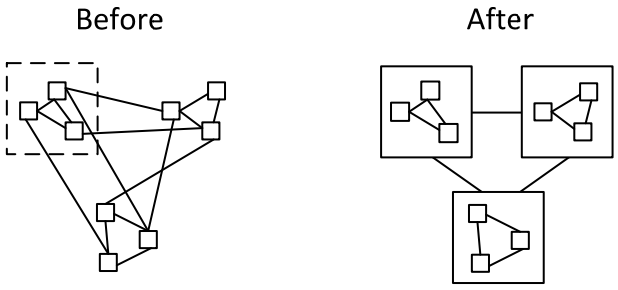


Figure 7-2: Redesign from integral to a modular system design.

The redesigned data processor is available in two configurations, depending on the target product platform. It also includes the opportunity to make internal modifications depending on software requirements, without the necessity to adapt adjacent systems. Following delivery to Signal Solutions, the data processor is assembled into the relevant product platform. In all platforms, the data processor is mounted inside a cabinet that contains several electronic devices. The cabinet functions as a buffer between the data processor and surrounding equipment, protecting either from influencing the other. The cabinet is important for the design of the data processor since it reduces the need to adapt the design of the data processor to environmental characteristics, from one customer project to another.

7.2 COMMUNICATION PLATFORMS

Communication Platforms is a global supplier of technology for automated and embedded computing systems. It provides a wide range of offerings to its customers, from individual computer boards and software to entire communication systems. All its offerings are designed using standardised components, proven technology and recognised information technology standards.

All products offered by Communication Platforms are built on a single board computer card that is sold separately as a standardised item or configured and combined into a customised solution. The computer cards constitute the hardware onto which customers upload their software. In other words, the hardware determines input and output signals, power supply and cooling, but does not dictate the functionality of the signals. This functionality can be purchased from Communication Platforms as an extra option; otherwise responsibility lies with the customer. In addition to the computer cards, the supplier offers a variety of other features such as displays, operating systems, data processing and networking capabilities. In combination, these features form a communication system which can differ in its complexity. Some of the offerings are standardised, but most systems are customised for particular customers. The data processor is a customised solution without inclusion of software in the offering. Apart from the systems themselves, lifecycle management is an important part of Communication Platforms' offerings. It has a dedicated team that works alongside the engineering department, and focuses

exclusively on the management of obsolete electronic components. Services include reporting discontinued items, holding long term safety stocks and redesigning systems to use new components. This lifecycle management is a vital service in the data processor offering to Signal Solutions.

Communication Platforms' operations are characterised mainly by minor manufacturing and assembly functions, starting with configuration of the standardised base boards. Coating of the base boards is an important production step, while testing procedures represent the most complicated part of the operations and constitute the majority of the production process. Both the testing and coating equipment are extremely expensive and represent a bottleneck in the operations. To accommodate this, Communication Platforms operates 24 hour shifts in both these areas. Apart from this expensive equipment, supplier representatives argue that the operations of Communication Platforms are not especially capital intensive. Its operations were described as rather flexible, and the supplier emphasised that all its capabilities and production facilities are shared across the entire customer base. Since there are no resources dedicated specifically to Signal Solutions and the data processor, the production environment is well suited to this company's low and less regular order pattern. Also, since the business with Signal Solutions is located within a business unit dealing with customers with similar needs, the supplier is accustomed to the quality and documentation requirements.

Similar to all the systems studied, data processor lead time is highly dependent on the status in the inventory. Although the data processor is designed using standardised materials, no purchased components apart from the base boards are available directly off the shelf. To exemplify, the encapsulation needs casting, implying that the suppliers of these services only engage in customised designs. Because of the low purchasing volumes, the risks inherent in making stock orders for these purchased items are too high. Therefore, the majority of components are often purchased as build-to-order and in only exceptional cases does Communication Platforms decide to buy larger batches in order to reduce the price or secure inventory. The assembly and subsequent testing of a data processor can be achieved within a week. However, if there are no components in stock, the lead time can easily become six months. The average lead time experienced so far by Signal Solutions is 13 weeks. Clearly, Communication Platforms' sourcing operations constitute the majority of the lead time. According to the supplier representatives, it would be possible to reduce both prices and lead times if Signal Solutions could commit to certain volumes or provide better forecasts of demand.

7.3 CONTRACTUAL ARRANGEMENTS

The relationship with Communication Platforms began in 2007, and the redesign of the data processor was the first joint undertaking. However, the parties were well

known to each other before that since Communication Platforms supplied standardised circuit boards to the whole corporate group, although through a distributor because of small volumes.

Relying on its substantial industry experience, Communication Platforms was very clear from the beginning about how the relationship should be arranged in order for the supplier to commit to assuming responsibility for the lifecycle management of the data processor. It was important that the relationship would be in harmony with its current routines. First, with the exception of contracting work which cannot be purchased off the shelf, it required the system to be designed using entirely standardised components. Secondly, it required the data processor to be upgraded periodically rather than continuously meaning that the design would be frozen for a fixed period during which Communication Platforms would guarantee to deliver this particular configuration, including monitoring component obsolescence and buying safety stock when necessary. After this fixed design period there would be a short grace period to provide a window for the redesign work, during which buyer and supplier would agree to upgrades and adjustments on a mutual basis. Third, it requested that the relationship should be arranged as a partnership to match the long term nature of the undertaking and the necessary collaborative efforts. This business arrangement suited Signal Solutions and it agreed to all the conditions with the amendment only that each revised configuration of the data processor should be compatible with the previous versions.

The division of responsibility in the subsequent development project was such that Signal Solutions specified requirements and Communication Platforms conducted the actual design. In the frame agreement, Communication Platforms is responsible for financing the design of the data processor. However, Signal Solutions funded part of the development work of the supplier in return for access to the resulting design documents. This arrangement reduced Communication Platforms' initial investment and thus its risk while securing supply for Signal Solutions in case of future insolvency on behalf of the supplier. There were no order volumes stipulated in the contract. However, prices were based on estimations of volumes provided by Signal Solutions. In exchange for informal commitments regarding future order volumes and a long term relationship, Communication Platforms agreed to fixed prices for the data processor. Finally, the contract regulates end-of-life terms in order to regulate the responsibilities and costs related to managing component obsolescence. The agreement mainly states that Communication Platforms is responsible for notifying Signal Solutions of end-of-life, after which Signal Solutions can choose between allowing the supplier to replace the component and guarantee its functionality or financing a safety stock. The elements of the frame agreement are illustrated in Table 7-1.

Table 7-1: Frame agreement with Communication Platforms.

FRAME AGREEMENT ELEMENTS
Buyer providing specification of requirements
Supplier responsible for design and manufacturing
Fixed prices and informal volume commitments
Buyer funding part of design in exchange for design documents
End-of-life terms
Monthly forecasts

A unique provision in the agreement with Communication Platforms is the promise to give the supplier monthly forecasts, these forecasts to be valid for 18 months and divided into ‘secured business’, ‘probable business’ and ‘uncertain business’. The figures are based on information from the product management department. Although not constituting a formal commitment, the forecasts assist Communication Platforms in their planning operations and supply activities. At the time of data collection, a revision had been included in this provision, to include in these forecasts actual material commitments for the immediate six month period. This would imply Signal Solutions commitment to materials costs, although the timing of the actual orders could change. The arrangement was to allow Communication Platforms to consolidate purchases and make stock orders without risks related to the funding of these investments.

As already mentioned, the business exchange between the corporate groups is not limited to the data processor. Since work on the data processor redesign began, there have been other group level developments. As a result of consolidation efforts among business units, the previous distributor has been bypassed and the volume of business with Communications Platforms from Signal Solutions and its corporate group has increased substantially. In parallel, the identification of strategic suppliers across business units has resulted in Communication Platforms being appointed group partner and corporate wide terms and conditions have been negotiated between the parties, facilitating the securing of additional business. Currently, the data processor corresponds to the highest value business because of its comparatively high complexity and unit price. However, at the time of writing, the supplier is expecting major orders from other business units that will make the data processor only a minor contributor to the business with this company. Thus, the relationship with Signal Solutions and the data processor development project have really opened opportunities for the supplier.

7.4 RELATIONSHIP ORGANISING

In order to compile the requirement specification, based on which Communication Platforms was selected as a supplier, a cross-functional team was established internally at Signal Solutions. This team was composed of members from the Partner Management group, the purchasing department and the product development department. Also, since it was a development project, there was a project manager overseeing progress.

Throughout the subsequent design process, the cross-functional team at Signal Solutions collaborated extensively with a counterpart team in Communication Platforms. The latter team members included a Key Account Manager, a project manager and two engineers, one focusing on the overall architecture and one specialising in detailed design. Since Signal Solutions had previous design experience related to the data processor it supported the supplier with knowledge and ideas. The specification provided by Signal Solutions was subject to discussion in order to assure that unnecessary costs could be avoided. Throughout the design process both parties met regularly in order to discuss seemingly impossible or costly requirements. Communication Platforms created a compliance matrix and marked each listed requirement as ‘yes’, ‘partial’ or ‘no’. The revised and final version of the design specification included 164 individual requirements. For these interactions, a cross-corporate team was established, composed of two cross-functional teams. The contact pattern related to the revised design specification is illustrated in Figure 7-3.

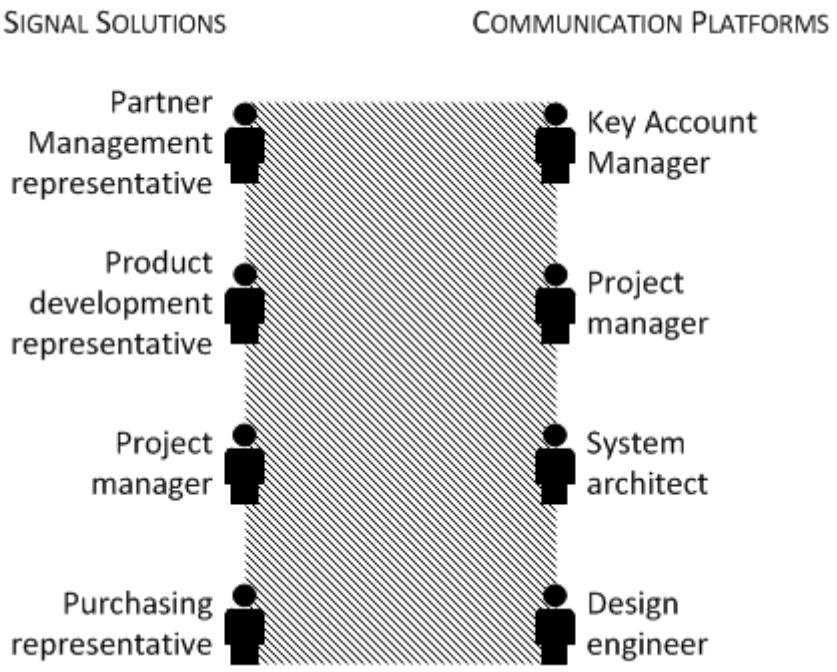


Figure 7-3: Original contact pattern with Communication Platforms.

Following the intensive design phase, the contact pattern between Signal Solutions and Communication Platforms changed and the relationship entered a more stable phase. Instead of focusing on specifying and implementing the data processor, interaction shifted towards continuous problem solving and component revisions. Figure 7-4 illustrates this new contact pattern. In the Signal Solutions' team, the product development and purchasing representatives have remained unchanged. The project management function is still represented although the competence has changed from a project management specialist to someone with technical project management capability. Finally, product management is no longer directly involved in the relationship interface, but there is a configuration manager member who is responsible for managing documentation in relation to revised system configurations due to obsolescence. The purchasing representative is clearly focused on commercial matters while the other three representatives focus mostly on technical concerns. In Communication Platforms, the Key Account Manager and the project manager are the same, and manage ongoing commercial and technical issues respectively. The rest of the supplier team representation has been slimmed down, and engineers are brought in by project managers only when there is a technical problem.

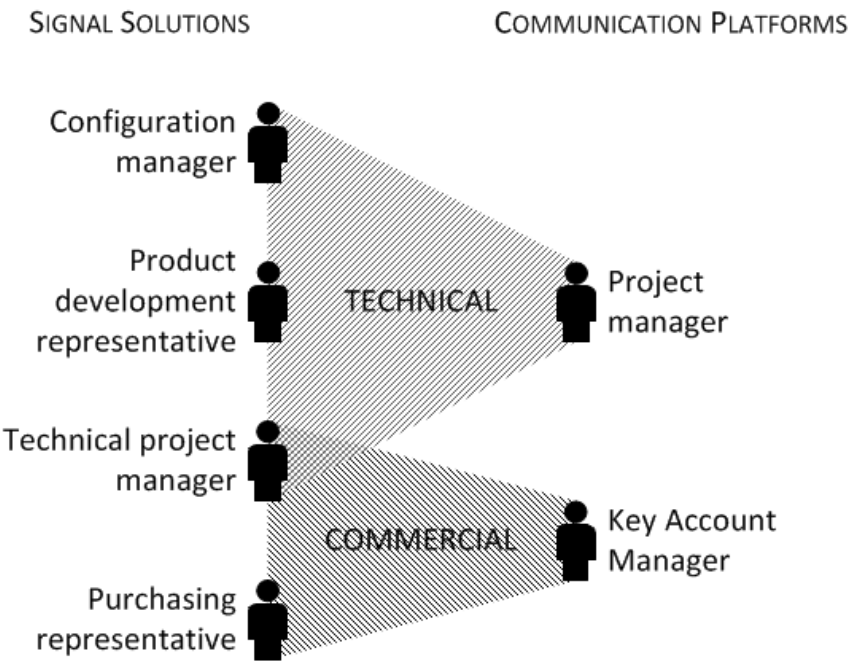


Figure 7-4: Revised contact pattern with Communication Platforms.

Communication between these formal contact roles occurs on a daily basis, either by telephone or email. Contacts are generally reported in email form in order to provide a record of the discussion or agreement. Regular conference calls take place - a legacy of the design stage when they were used to disseminate information on the design progress. The ongoing developments now involve mostly continuous quality

issues. Currently, telephone meetings occur approximately every third week – down from weekly during the most intense design phase. Conference calls focus mainly on technical matters. However, there is participation from the purchasing representative usually in about one meeting in three. Finally, buyer and supplier meet face to face several times a year. These meetings commonly do not include commercial representatives. Both buyer and supplier representatives emphasised that although there is no formal steering committee, the pattern of contact between buyer and supplier differs depending on current needs. For example, although the purchasing representative and sales representatives interact more often with each other than with other employees, they engage with other company representatives whenever such communication is justified. Similarly, the project managers typically interact with the engineers in both companies, but also often meet with their commercial representatives. Project managers also include other people in the contact pattern if necessary. The magnitude of these informal and individual connections was demonstrated by the number of business cards buyer and supplier representatives had for individuals in the respective other companies. Both parties expressed their satisfaction with the contact pattern and maintained that they have succeeded in developing rich communication channels between the two companies over a relatively short space of time.

It was described above that Communication Platforms has been formally appointed group partner at corporate level, which required a group level coordinator. Because of the comparatively advanced characteristics of the data processor and its supply arrangement, this coordinating role was assigned to Signal Solutions. The business unit's Supplier Account Manager is also the Partner Account Manager. At the time of data collection, the two contact patterns had not yet been formally connected.

7.5 INTERNAL PILOT PROJECT

The redesign of the data processor represents a first important step towards implementing product-based organising. As already mentioned, it was one of the first initiatives undertaken by the newly established Partner Management group. The members of this group were former strategic purchasers with extensive experience in component obsolescence related to the data processor. As newly appointed partner managers, redesigning the data processor was the perfect opportunity to try out their ideas. They decided to use the data processor redesign as a pilot project.

It soon became apparent that the current organising was not suited to the interaction and investments necessary to achieve the redesign. The redesign effort not only required substantial interaction with the supplier, it also required considerable adaptations to the internal software and adjacent systems. Achieving a standardised interface between hardware and software required new software architecture. All these interactions were additional to individual customer projects and were enabled

by financial resources provided by the Partner Management group via the product management department. The investment and the subsequent development task constitute an important milestone in the history of the company. Internal development projects are rare, and an initiative on this scale and scope which also included outsourcing, was unique.

"Money talks, and usually we are like beggars with cap in hand."
- PRODUCT DEVELOPMENT REPRESENTATIVE, SIGNAL SOLUTIONS

In addition, unlike other outsourced systems, the internal task force related to the data processor was not dissolved after the design was finalised. The internal development project continued as a maintenance or administrative project, with a sponsor and a budget. The internal project implies that emphasis was placed on the need to continuously coordinate the data processor outside of specific customer projects, corresponding to internal coordination, not typical of Signal Solutions. Appointing a project manager to be responsible for this task and providing the data processor with a dedicated budget demonstrate the radically different circumstances compared to other purchased systems. The sponsor providing the budget for this internal maintenance project is located within the product management department of Signal Solutions. Typically, product managers are not assigned responsibility for separate systems but usually such responsibility is embedded in the task to guide the development of an entire product platform. There have been other exceptions when internally developed systems have needed coordination across product platforms. Since the data processor constituted the first attempt to design an outsourced system, a product manager was assigned responsibility for an outsourced system for the very first time. This initiative implied that the relationship with Communication Platforms could continue unchanged even after the Partner Management group was dissolved. All interviewed buyer representatives point out that these organisational arrangements are key to what they referred to as a successful redesign project.

"The internal team that manages the ongoing maintenance of the data processor is a unique setup in our organisation."
- PRODUCT DEVELOPMENT REPRESENTATIVE, SIGNAL SOLUTIONS

While the redesign efforts progressed as intended, responsibility for preparing and coordinating implementation of the resulting data processor into the customer projects began to fall between the cracks. In hindsight, everyone agreed that the general perception was that outsourcing the data processor would mean that the responsibility for this system would pass to an external party, without taking account of the fact that the endeavour would be accompanied by other responsibilities within the company. Although the business case had been approved and there was a formal decision to redesign the data processor and implement it into the customer projects,

the consequences of this decision had not been properly identified or communicated across departments. When the time for implementation approached, it was unclear what was needed for the data processor to be piloted in existing customer projects. As a result, several unexpected problems emerged in the customer projects where the data processor was implemented. These substantial costs had not been accounted for in the business case, and were an irritation for the project managers who were unwilling to accept either the costs or risks related to the data processor. When the redesign encountered quality challenges, the already unsympathetic project managers reacted. In order to postpone implementation of the new data processor, the project management department created its own business case which included risk calculations. Massive internal debate ensured, and the conflict continued for so long that it became too late to implement the data processor into ongoing customer projects. Instead, it was decided to implement it in new customer projects.

The turmoil left a bitter taste in the organisation. However, over time, the benefits of the new data processor have become visible in the organisation and it is clear that the investment will pay off in the long run. In fact, the internal costs of maintaining the outsourced data processor appear to have been overestimated by almost 50%. Lead times are shorter and service, maintenance and test equipment related to the data processor is standardised across all product platforms. Staffing and competence synergies have emerged, and the same people can manage the data processor for several product platforms. In addition, the modularised version offers potential for the customer side of Signal Solutions. The offerings are often accompanied with maintenance agreements, making it difficult for Signal Solutions to repair data processors if components become obsolete. The new design allows the entire data processor to be replaced without adjustments. Also, in line with product portfolio improvements, Signal Solutions is now able to offer its customers upgrades to existing products, resulting in upselling. This was impossible when new versions and functionality of the data processors were not compatible with previous ones. Although it is too early to make a final evaluation, the track record so far has helped the specific system and also the original idea to gain acceptance within the organisation. Since completion of the development project, a similar approach has been tried in relation to two other systems and one of the initiatives has achieved similar success.

"Costs related to maintenance have reduced by 50-70%."
- PARTNER MANAGEMENT REPRESENTATIVE, SIGNAL SOLUTIONS

Despite the internal turbulence, representatives of Signal Solutions express satisfaction regarding the redesign of the data processor. However, as the next section shows, the collaboration with Communication Platforms has not been completely problem free.

7.6 DESIGN PROBLEMS AND LACKING ORDER VOLUMES

According to representatives from Communication Platforms, all design projects contain some element of trial and error, and an immediate satisfactory solution is not usually possible. The development of the data processor was no exception. Before approaching potential suppliers, Signal Solutions had developed a design specification that detailed the most important functional requirements of the data processor. After Communication Platforms was selected as the supplier, it assumed responsibility for interpreting and realising the specification. Since Signal Solutions had explicitly requested a system that was cost-efficient to produce and modify, there was much discussion regarding the design parameters that drove costs. It became important to achieve what the supplier referred to as a 'just enough' solution in terms of Chapter quality and performance.

However, there is a fine line between hitting and missing a specified target, especially in aiming for a design that is 'just enough'. Unfortunately, Communication Platforms had slightly misinterpreted the objectives of the design project. Supplier representatives describe that they judged cost-efficiency to be the most important design factor and understood that it could make minor alterations to the design specification if they would result in major cost benefits. As a result, development of the data processor encountered substantial quality issues during system testing. Most of these problems can be explained by Communication Platforms opting for a lower level of robustness than was needed, in order to save costs for Signal Solutions.

> *"We focused too much on trying to keep costs down for them and underestimated some of the requirements in the process."*
>
> - PROJECT MANAGER, COMMUNICATION PLATFORMS

There were mechanical problems related to the boxing of the data processor, the chassis did not endure the vibration tests and disintegrated. This required a redesign and the problem was solved only after visiting Signal Solutions and learning how they had cast the mould in one piece before the data processor was outsourced. Unfortunately, the result was a slightly tighter fitting chassis which provoked problems with the tolerances inside the data processor. The tolerances turned out to be so small that the computer cards could be inserted together, but not one by one. The problem was solved by redesigning the clips holding the computer cards in place inside the rack.

There were also problems related to the power supply since it was discovered that voltage spikes could destroy the data processing. An overvoltage protection was added retrospectively to the design in order to solve the problem. Also, the most important computer cards have battery backups in order to assure some basic functionality without access to a power supply. Since Signal Solutions' offerings

have long life expectancies, the battery lifetime specified was very long. Communication Platforms was not able to find a supplier that could guarantee the specified lifetime. This was solved by reducing the lifetime in the specification and Signal Solutions revised their service plan to include a battery change well before the forecast life end. Unfortunately, trials have shown that the battery life is much shorter than expected.

In addition, there was confusion regarding prototyping. In order to keep costs down, some of the elements in the prototypes were constructed of less expensive materials and spare parts. In some cases, this difference masked problems and in others it aggravated problems. Because of the low volumes, Signal Solutions is not accustomed to working with prototypes and was not aware that the first deliveries would differ from the final design. This misunderstanding caused a lot of confusion and disappointment.

The first prototype was delivered about a year before the final design was approved. Because of all the quality concerns, the first data processor delivery was delayed by almost two years. This delay not only implied additional development costs, but the postponed implementation translated into lost sales. In terms of finance, the supplier has lost the most on problems in the development phase. Simultaneously, concerns were raised that the order volume estimations provided to the supplier had been exaggerated. Even discounting the lost sales resulting from the delayed delivery, it was claimed that normal sales rarely achieve half of the forecast volumes. At the time of writing, actual order volumes were less than half the estimated numbers.

7.7 LEARNING CURVE AND FUTURE POTENTIAL

Despite all the quality issues and financial consequences, buyer and supplier are optimistic about their relationship, and assume shared responsibility for past events. Both parties emphasise that design endeavours are often rife with problems, and stress that it takes time to learn how to collaborate in a new relationship. In addition, Communication Platforms has taken full responsibility for misinterpreting the requirements and also for some pure engineering mistakes. Signal Solutions argues that the time plan was too tight and that it was inexperienced in this type of collaboration and design task, making it difficult to coordinate and communicate, both internally and with the supplier. It is grateful that this first project experience was with a knowledgeable supplier and claim they can exploit what they have learnt in future projects.

This optimism and understanding emerge in how problems were dealt with. Instead of blaming each other, both buyer and supplier trusted in one another’s experience and supported each other throughout the development project. For example, Communication Platforms visited Signal Solutions in order to learn how to solve

quality problems while Signal Solutions assisted Communication Platforms in replacing faulty components by conducting the work themselves instead of returning the systems to the supplier. Both parties referred to sharing some of the costs of rectifying problems.

They seem to be agreed that the first contract period was an enriching and learning period that has established well-functioning communication channels between the parties. Both buyer and supplier looked forward to further improving the design of the data processor in the next generation. Representatives of both parties expressed confidence that the reward for the time and effort invested would be reaped in the next design phase. They were also beginning to discuss whether also to integrate the data processor in the fourth product platform.

"You never cut the corner on the first generation of a customer-specific design. Having put in all this work, now is when we can start benefiting from it."

- KEY ACCOUNT MANAGER, COMMUNICATION PLATFORMS

Both parties claim that the additional business between the two corporate groups has relieved some of the tensions related to the quality problems. Because of the corporate-wide frame agreements, the data processor is not decisive to the future of the business relationship. On the contrary, the redesign initiative, although so far not profitable for either buyer or supplier, has contributed to the establishment of a direct sales channel between group levels. This is the main reason why Communication Platforms is not aggravated by the lower than forecast sales volumes. In fact, it was the additional sales potential accompanying the redesign of the data processor that constituted the main reason for engaging in the relationship with Signal Solutions. Supplier representatives explained that a very different contractual arrangement would have been necessary had the redesign task been considered in isolation.

It is interesting that Communication Platforms is the only supplier interviewed that expressed satisfaction with the relation to Signal Solutions. The supplier is content with the way that the relationship has developed. One representative said it is difficult to believe how successful it was, considering all the quality problems encountered. Similarly, Signal Solutions rarely express satisfaction with suppliers, but the people dealing with this supplier have no complaints. Both buyer and supplier refer to each other as partners rather than buyer or supplier, and emphasise the importance of long term thinking and open discussions instead of legalism. It is obvious that there is more to the relationship than pure business transactions. The supplier representatives seem genuinely concerned that Signal Solutions are satisfied with them. They describe how the contact people sometimes have to "go to battle for us" in order to reassure the organisation that they will deliver on their promises and

they seemed worried that they might not always have lived up to these expectations. Conversely, Signal Solutions representatives expressed how they sometimes are blamed or reprimanded for acting outside their authority when they make promises or agreements with people from Communication Platforms. However, the same people think it is a small price to pay for maintaining a well-functioning relationship.

"We do not consider ourselves buyer and supplier. We are partners."
- PROJECT MANAGER, SIGNAL SOLUTIONS

The critical incidents in the unfolding relationship between Signal Solutions and Communication Platforms can be found in the timeline in Appendix IV. In the next section, the relationship and its organising are analysed with the help of the analytical framework.

7.8 CASE ANALYSIS

Analysis of the relationship between Signal Solutions and Communication Platforms follows the same logic as the two previous cases. Sections 7.8.1 and 7.8.2 analyse the impact on 'what' is organised by the partitioning principles and bridging of use and produce contexts. Sections 7.8.3 analyses the impact of actor involvement on 'who' is organising across boundaries, taking the findings from the two previous sections into consideration.

7.8.1 PARTITIONING PRINCIPLES

The partitioning principles related to the data processor are heavily influenced by the redesign towards modular design principles. The first section analyses the decoupling of design activities across company boundaries following modularisation. The second section discusses the implications of this design principle for the manufacturing activities of the supplier.

Organising Decoupled Design Activities Across Company Boundaries

The outsourcing and redesign of the data processor involves major adjustments to the activity configuration. Previously, the design activities of Signal Solutions were linked closely to the design activities of component suppliers, and each adjustment conducted by suppliers was accompanied by redesign efforts at Signal Solutions. In addition, the integral design principles inherent in the buyer's offerings caused design changes related to incoming components, to affect the whole offering. This resulted in countless activity links requiring constant adjustments. Figure 7-5 shows how the design activity of the component supplier (represented by letter D_1) is directing adjustments in the system design activities (denoted by letter D_2) of the buyer, which in turn direct adjustments in product offering design activities (characterised by letter D_3).

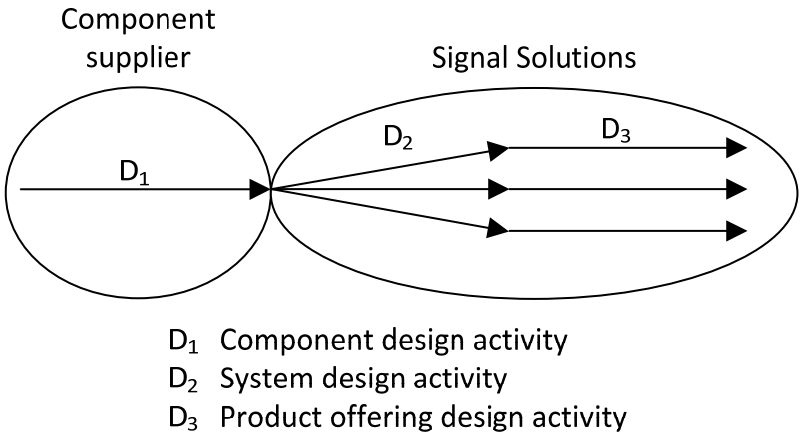


Figure 7-5: Supplier's design activity directing buyer's design activities.

The redesign of the data processor changed the nature of the activity configuration. By standardising the system interfaces and adjusting the related design activities concerning adjacent systems, the design activities become decoupled. Such decoupling implies that the components within the data processor could become obsolete and require replacement, without jeopardising the design of the product offerings. These modular design principles reduce interdependencies in the activity configuration. Figure 7-6 shows how the modularisation of the data processor implies that the design activities related to this system (represented by letter D_2) become decoupled from the design activities associated with the product offerings (represented by letter D_3). This decoupling implies that design changes prompted by adjustments in component design activities (represented by letter D_1) are no longer interfering with product offering designs.

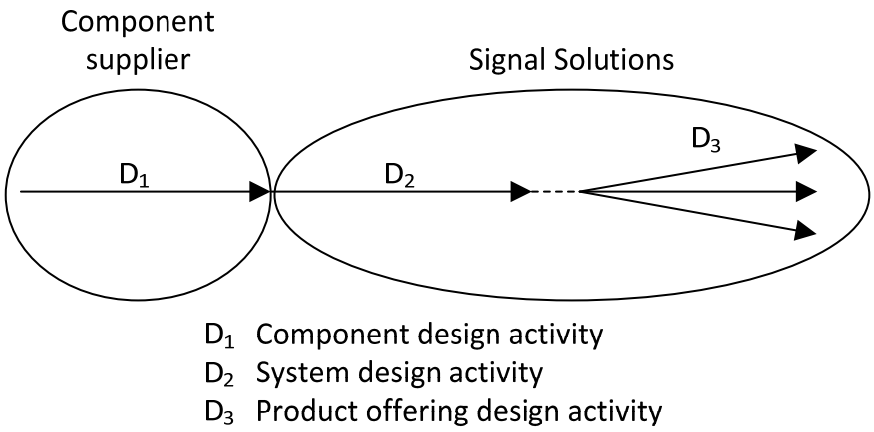


Figure 7-6: Decoupled design activities following modularisation.

The decoupling of design activities enabled outsourcing of the data processor to Communication Platforms since the modular design reduces the activity links spanning company boundaries, thereby reducing the activity interdependencies between Signal Solutions and its supplier. Had the system not been modularised,

these regular design changes would have spread across company boundaries, making organising of activity links more problematic. The decoupling of design activities in Communication Platforms and Signal Solutions is illustrated in Figure 7-7. Because of this decoupling, Communication Platforms can take on design responsibility for the data processor and handle lifecycle management related to component design activities independently from Signal Solutions design activities.

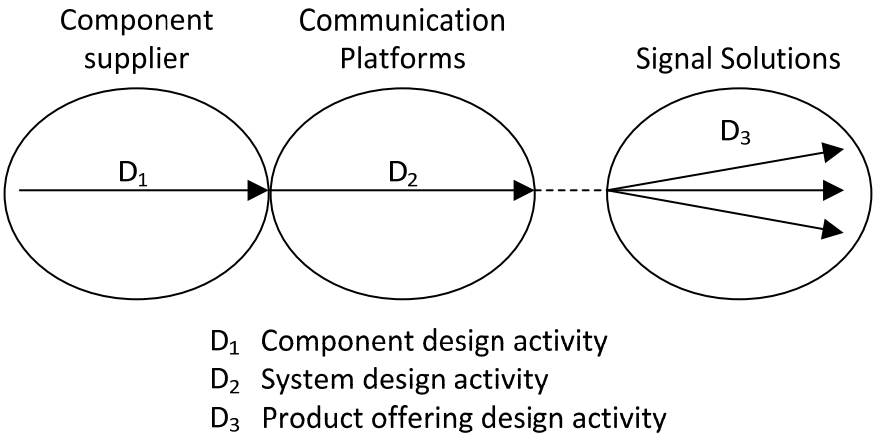


Figure 7-7: Outsourcing of design activities following decoupling.

It should be noted that in order to achieve the redesign of the data processor, the task partitioning related to the design of the system needed modification. Before redesign, the task had been specified in relation to specific product platforms, and separately for each customer project. In preparation for the redesign, the design task was changed towards a cost-efficient, modular system that could be used across several product platforms and in all customer projects. The task specified that the system should be designed from standardised components and allow for regular upgradings without compromising the compatibility of previous designs. Some of these task characteristics were specified by Signal Solutions, others were added by the supplier following outsourcing of the system design.

While modularisation reduces activity interdependencies in the activity configurations, the analysis shows that the effort is associated with substantial coordination to achieve the solution. The redesign and outsourcing of the data processor was a costly undertaking for both Signal Solutions and Communication Platforms. The reason for this major investment is that the resulting activity configuration brings benefits that offset the costs. Since the maintenance costs associated with the data processor have decreased by some 50%-70%, there would seem to be major advantages associated with the decoupling of activities.

Organising the Connection Between Design and Manufacturing Activities

The decoupling of design activities has consequences also for manufacturing activities and especially opportunities for outsourcing design and manufacturing

because of the connections between them. The data processor case illustrates the importance of design principles for the subsequent division of labour. The previous design did not allow for outsourcing because of its integral nature in relation to adjacent systems. Its product architecture meant that each modification in response to component obsolescence required close control because of its effects on surrounding systems. Moreover, the design differed from one product platform to another, multiplying the work required to accommodate to each minor design change. For these reasons, it was neither possible nor cost-efficient to assign design responsibility to a supplier without adjusting the design principle. Similarly, frequent redesign implies accompanying changes in manufacturing activities, making subcontracting problematic.

The outsourcing of design and manufacturing activities to Communication Platforms was characterised by mutual adjustments by buyer and supplier. While the supplier assumed responsibility for the design of the data processor, Signal Solutions continuously adapted the design specification in order to improve system manufacturability. As illustrated by the loop in Figure 7-8, design activities (represented by the letter D) are mutually adjusted to both buyer and supplier requirements, in terms of specification and manufacturing activities (denoted by the letters S and M in the figure). These relationship characteristics are referred to in the analytical framework as ‘interactive’ interfaces. The joint collaboration efforts signify that neither Signal Solutions nor Communication Platforms could have undertaken redesign of the data processor single-handedly. The functional knowledge and previous manufacturing experience of Signal Solutions had to be combined with the component knowledge and lifecycle management skills of Communication Platforms in order to design a modular system using standardised components without jeopardising functionality of the system.

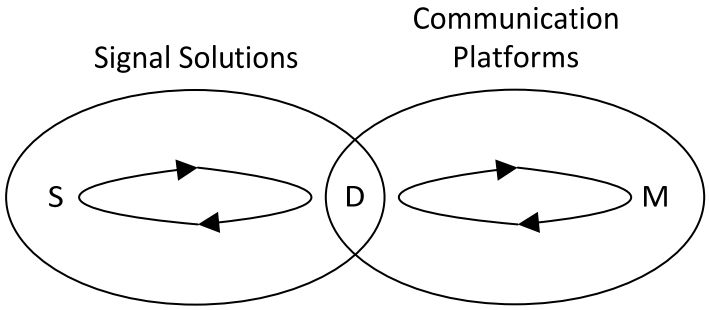


Figure 7-8: Mutual adjustments between activities in the relationship.

The changes to the activity configuration in terms of both modularisation and outsourcing, brought substantial advantages related to the connection between design and manufacturing activities. Modular design principles contributed to activity similarities because of the increased degree of standardisation in the activity

configuration. Communication Platforms has developed standardised work procedures in relation to all its customers in order to benefit from similarities in its operations. Modularisation of the data processor has allowed Signal Solutions to exploit these similarities by utilising the supplier's engineering skills, manufacturing facilities and lifecycle management procedures. By relying on the capabilities and similarities in the operations of Communication Platforms, Signal Solutions has been able to purchase a data processor at a much lower price and with a shorter lead time compared to in-house operations.

Despite the benefits of the redesign and outsourcing of the data processor, the analysis illustrates that some problems remain. Although the share of standardised components has substantially increased in the data processor, some production activities are unavoidably closely complementary. For example, the casting of the sheet metal chassis and moulding of plastics, have customised features built into the operations, implying that these activities are closely complementary beyond the operations of Communication Platforms. Because of the substantial purchasing activity related to Communication Platforms' operations, these activity interdependencies prolong data processor lead times significantly. Because of the order-based production applied in these operations, lead times related to these components cannot be reduced further. As the supplier has already concluded, the only way to reduce the data processor lead time would be to commit to these materials earlier and make advance purchases. Such administrative activity adjustments were requested in the previous relationship and depend on the actor involvement between buyer and supplier, which are analysed later.

The data processor redesign exemplifies changes to the partitioning principles in relation to partitioning of the system and the activities involved in its design and manufacturing that require organising across company boundaries. The bridging of use and produce contexts in the relationship is analysed next.

7.8.2 BRIDGING USE AND PRODUCE CONTEXTS

In line with the two previous relationship analyses, bridging of use and produce contexts related to the data processor are limited to physical resource combining. The organisational resources associated with this resource constellation are analysed in the next section on actor involvement.

Organising Physical Resources Across Company Boundaries

Analysis of the use and produce contexts related to the data processor shows that they differ substantially. While the use side is characterised by extensive customisation and low purchasing volumes, the produce side relies heavily on standardisation in order to assure capacity utilisation. Because of capital intensive production operations related to these components, it was necessary for the produce side to standardise operations according to the needs of most customers. Therefore,

Signal Solutions was forced to allow component characteristics to influence the design of the data processor since there was no possibility to purchase customised components at an acceptable price. Adapting the resource base to the component suppliers caused problems when the characteristics of components did not match the characteristics of the offerings in which they were combined. The frequent redesign due to component obsolescence derives from differences between component lifecycles and the product lifecycles of Signal Solutions. This situation is similar to the setup with the standardised electronic device where the produce context of the supplier was governing the use context of the buyer.

The changes undertaken to bridge the use and produce contexts can be divided according to two distinctive but related bridging efforts. First, identification of Communication Platforms as a facilitator in the bridging of use and produce contexts was an important step towards resolving the problems experienced. The relationship with Communication Platforms changed the resource constellation related to the data processor. The outsourcing of the system was to allow a specialised supplier to handle the frequent redesigns necessitated by component obsolescence. This was accomplished by assigning responsibilities so that the supplier could deal with the supply side dynamics, and redesigning the data processor so that these changes did not interfere with integration of the system into the offerings of Signal Solutions. This allowed stability in Signal Solutions' resource base, with the supplier handling the dynamics related to component suppliers. In this respect, the supplier's resource base functioned as a buffer between the products of Signal Solutions and the components from component suppliers.

The second bridging effort consisted of redesigning the data processor to a modular system in order to minimise the impact of the individual components on system design. Before the redesign, there was substantial interplay between the functional and physical features of the data processor and adjacent system interfaces. Because of the integral design principles applied, the mismatches between components and offerings were aggravated as design changes multiplied throughout the offerings. Modularisation of the data processor changed the nature of these resource characteristics. While the redesign initially required substantial adaptations to adjacent resource interfaces, such as the software architecture, the resulting modular design principles allowed changes to the data processor to remain within system boundaries. The redesign of the data processor thereby constitutes the second bridging effort in the matching of use and produce contexts.

Organising and Economies

The redesign and outsourcing of the data processor provided opportunities for economies of scale and scope, as a result of increased resource utilisation from many perspectives.

The operations of Communication Platforms are set up in order to handle the standardised features on the produce side while simultaneously offering flexibility to their customers. By adopting similar procedures for individual components, as well as complex systems, the supplier is able to benefit from economies of scale and scope in its operations while still offering a large amount of variety to its customers. Designing all their systems to use standardised components and specialising in lifecycle management means there are dedicated resources in place to monitor and manage component obsolescence. Since these dedicated resources can be utilised by all Communication Platforms' customers, the service can be provided in a cost-efficient manner. Modularisation of the data processor was important for the system to match the supplier's procedures. In order for Communication Platforms to benefit from economies of scale and scope related to their capabilities, the supplier needed as much design freedom as possible. In this respect, the modularisation served to disconnect the data processor from the rest of the offering.

The redesign and outsourcing of the data processor provided opportunities for economies of scale and scope also in Signal Solutions' operations. Modularisation of the system made it possible to consolidate the design across several product platforms. This commonality saved a great deal on man hours related to product development and system integration. The modular design also enabled upgrades and upselling at much lower costs. Previously, repairs and upgrading were very expensive due to the customised and integral systems comprising the product offerings. The new design allows customers of Signal Solutions to benefit from economies of scale and scope in operations without compromising on customisation. Modularisation of the data processor has also provided more opportunities for economies of integration in supply operations. The increased ability to consolidate purchasing orders across several product platforms has allowed the costs associated with improved activity coordination across company boundaries to be shared across several customer projects. For this reason, Signal Solutions has been able to offer Communication Platforms administrative activity adjustments in terms of volume commitment and forecast adjustments.

The economies of scale and scope from this initiative were the main objective of the buyer-supplier relationship. However, the cost rationalisations related to the data processor were enabled by mutual adaptations in the relationship. Achievement of a redesigned system with decoupled resource interfaces required collaboration between Signal Solutions and Communication Platforms. The outcomes of these joint efforts were enabled by economies of innovation related to the configuration of activities, and recombining of resources across company boundaries. Increased scale and scope economies in the operations related to the data processor required the complete rethinking of the resource constellation surrounding the data processor, and adjustments to accompanying design and manufacturing activities.

The substantial changes to the resource constellation and activity configuration related to the data processor were enabled by organisational resources. The involvement of actors, and the social and administrative features that facilitated the redesign and outsourcing of the data processor, are analysed next.

7.8.3 ACTOR INVOLVEMENT

The analysis of actor involvement related to the data processor is presented in three parts. First, actor involvement contributing to mobilising the supplier is analysed. Second, the connections between organisational entities are addressed and the functional priorities that follow from these connections. Third, mixed resource interfaces are analysed, outlining the combining of physical and organisational resources made possible through actor involvement.

Mobilising the Supplier

The redesigning and outsourcing of the data processor was a costly undertaking for both Signal Solutions and Communication Platforms. The data processor constituted a massive design task with substantial initial investment on both the buyer's and supplier's parts. It was explained how Communication Platforms dedicated huge numbers of man hours to designing a prototype, testing and verifying the system, and finalising the design before the first business transaction.

Analysis of the incentives for engaging in such a high involvement relationship shows that the buyer was motivated to commit resources to the investment by expected savings on the costs of maintaining the data processor over time. The supplier was willing to commit resources to the design effort in the expectation of scale and scope economies due to a steady influx of orders following the initial investment.

The contractual arrangement between Signal Solutions and Communication Platforms constituted an important control mechanism in mobilising the interest of the supplier to engage in the collaborative redesign efforts. In the case of the data processor, the willingness of Communication Platforms to take on the design and manufacturing of the data processor relied on a long term commitment. A frame agreement was established that included exclusivity for a fixed period of time following design of the data processor. There was also a condition that the system should be designed using standardised components and including periodic upgrades in line with the normal work procedure of the supplier. The development grant awarded by Signal Solutions served to further demonstrate long term commitment and to mobilise the supplier. In addition, although there was no formal agreement about purchasing volumes, the business case underlying Communication Platforms' decision to commit to the relationship was significantly improved as a result of the consolidation of design across several product platforms. This consolidation implied that expected sales volumes for the supplier would increase substantially. In addition,

Signal Solutions promised regular forecasts. These efforts signalled long term engagement and compensated for lack of formal volume commitments.

Besides the potential inherent in the data processor business, Communication Platforms was also attracted by Signal Solutions' corporate belonging. Supplier representatives described that the business related to the data processor was not isolated from other dealings between the two corporate groups. They suggested that the supplier was interested in the relationship with Signal Solutions because of the additional sales potential in relation to neighbouring business units. The fact that Communication Platforms was made a group level partner and was awarded a corporate level frame agreement regarding supply of standardised circuit boards following the design of the data processor, is illustrative of the connections between the businesses. Although the data processor commitment was not decisive for this frame agreement, respondents described how this joint project sparked additional connections between the two corporate groups. The supplier took account of business elsewhere in the group when evaluating the relationship with Signal Solutions. Several supplier representatives referred to the corporate level frame agreement to explain the acceptance of lacking sales volume in relation to the data processor.

The initiative related to the supplier engaging in redesign of the data processor was characterised by collaboration. Signal Solutions and Communications engaged in so called trade-off techniques in the development of the design specification for the data processor. This inter-organisational control mechanism ensured that the system design was continuously improved in order to shave off costs and arrive at a solution that was cost-efficient for both buyer and supplier. While some misunderstandings and quality issues arose during the process, the joint undertaking was a real collaborative effort that required mobilising of resources on both sides of the relationship.

Once the design of the data processor was stabilised, it was important for both Signal Solutions and Communication Platforms to maintain the relationship to reap the benefits of their joint investment. The supplier needed to gain threshold value to recoup the design investment. Due to the substantial startup work and partial funding of the product development cost, switching supplier was not desirable for Signal Solutions. For these reasons, both parties have engaged in a long term relationship. This current state was clear in the conversations held about the relationship. Both buyer and supplier refer to each other as long term partners and emphasise the learning curve involved in dealing with each other. Both parties are expecting profitable outcomes from the next contract period.

Actor Interaction Across Organisational Entities

The contact pattern between Signal Solutions and Communication Platforms allows for broad and deep interaction because of the many functional representatives

included. The design phase included members of both companies participating in regular telephone meetings in order to finalise the design specification. In this cross-corporate effort, there were multidimensional contacts between buyer and supplier. This close contact pattern was explicitly aimed at connecting physical resource characteristics to commercial implications in order to arrive at a cost-efficient but technologically sustainable system sourcing solution. In this respect, the functional priorities of both the purchasing function, product development function and product development function are addressed interactively. Since the design stage was succeeded by substantial quality issues, the telephone meetings have continued, although they are less frequent. Therefore, despite lack of a formal cross-corporate steering committee, there is a stable number of company representatives involved in organising the relationship. Additional people are involved on a need-to-know basis, both formally and informally, adding flexibility to the contact pattern.

Because of this multidimensional contact pattern, the coordinating roles of the Supplier Account Manager and Key Account Managers were described as crucial by company representatives. Although the interaction between Signal Solutions and Communication Platforms is dominated by technical matters, representatives from the respective purchasing and sales departments kept track of the mixed resource interface between commercial and technical aspects during the design stage. Because communication occurred at multiple points in the relationship, the coordination and control applied by these representatives was seen as providing a much needed filter to keep the relationship on track. Because of these coordinating roles, the original contact pattern between Signal Solutions and Communication Platforms can be described as ‘purchasing and marketing coordinated’.

The analysis also reveals how the internal organising at Signal Solutions was pivotal to the collaboration between the parties. In the case of the data processor, the involvement of the product management department in the cross-corporate task force, via the Partner Management group, was decisive for initiating the redesign effort across multiple product platforms. The direction provided by Partner Management in terms of competence and decision authority was important for the initiative to extend beyond the traditional project management scope. Furthermore, in addition to providing organisational authority, the financial assets allocated to the redesign effort constituted important compensation to the project focused budgeting system. The mandate and financial resources provided by the product management department makes the data processor unique in being a system that was designed giving priority to purchasing issues, demonstrated by the fact that the design targets the supplier’s requirements and capabilities. Hence, although the purchasing function assumes a typically less influential role within the internal organisation, its position concerning the data processor was much stronger, requiring other company functions to adapt to these circumstances.

Although the purchasing function dominated redesign of the data processor, support from the product management function meant that other functional priorities were represented. The interest of the project management function was initially problematic in the redesign task. The project management department managed to delay implementation of the redesigned data processor. The department prioritised the goals of individual customer projects which interfered with the long term objectives of the product platforms. This incident shows the difficulty involved in managing the multiple and simultaneous objectives of different company functions.

While the internal organising was crucial for redesigning and outsourcing the data processor, it should be emphasised that these internal arrangements remained in place after finalisation of the data processor design. The cross-functional task force developed into a formal maintenance project sponsored by the product management department. Thus, although product management representatives were no longer involved in the contact pattern with Communication Platforms, their functional priorities continued to be represented through reporting channels and a dedicated budget. Figure 7-9 shows that this maintenance project constituted a major shift in cross-functional interaction compared to the customer project centred arranagements in the previous relationship analyses.

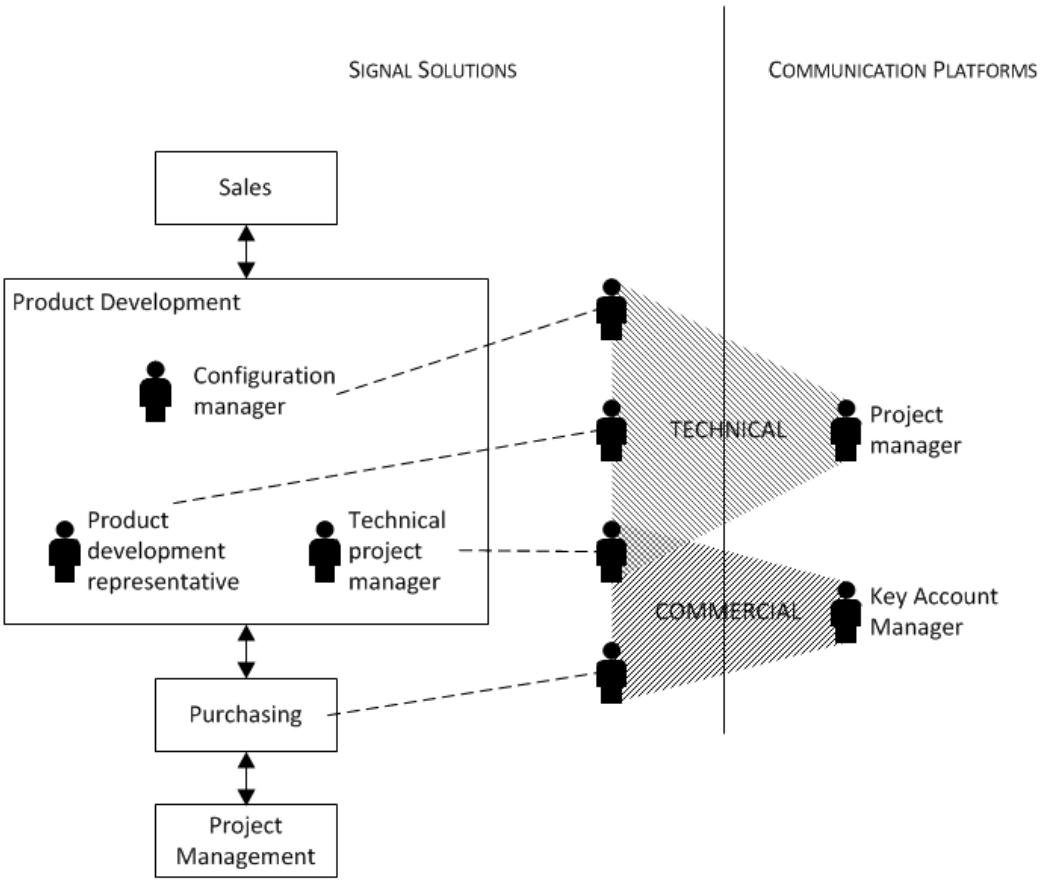


Figure 7-9: Cross-functional interaction supporting cross-corporate interaction.

The maintenance project with formal project management and associated budget constitutes a unique opportunity to continuously manage redesigns, and issues related to the data processor. This arrangement facilitates stronger cross-corporate interaction with the supplier than enabled by coordination through the purchasing department. For example, without this connection to the product management department it would have been impossible to implement forecasts and material commitments. Also, the internal project team was able to continuously manage data processor design in preparation for the next generation. In the absence of this project team, all these efforts would have had to be financed within individual customer projects which rarely prioritise these sorts of efforts. The establishment of the project team and its sponsorship occurred after the Partner Management group was dissolved. This suggests that although the formal group was disbanded, its authority was awarded permanent status within the purchasing function. Figure 7-9 illustrates the internal project team with direct connections to the product management department. The figure indicates the shift in importance of the project management department related to the data processor. Instead of directing development of the data processor, individual customer projects purchase the data processor via the purchasing department which has a central position in managing the system.

The stability provided by the internal maintenance project and its interaction with Communication Platforms was important for the development of the relationship between Signal Solutions and the supplier. While buyer representatives described how other supplier relationships have been negatively affected by internal conflicts, such as the dissolution of the Partner Management group, the relationship with Communication Platforms remained intact throughout this turmoil. There had been major turnover of personnel involved in the contact pattern over a fairly short period of time. Although buyer and supplier representatives explained that these events naturally disturb relationships, it was found that the existence of strong, well established communication channels minimised this disturbance. It can be argued that, in many ways, the internal organisational arrangements supported the relationship.

Organising Mixed Resource Interfaces

The actor involvement enabled by the interaction across organisational entities was critical in the redesign and outsourcing of the data processor. The inclusion of the most appropriate people in the development project made it possible to set up the organisational resources to support the physical resource adaptations required.

The redesign and outsourcing of the data processor was feasible only because of the decision to modularise and consolidate the system design across several product platforms. These adaptations to physical resources were enabled because organisational resources could be adapted accordingly, constituting an important mixd resource interface. Before outsourcing of the data processor, the organisational

resources were all directed towards individual customer projects and isolated product platforms. The internal organising of Signal Solutions served to nurture individual customer needs and project specific undertakings, arrangements that contrasted sharply with the redesign of the data processor. In order to prepare for the substantial coordination across products and projects, new formal organisational arrangements were established in relation to the data processor. These organisational arrangements compensated for the otherwise scattered organisation in terms of product platforms and system interfaces. The arrangements allowed the data processor to be designed from scratch, with cost-efficiency and supplier capabilities as the main priorities. The funding and participation provided by the product management department made it possible to arrive at a solution that increased resource utilisation across individual projects as well as in relation to supplier facilities and capabilities.

In the absence of substantial contact patterns between Signal Solutions and Communication Platforms, the design specification and subsequent product development activities would not have resulted in a data processor that was a cost-efficient design for the supplier and a fit with adjacent systems in the buyer's offerings. Since the undertaking required adaptations by both buyer and supplier, it was necessary to establish an interactive relationship that facilitated knowledge sharing and joint problem solving.

7.8.4 'WHAT' IS ORGANISED AND 'WHO' IS ORGANISING?

This section summarises the relationship analysis in terms of 'what' is organised and 'who' is organising across company boundaries.

Beginning with 'what' is organised, the connection between design and manufacturing activities were organised across company boundaries in the relationship with Communication Platforms. On the one hand, having outsourced design activities, they needed to be coordinated with the design of the product offerings at Signal Solutions. On the other hand, the connections between these design activities were organised with the specific objective to achieve a system that would be cost-efficient from a manufacturing and lifecycle perspective. The outsourcing of design and manufacturing activities was to achieve these objectives. Modularisation of the data processor was crucial for achieving such a solution since the decoupling of design activities allows more flexibility in the supplier's operations and potential for economies of scale and scope in facilities and capabilities. Within this modularisation, consolidation of the design principles across product offerings constitutes an additional dimension requiring organising in relation to the data processor.

In terms of 'who' is organising, the outsourcing of the data processor constituted a change in the division of labour which introduced a new actor into the activity configuration. The analysis identified a 'coordinated' contact pattern between Signal

Solutions and this supplier, which organised connections between commercial and technical aspects. Collaboration involving multidimensional connections between the two parties allowed them to jointly specify the data processor. In this joint effort, Signal Solutions adapted its resource base to that of Communication Platforms rather than the other way round. In order to accomplish the adaptations to physical resources, the buyer had to modify its internal organisational resources to prioritise long term product management over short term project management.

Following this analysis of 'what' is organised and 'who' is organising in relation to the four purchased systems in the three buyer-supplier relationships, Chapter 8 serves to combine these findings in a discussion.

8 DISCUSSION

So far, the internal organising efforts of Signal Solutions, and those involved in the three buyer-supplier relationships, have been analysed separately. These analyses have resulted in a number of findings concerning 'what' is organised and 'who' is organising, in order to address the research questions underlying this study. The three subcases used to address these research questions provided variety in terms of 'what' is organised and 'who' is organising, but to understand this variety, the three relationships need to be analysed concurrently. Analysing these subcases together, and comparing the findings with previous research, should extend the understanding of the research phenomenon.

Based on the previous analyses, three important themes can be identified in relation to organising purchasing and supply management across company boundaries. The first concerns 'who' is organising, and outlines the roles played by organising entities in the organising efforts. The second theme revolves around 'what' is organised through a discussion of the organising of design and manufacturing in terms of both activity configuring and resource combining. The third theme introduces three issues crucial for the efforts of organising entities to organise design and manufacturing, namely commonality, consolidation and customisation. Sections 8.1-8.3 are devoted to these three themes. Following this discussion, Chapter 8 concludes by addressing the interplay between 'who' is organising and 'what' is organised in Section 8.4.

8.1 ORGANISING ENTITIES

As outlined in the analytical framework, actors constitute the organising force, and organise all actions. Hence, actors are responsible for and conduct organising. Actors reside within organisations and this section outlines four organising entities and their roles in the organising of purchasing and supply management across company boundaries. These organising entities are active in cross-functional and cross-corporate interactions and they contribute with different functional priorities, knowledge and financial assets in these interactions. While the organising entities serve multiple company functions simultaneously, the analysis focuses on how their functional priorities impact on their roles related to the purchasing function.

The purchasing department as an organising entity is discussed first, followed by the role of the product development department in purchasing and supply management activities. The third section focuses on the influence of the project management department on the purchasing function and the fourth analyses the product management department as an organising entity.

8.1.1 ORGANISING AND THE PURCHASING DEPARTMENT

The composition of the purchasing department influences the opportunities for rationalising purchasing and supply management activities. Commodity-based organising provides opportunities to manage purchases at component level, providing that the design parameters across product platforms and customer projects are standardised. For example, it was possible for Signal Solutions to manage the purchasing of circuit boards not only within the business unit but also at corporate level. Commodity-based organising was a prerequisite for this achievement. However, commodity-based organising shifts the focus from the system sourcing level towards a lower level in the product architecture. For Signal Solutions, this was compensated for eventually through the formation of a group within the purchasing department specialised in organising system sourcing. This constellation allowed closer collaboration with suppliers on system specific matters. Purchasing representatives within this group constituted a natural point of consultation for the rest of the organisation. The Supplier Account Managers in the three studied suppliers were all located within this purchasing department subgroup. Other researchers emphasise the modified organising required if the focus shifts from component purchasing to system sourcing (Jellbo, (1998); Lilliecreutz, (1993).

The location of the purchasing department in the organisational hierarchy is important for the organising of purchasing and supply management, which highlights the issue of centralisation and decentralisation. The literature reviewed in the theoretical framework chapter suggested that centralised purchasing operations provide opportunities for consolidated purchases and decision autonomy on behalf of the purchasing department. The findings show that the location of the purchasing department and its consequences constitute a multidimensional issue that has several implications. First, whether the purchasing department is centralised or decentralised depends on the perspective; a purchasing department can be centralised within a particular business unit, but decentralised across a corporate group. This was the case at Signal Solutions, where purchasing activities were centralised within one department at business unit level, but decentralised in relation to the group level activities. Second, although the central purchasing department at Signal Solutions facilitated consolidated purchases across product platforms, this seeming centralisation was counterbalanced by other departments dictating many of the purchasing activities. These findings are in line with van Weele (2005) who distinguishes between centralisation in corporate groups and single-unit companies. His account regarding corporate groups is similar to traditional descriptions in that centralisation applies when a central department, at corporate level, is responsible for key matters such as product specifications and supplier selection. In single-unit companies, however, van Weele (2005) suggests that the extent of centralisation depends on the authority assigned to the purchasing department. In other words, there may be one central purchasing department, but the purchasing function may be

considered decentralised within the individual business units depending on the authority assigned to the purchasing department. The above indicates that an organisation can be considered as simultaneously decentralised because of autonomous purchasing activities by business units and centralised because of the purchasing department's authority.

Composition and the location of the purchasing department are only two factors that contribute to the role of the purchasing department in purchasing and supply management activities. Depending on the status of the purchasing function in relation to other company functions, the purchasing department plays different organising roles. When the purchasing function is limited to an 'order-taking' unit, purchasing representatives bring purchasing orders to suppliers in order to negotiate commercial terms, on a case by case basis or within a contractual arrangement for recurring transactions. Such an operative and commercially oriented role in relation to suppliers and purchased items provides few opportunities for the purchasing department to participate in problem solving activities or rationalisation through for example standardisation of design parameters. The purchasing function as an 'order-taking' unit is illustrated by the cases of the structural frame and standardised electronic devices, where purchasing representatives were involved only as commercial representatives.

When the purchasing function dominates other company functions, the purchasing department is not limited only to negotiate commercial terms but can participate in organising the interplay between technical and commercial matters. In this type of organising, the purchasing department can influence the design of the purchased system, either to increase standardisation for rationalisation purposes or to exploit expert competence to develop better offerings. Although the purchasing function at Signal Solutions was generally not a 'dominant' unit, in the specific case of redesign of the data processor it took precedence over other functional needs and directed the redesign activities. Dubois and Wynstra (2005) describe similar roles played by purchasing representatives in relation to suppliers depending on the status of the purchasing function in the buying organisation.

The status of the purchasing function is determined by the interaction between the purchasing department and other organising entities. Greater autonomy for the purchasing function comes at the expense of autonomy in other company functions. If the purchasing function acts mostly as an 'order-taking' unit, the purchasing department operates as an information transmitter, and receives directives that are forwarded to suppliers. If the purchasing function is more 'dominant', it directs the actions of other company functions or acts as a mediator between the buying company and its suppliers. The remainder of this section focuses on the participation of other organising entities in these interactions, cross-functionally and in cross-corporate arrangements.

8.1.2 ORGANISING AND THE PRODUCT DEVELOPMENT DEPARTMENT

The product development department first and foremost represents the product development function. The objective of this function is to develop the technology to serve customers with the performance requested. The product development department is responsible for all internal design activities, but since the offerings include purchased components, product development assists also in specifying the technological requirements for these purchases. Supplier involvement in product development has been investigated in previous research (see e.g. Clark, 1989; Ragatz et al., 1997).

Internal design activities impact on the design activities of purchased systems to the extent that physical and functional system interfaces influence each other. Thus, the nature of design specifications provided by product developers determines the level of freedom in the operations of suppliers. At one extreme, design specifications are provided through unidirectional communication between the product development department and the suppliers via the purchasing department. This applies to the standardised electronic device where even the supplier brand for this device was often stipulated in the customer contracts; the product development department assisted only in detailing the specifications of functionality associated with this system in order to ensure connection with adjoining systems in the total offering. Similarly, design of the structural frame was carried out independent of High Tech Structures and dictated the supplier's manufacturing activities. At the other extreme, product developers can negotiate design specifications through a flexible and interactive process that considers the suppliers design and manufacturing activities. In the case of data processor design, the product development department played a key role in adapting the design specifications with Communication Platforms. These findings are in line with Araujo et al. (1999) who describe how the level of specificity in design determines the opportunities to adjust buyer and supplier operations to the respective contexts. Dubois and Araujo (2006) emphasise that complex system interfaces necessitate open-ended and flexible design specifications in order to allow for coordination of interdependent tasks across company boundaries.

The coordination of design activities internally also provides a basis for standardisation in either components or systems, across customer projects and product platforms. This standardisation is determined by the extent to which the product development department operates under locked design parameters. In the case of the structural frame, no coordination occurred of the design activities related to the various structures in the different product platforms. In the case of redesign of the data processor, this was undertaken in order to achieve as much standardisation as possible and required product developers to redesign adjacent systems. This standardisation provided benefits such as reduced man hours devoted to subsequent

design activities and more opportunities to involve suppliers in product development. These findings are in line with Wynstra et al. (2001), who argue that promoting standardisation and simplification in product management is important for successful supplier involvement in product development.

The design activities undertaken by the product development department are directed through development assignments from other departments such as product management or project management. The roles of these organising entities are described next.

8.1.3 ORGANISING AND THE PROJECT MANAGEMENT DEPARTMENT

The main objective of the project management department is to satisfy the needs of the project management function. Project managers are responsible for completing customer projects on time and within budget. An important part of their task is monitoring of purchasing activities to assure that purchased items are delivered on time and according to specifications.

Because of the project scope applied by project managers, the project management department manages purchasing and supply activities within isolated individual customer projects. Project managers direct the issue of purchasing orders for suppliers via the purchasing department and with the assistance of product developers. This applies to the cases of the standardised electronic devices and the structural frame, where project managers managed customer needs and authorised the purchasing department to initiate purchasing operations within individual customer projects. By representing the customer in projects, the project management department may become directly involved in design activities in the buyer-supplier relationships. This applied to the design of the customised electronic device, a system that was developed for one specific customer. Project managers may also be involved in buyer-supplier relationships if the project is at risk. In the relationship with High Tech Structures, the project management department decided to interfere when escalating costs threatened to overrun the target cost set in an individual customer project.

When purchasing issues extend beyond the individual project, either in terms of design activities or when purchasing orders are placed, the involvement of the project management department is either limited or becomes a nuisance. This was the case with the structural frame where project centred budgets hindered commitments that would allow pre-manufacturing or advance purchase orders. Furthermore, the project scope applied in the relationship with High Tech Structures resulted in different materials being utilised in the structures purchased from this supplier. The financing and conduct of design activities within individual customer projects provide few incentives to harmonise designs across product platforms. The project management department actually delayed implementation of the redesigned data processor

because their prioritisation of goal achievement within individual customer projects interfered with the long term objectives of product platforms. Finally, in the case of the standardised electronic device, it was not possible to rationalise purchasing of this system because customer requirements dictated individual customer projects. Project managers prioritised openness to customer preferences over establishing cost-efficient purchasing operations and system integration procedures. Similar findings were made by Dubois and Gadde (2000) in their study of purchasing behaviour within the project focused construction industry. They conclude that a focus on individual projects hampers long term solutions that include several projects. However, their research investigates project-like contexts rather than the involvement of project management departments in purchasing activities.

8.1.4 ORGANISING AND THE PRODUCT MANAGEMENT DEPARTMENT

The priority for the product management department is representing the product management function. This function develops the company's long term product portfolio in line with customer needs. In this respect, managing the profitability of the offerings is an important task that is accomplished by maintaining cost-efficiency in the operations related to product platforms while still satisfying customer requirements. The impact of the product management department on the organising of purchasing activities counterbalances customisation and short term scope of the project management department. Product managers are responsible for all purchasing initiatives outside of individual customer projects.

The product management department is active in the purchasing function in the case of product platform issues that affect the long term. Product managers possess the organisational authority and financial assets required to influence purchasing activities. Direct influence includes sponsoring strategic initiatives that secure long term and cost-efficient supply to the product platforms. They included tactical purchases as advance purchase orders, and consolidated purchases to secure cost efficient supply for the product platforms through volume commitments and forecasting in the relationship with Communication Platforms. In addition, the involvement of the product management department is important for managing strategic relationship content in buyer-supplier relationships. The objective of establishing a Partner Management group within the product management department of Signal Solutions was to increase the involvement of product managers in the purchasing function to achieve more equitable relationships. The original intention in the relationship with Secure Communications was to achieve such a partnership-type relationship. The way that this buyer-supplier relationship was eroded when regular purchasing representatives became responsible after the Partner Management group was discontinued, illustrates the importance of involvement of the product management department in more strategic relationships.

Indirectly, the product management department influence purchasing operations by dictating standardisation across customer projects or product platforms in internal design activities, and their impact on purchased items. They set up procedures for maintaining the product platforms to achieve stability and control in purchasing operations. In the case of the data processor, the involvement of product managers was decisive for initiating a redesign across multiple product platforms. Its absence was pivotal to the material choices for the structures purchased from High Tech Structures. Other researchers also show that the management of product offerings has a positive impact on purchasing operations. For example, Robertson and Ulrich (1998) showed that product platform planning can cut costs related to purchasing operations while simultaneously improving service levels. Furthermore, Tersine and Hummingbird (1995) argue that purchasing operations can be aimed at reducing lead times for product offerings.

The involvement of the product management department in purchasing activities can take the form of direct participation in the buyer-supplier relationship, such as in the case of the establishment of the relationship with Secure Communications and the cross-functional team that redesigned the data processor. It can also consist of reporting lines, as in the case of the supporting of a continued relationship with Communication Platforms. In both cases, the involvement of the product management department constituted a lateral communication mechanism that compensated for an otherwise heavily project focused organisation. Both reporting lines and cross-functional teams are included as common lateral communication mechanisms in the theoretical framework (see e.g. Rozemeijer and Wynstra, 2005b; Trent, 1996).

Having discussed the organising entities that constitute ‘who’ is organising, the next section deals with ‘what’ is organised, by addressing the organising of design and manufacturing.

8.2 ORGANISING DESIGN AND MANUFACTURING

In the analysis of organising design and manufacturing, three issues are considered. First, it is argued that the division of responsibilities and the specifications underlying these responsibilities are crucial for opportunities to organise design and manufacturing in relation to each other. Second, the possibility to decouple design activities through the utilisation of modular design principles is addressed. Third, solutions aimed at decoupling tightly related manufacturing activities across company boundaries are examined.

8.2.1 DIVISION AND SPECIFICATION OF RESPONSIBILITIES

The organising of design and manufacturing is affected by the division of responsibilities between buyer and supplier. There are trade-offs from adjusting

activities within versus across company boundaries. Gadde and Jellbo (2002) suggest that design activities are either adjusted to other internal design activities, or they are adjusted to the manufacturing activities of the supplier. Their findings show that the division of labour influence these adjustments because of the interaction enabled by the priorities set by the actor responsible for design activities. These claims are supported in part by the findings from this case study. It was found that maintaining design activities in-house facilitates coordination with other internal design activities. However, internal activity coordination implies that the manufacturing activities of suppliers might require adjustment to the buyer's design activities. In the case of the structural frame, Signal Solutions designed the system and High Tech Structures was responsible for its manufacturing. In this setup, the adjustments to supplier's manufacturing activities reduced the opportunities for High Tech Structures to exploit similarities in its operations. The opportunities for resource utilisation based on the design of the system extended beyond this supplier and affected the operations of material suppliers. Conversely, when both design and manufacturing are outsourced to a supplier, the setup with the standardised electronic device implied improved coordination of activities performed by Secure Communications. Indeed, the priority given by the supplier to coordinate design and manufacturing for this system implied that Signal Solutions had to adjust their internal design activities in order to accommodate the standardised electronic device in their offerings.

The case study findings show that the relationship between division of labour and adjustments to design and manufacturing activities is not straightforward. Separating or uniting management of design and manufacturing does not have a direct impact on the opportunities to coordinate the undertaking of the two. Rather, the nature of the design specification determines the opportunities to adjust activities. The reason for adjusting design and manufacturing activities in the case of the standardised electronic device was not that the design activity was outsourced, but rather that the design was completely controlled by Secure Communications. As a system belonging to the standardised product portfolio of Secure Communications, the supplier was able to benefit from similarities in their operations since it controlled the organising of design and manufacturing. This was also why Signal Solutions was obliged to adjust its design activities to those of the supplier. The data processor also represents an outsourced design activity. However, in this case the open design specification provided opportunities to adapt the design to suit both buyer's and supplier's needs. The extensive interactions engaged in by Signal Solutions and Communication Platforms made it possible for Communication Platforms to adapt the design to suit their manufacturing activities and standard work procedures, while still accommodating Signal Solutions' design activities. In the outsourcing of manufacturing activities, the adjustments to the operations of High Tech Structures were to accommodate the buyer's detailed specification of the manufacturing task. The purchasing department's representation was based on a rigid specification and a

commercial focus, giving the supplier little flexibility to adjust manufacturing activities to suit its operations. Although the case study does not include such examples, there should be opportunities to outsource manufacturing activities and to remain open to adapting design specifications to improve system manufacturability.

These findings show that, in addition to the division of labour, the nature of the design specification provides a rationale for adjusting design and manufacturing activities to each other. The more specified and rigid the design specification, the fewer the possibilities to adjust design and manufacturing to each other. The product development department produces the design specification, but its nature is determined by the directions provided by project managers for each particular customer project and the long term product strategies pursued by product managers.

Purchasing of customised and complex systems implies that costs and benefits are rarely co-located in time. Generally, both buyer and supplier invest heavily at the outset of the relationship in order to adjust design and manufacturing activities to each other, in the expectation of future long term benefits. This is exemplified with a supplier assuming design responsibility since there are high costs associated with the design task preceding the first business transaction between buyer and supplier. Other researchers also point to relationship specific investments that characterises many buyer-supplier relationships (see e.g. Gadde and Snehota, 2000; Ford, 2007). In the case study, the redesign and outsourcing of the data processor was a very costly undertaking for both Signal Solutions and Communication Platforms. Signal Solutions engaged in this process because of expected cost decreases related to lifecycle management of component obsolescence, while Communication Platforms expected long run economies of scale and scope based on a steady inflow of orders. The development of the customised electronic device implied similarly high costs for Secure Communications before the first sales. The investment nature of outsourced design activities imposes risks for both buyer and supplier. For the buyer, outsourcing design activities implies high switching costs and potential lock in effects. For the supplier, there is a risk of not achieving sufficient business volume to compensate for the start-up costs. In such cases, long term agreements are important for both buyer and supplier, making it important for the purchasing department to have the support of the product management department in formal and informal commitments. This organising entity can facilitate risk reduction by supporting exclusivity clauses and volume commitments, or contributing development money to reduce the supplier's initial costs.

8.2.2 DECOUPLING OF DESIGNS

Since design activities are interrelated via system interfaces, they require organising in relation to each other. The design principle applied is important in this respect since it determines the degree to which system interfaces are coupled. Systems can adhere to either integral or modular design principles, and while integral designs

require tightly coupled designs, modular designs imply decoupling of system interfaces.

The analysis of electronic devices reveals both modular and integral design characteristics depending on the perspective applied. From the perspective of Secure Communications, the design of the electronic devices followed a modular design principle that facilitated management of variety related to the particular system without the need to adjust its design activities. For Signal Solutions, however, there were neither standardised system interfaces between different brands, nor in relation to the offerings that included them. These integral design characteristics made it difficult for Signal Solutions to handle the integration of various electronic devices into their offerings in the individual customer projects since design changes propagated through the offerings. In terms of the data processor, the modular design principle that resulted from the redesign efforts implied that the design activity of the data processor was decoupled from the design activities related to adjacent systems. This decoupling was enabled by the standardised system interfaces which mean that the design changes were more contained compared to integral design.

The nature of the couplings between design activities impacts on the relationship content between buyer and supplier. Many authors suggest that modular design principles facilitate collaboration with suppliers (see e.g. Dubois and Wynstra, 2005). Similarly, Araujo et al. (1999) and Brandes (1993) argue that collaborative relationships require internal adaptations in order to achieve decoupled system interfaces that reduce variety and increase standardisation. However, the literature differs in relation to the organisational arrangements resulting from modular design principles. On the one hand, Sanchez and Mahoney (1996) argue that a modular product architecture reduces the effort devoted to organising purchased systems, building on the notion that modularity allows for loosely coupled design activities. On the other hand, Brusoni and Prencipe (2001) claim that modularisation can require greater interaction and knowledge exchange between buyer and supplier.

The findings from this case study are in line with both these statements. On the one hand, modular design interfaces enable decoupling of internal and external design activities, making it possible to achieve similar results with less interaction compared to a system characterised by integral design principles. For example, Secure Communications' modular standardised electronic device implied that it was able to satisfy a number of customer requirements without the need for close interaction with customers. This compares to the integral design characteristics of the structural frame which implied that every design change required close interaction between buyer and supplier. On the other hand, analysis of the relationship with Communication Platforms demonstrates that although the data processor included modular system interfaces, this relationship was one of the most interactive buyer-supplier relationships of Signal Solutions. This interaction is partly explained by

modular design principles requiring more initial organising in order to establish the standardised system interfaces that decouple subsequent design activities. The interaction was also based on the additional responsibility that Communication Platforms was able to assume because of the modular design features. The supplier was fully responsible for both system design and lifecycle management related to the data processor, without this impacting on the rest of the offering. This is enabled by the locking of certain design parameters resulting from the modular design. Without modular design and decoupling of design activities, outsourcing of design and maintenance of the data processor would have been very difficult. Hence, the seemingly contradictory findings regarding the relationship between modularity and organisational arrangements can be explained by the fact that the division of responsibilities between buyer and supplier constitutes a mediating variable between the two. When modularity results in more intense interaction between buyer and supplier this is explained by the accompanying transfer of responsibility, which in the absence of decoupled design, would have been impossible. If the division of labour between buyer and supplier remains constant, modular design interfaces require less interaction than integral ones.

Although decoupled designs facilitate the outsourcing of design activities, this division of labour is still possible with integral design features which characterise tightly coupled designs. Outsourcing of the customised electronic device shows that new product development can be outsourced even if the offering in which it is included represents an integral product architecture. However, because of the diffusion of design changes, these systems are more easily managed if outsourcing is limited to manufacturing activities, unless a stable design can be guaranteed over time. Design of the structural frame was kept in-house since the structural frame was not only a customised design but also required minor adjustments in response to individual customer projects. In alignment with these findings, Araujo et al. (1999) discuss the importance of linking product characteristics to the division of labour. They are not in favour of separating design and manufacturing responsibilities in the case of integral designs and emphasise the substantial collaboration and mutual adaptation that follow from such a separation. Similarly, Gadde and Jellbo (2002) claim that the limited flexibility following the coupling of design activities makes it more difficult to outsource systems characterised by substantial interdependencies related to adjacent systems.

8.2.3 Decoupling of Manufacturing Activities

Outsourcing manufacturing activities requires coordination of internal manufacturing activities and the manufacturing activities of the supplier. In the studied case, all three relationships were characterised by this division of labour. This study includes operations related to customisation and order-based production due to the independent customer projects that characterise the operations of Signal Solutions.

Coordinating manufacturing activities is important because of the close complementarity among the activities involved in customised operations. The technical interdependencies between the buyer's and supplier's manufacturing activities have been addressed in the context of their dependence on system design.

In addition, there is a time dimension related to the complementarity between manufacturing activities. Because of the tight coupling between the manufacturing activities of Signal Solutions and the supplier, lead time was identified as important and problematic in all three relationships. Since the manufacturing activities related to purchased systems were initiated in response to specific customer orders, lead times were longer compared to standardised supply where it was possible to draw on inventory supply to reduce delivery times. Since many upstream suppliers adhered to order-based production and lean manufacturing principles, lead times could snowball. For all purchased systems, the sourcing operations of suppliers accounted for most of the lead time.

Gadde et al. (2010) emphasise the importance of continuity in physical flows, and suggest that this continuity is fundamental to a company's operations. Just-in-time principles have been the subject of much research, and are used to ensure timely deliveries for manufacturing operations in order to improve flows of materials (see e.g. Waters-Fuller, 1995). However, not all operations are characterised by continuous manufacturing. Gadde et al. (2010) show that demand patterns may be irregular, making guarantee of supply difficult. In the studied case, production volumes were low and irregular, making it both difficult and undesirable to establish continuous material flows. When low purchasing volumes and irregular order patterns make it difficult to coordinate manufacturing activities, the solution might be to decouple the manufacturing activities of buyer and supplier. This reduces the impact of lead times on the manufacturing activities of the buyer. Decoupling is accomplished by introducing buffers along the chain of activities. Pre-manufacturing solutions and subsequent storage is one option that assures availability of key systems for new customer projects. Alternatively, if the supplier's sourcing operations constitute a major source of lead times, another solution would be advance purchase orders to ensure that there are components in stock to manufacture the systems in response to new customer projects. In addition, providing suppliers with reliable forecasts facilitates adjustments to manufacturing operations. Gadde et al. (2010) mention both inventory and information sharing as viable methods to adjust the manufacturing operations of buyer and supplier in relation to each other.

The opportunities to commit to buffering solutions that decouple manufacturing activities depend on the availability of the resources necessary to invest in cost-efficient purchasing operations outside individual customer projects. Sponsorship from the product management department is pivotal to such investments if the purchasing department does not have decision autonomy, or the financial authority

for such commitment. In the case of Signal Solutions, the purchasing department was 90% financed by individual customer projects. Thus, support of the product management department was required to forge a frame agreement with Communication Platforms that included volume commitments to facilitate advance purchasing orders. On the other hand, the project centred approaches related to Secure Communications and High Tech Structures explain the lack of formal arrangements for decoupling manufacturing activities. Project managers struggled to authorise advance purchase orders in order to meet delivery deadlines for the structural frame since project managers could not sign off on purchasing activities before a customer contract is signed.

8.3 ISSUES IN EFFECTIVE ORGANISING

In the attempts of the actors in the organising entities to organise purchasing and supply management, three important issues can be identified based on the relationship analyses: commonality across systems and offerings, consolidation across customer projects, and management of customisation in relation to purchased systems. These issues are crucial in organising since they provide the prerequisites for the resource utilisation of buyer and supplier as well as the necessary adjustments to design and manufacturing activities. In the three following sections, the three issues are introduced and analysed.

8.3.1 COMMONALITY

Commonality refers to the use of similar components across multiple products. Commonality is closely associated with standardisation in design activities since locking of design parameters is necessary to achieve commonality in purchased items. Commonality increases the opportunities for resource utilisation, both internally and in relation to suppliers. This is explained by the fact that standardisation allows for exploitation of economies of scale and scope in facilities and capabilities, via similarities in design and manufacturing activities.

Most of the literature on purchasing and supply management focuses on component or parts commonality (see e.g. Sánchez-Rodríguez et al., 2006; Sheu and Wacker, 1997). In relation to this literature, the case study identifies commonality at both component and system level, with different levels of commonality in the product architecture. For example, the corporate-wide frame agreement with Communication Platforms implies component commonality for circuit boards, across all products in all business units. In Signal Solutions offerings there were many systems that were similar across several product platforms: three out of the four studied systems purchased were included in more than one product platform. However, in terms of commonality, only one of these systems, the data processor, was standardised across these products. While commonality at component level enables more efficient purchasing operations due to the need to manage fewer purchased items,

commonality at system level saves on man hours devoted to design and integration activities.

Also, the literature emphasises commonality in relation to the product perspective, but there is also commonality in relation to customer projects in operations characterised by heavy customisation. For customised offerings, design adjustments may be necessary between customer projects related to the same product platform. This applies to the standardised electronic device and customers' requests for different supplier brands. These individual requests reduced commonality within product platforms. The discussion to implement a standardised interface in relation to adjacent systems within these offerings constituted an attempt to increase commonality across customer projects. The commonality across customer projects was high for the structural frame, which required only minor design changes from one customer to the next.

The literature (see e.g. Gerchak and Henig, 1989; Wacker and Treleven, 1986; Hillier, 2002; Perera et al., 1999) focuses on commonality from the perspective of one company, typically the actor responsible for design or purchasing activities. This study adopts a relationship perspective on commonality and shows that commonality differs depending on the actor perspective. For example, there was commonality in the standardised electronic device from the perspective of Secure Communications in whose operations, the system was completely standardised, enabling economies of scale and scope in design and manufacturing. However, since Signal Solutions was forced to manage multiple systems across its customer projects, it experienced little system commonality. To achieve commonality for suppliers required adjustments to the design activities of Signal Solutions from one customer project to the next. The limited component commonality related to the structural frame applied to both buyer and supplier. Material choices not only varied in relation to different Signal Solutions' product platforms, they also differed in relation to the products manufactured by High Tech Structures.

Regardless of the level of commonality and whether it refers to projects within single products or multiple product platforms, support is necessary from organising entities that operate across customer projects. Depending on the status of the purchasing function internally, the purchasing department can influence design specifications to increase commonality. Alternatively, product managers can support initiatives to achieve commonality in order to stabilise product platform designs or secure cost-efficient supply activities related to the offerings. In the case of Signal Solutions, the purchasing function operating as an 'order-taking' unit resulted in overly-detailed specifications for purchased items. These specifications limited the opportunities for commonality in purchased systems, despite the establishment of a system group within the purchasing department. However, in the case of the data processor, the Partner Management group within the product management department sponsored a

cross-functional initiative targeted specifically towards increasing commonality across both customer projects and product platforms. This, in turn, provided opportunities to adjust the design activities of the buyer to the supplier's manufacturing activities. It was possible also for the supplier to assume more responsibility without affecting the buyer's operations. With less commonality, such initiatives would have been too resource demanding.

There may be functional or physical reasons that obstruct opportunities to achieve commonality across purchased systems. For example, the data processor represents a functionality that was of little interest to the customer because, although indispensable to the overall functionality of the offering, it did not contribute any other value than connecting crucial systems. This provided the opportunity to standardise the design of the data processor. The requirements regarding the functionality of the standardised electronic device were very detailed and this system also interacted with adjacent systems through software interfaces. For these reasons it was not possible to standardise it within or across product platforms. The standardisation applied to supplier offerings only. The physical size and shape of the structural frames differed across all product platforms because of the encapsulating functionality of this system. Therefore, although there was potential to achieve component commonality in materials, the limited potential for system commonality was inherent to this system's physical characteristics and function.

8.3.2 CONSOLIDATION

Consolidation refers to the aggregation of purchasing activities that previously were performed independently of each other. Two types of consolidation were identified in the study. First, consolidation of suppliers to reduce the number of the suppliers used for purchased items is typically achieved by replacing multiple suppliers with a few suppliers of selected components, or by replacing component supply with system sourcing. In relation to Secure Communications, base line concepts with a fixed number of brands implied consolidation of suppliers. Similarly, outsourcing of the data processor was a case of system sourcing. Second, consolidation of purchasing orders refers to the grouping of orders from the supplier. Only the relationship with Communication Platforms benefited from consolidation of purchasing orders, in relation to both standardised circuit boards and the data processor. Consolidation provides benefits in the form of larger purchasing volumes to attract suppliers. The larger order quantities that consolidated purchasing allows, help supplier operations that benefit from increasing batch sizes and operate according to minimum order quantities. Consolidated purchasing also reduces the administration in both buyer and supplier. These findings are supported by studies on consolidation of suppliers and purchasing orders (see e.g. Narasimhan and Das, 2001; Trent and Monczka, 1998; Crama et al., 2004).

Commonality provides the foundation for consolidation in that a degree of standardisation is required to enable consolidated purchasing activities. Depending on the level of commonality, consolidation of purchasing activities can take the form of synchronisation among several customer projects within particular product platforms or synchronisation across multiple product platforms. Beginning with consolidation across products, the lack of commonality in materials across the purchased systems made it difficult for High Tech Structures to consolidate purchases to satisfy the minimum order quantities of their material supplier. The lack of consolidation made it difficult to mobilise suppliers. For example, High Tech Structures expressed interest in replacing Signal Solutions, and the material supplier assigned lower priority to manufacturing the materials required for the structural frame. For both these suppliers, the low and irregular purchasing volumes made it difficult to benefit from economies of scale and scope in operations, problems that would have been eased by consolidated purchasing to pre-manufacture the structural frame or approved advance purchase orders. In contrast, the commonality across product platforms and individual customer projects in the case of the data processor provided opportunities for consolidated purchasing and supply management activities related to this system. These consolidated purchases enabled both volume commitments and forecasting which was helpful for Communication Platforms' operations planning.

Consolidation of purchasing and supply management activities occurs across business units. These consolidation efforts can apply to specific items or potential business from several business units negotiating arrangements with suppliers. In the case of Signal Solutions, both these consolidation alternatives applied. Concerning the consolidation of specific items, the corporate-wide consolidation efforts allowed negotiation of a centralised frame agreement with Communication Platforms, applying to the purchasing of standardised circuit boards across all business units. Consolidation of business opportunities allowed both Communication Platforms and Secure Communications to be mobilised as suppliers by Signal Solutions based on wider corporate group collaboration. Despite losses related to the first generation of the data processor, Communication Platforms expressed satisfaction with the relationship because of the business acquired as a result of the added business opportunities. Consolidation of purchasing volumes across business units have been observed in several studies (see e.g. Trent and Monczka, 1998).

The involvement of organising entities is crucial not only for achieving the commonality underlying the opportunities for consolidation, but also for the actual consolidation efforts. The departments that are influential in achieving commonality also facilitate consolidation. First, commodity-based organising within purchasing departments facilitates consolidation at the component level. This applies to Signal Solutions where lateral communication at group level was enabled by commodity-

based organising within the business units. The consolidation of purchases in relation to Communication Platforms was a result of these consolidation efforts which were directed by the Procurement Council based on organising across the commodity groups in the business units. At system level, the relative influence of the project management and product management departments provided the foundation for consolidating purchasing orders across customer projects. In the studied case, project focused operations hindered such consolidation efforts because budgeting was related to individual projects. The data processor was an exception, and sponsorship by the product management department allowed commitments outside individual customer projects.

8.3.3 CUSTOMISATION

Efforts to achieve commonality and subsequent consolidation concern the striving for similarities in activity configurations. These similarities need to be weighed against the need for variety promoted by individual customer requirements. Such diversity reduces similarities and increases close complementarity in activity configurations. In business environments characterised by customisation, these trade-offs can be expressed in terms of parallel product and project contexts. There are different ways of managing these simultaneous requirements. Two approaches emerged from the case study. First, in project-based organising, customisation occurs on a case by case basis, and products are developed incrementally within individual customer projects. Product-based organising implies locking of certain design parameters for fixed periods of time, which constrains the number of customised features. The involvement of the project management and product management departments differed substantially under these two organising approaches. In the first approach, the project management department directed operations; in the second approach, their decision autonomy was reduced in favour of the product management department.

The two approaches to managing customisation have implications for purchasing and supply management activities. In project-based organising, customer requirements take precedence over purchasing operations even when frequent design changes reduce the opportunity for cost-efficient, long term purchasing. This applied to the standardised electronic device where customers' preferences related to supplier brands did not allow long term supplier relationships. In relation to the data processor, the frequent redesigns and multiple system variants developed in parallel customer projects hindered outsourcing of the system before the redesign. In these circumstances cost-efficient purchasing was difficult and it was too resource demanding to adjust design and manufacturing activities across company boundaries.

In contrast, the product-based organising implemented during the data collection period, increased the status of purchasing and supply management activities internally by enabling a range of base line products. A fixed number of supplier

brands were selected as options for the standardised electronic device which reduced associated integration costs. This decision was beneficial for purchasing operations because fewer options brought some scale advantages with selected suppliers and more stable and attractive supply arrangements. Similarly, modularisation of the data processor was part of the effort to achieve product-based organising. Instead of developing the system incrementally, standardisation of the data processor was preserved by periodic upgrades. This facilitated outsourcing of design and manufacturing activities which had a major impact on purchasing and supply management activities.

While customisation generally limits the opportunities to benefit from economies of scale and scope by reducing similarities in design and manufacturing activities, resource utilisation can be increased without compromising customisation. It is possible to benefit from economies of scope based on using utilising suppliers that rely on standardised production activities to produce differentiated output. The structural frame purchased from High Tech Structures is an example. Although the structural frame constituted a customised design that was manufactured exclusively for Signal Solutions, it still contributed to the shared capacity utilisation of the supplier. Similarly, the design of the customised electronic device and data processor was part of the standardised work procedures that exploit similarities in the capabilities of Secure Communications and Communication Platforms. The manufacturing operations of these suppliers were set up in order to facilitate flexible operations to accommodate customised designs.

Alternatively, the design principles applied can contribute to customisation without compromising standardisation. The design principles applied to the system interfaces had a major effect on the prospects for achieving standardisation across product platforms and customer projects. Since modularity increases the standardised features of customised systems, this design principle provided opportunities to benefit from both standardisation and customisation. For example, the data processor and adjacent systems were redesigned using modular principles specifically to achieve system commonality across products and projects, and component commonality for the supplier. This standardisation made it possible to satisfy the requirements of three different product platforms, including a range of customised software applications, with the same system design. The modular design principles resulted in fewer engineering hours and higher purchasing volumes compared to the previous integral design features. Similarly, modularity in the standardised electronic device allowed Secure Communications to respond to specific customer requirements relying on standardised design activities. The integral design features of the structural frame made it more costly for High Tech Structures to attend to the customised requirements of Signal Solutions.

The need to balance commonality and product differentiation is discussed in Desai et al. (2001) which argues that the cost benefits associated with commonality in design activities need to be weighed against the revenue stemming from price premiums associated with product differentiation. Similarly, Robertson and Ulrich (1998) call for a balance between commonality and distinctiveness in product offerings. They suggest development of product platforms to manage commonality and variety in product offerings, an approach similar to the product-based organising identified in this study. Modularisation is also considered an effective means of managing standardisation and customisation simultaneously by several researchers (see e.g. Worren et al., 2002; Sanchez and Mahoney, 1996).

8.4 INTERPLAY IN ORGANISING

'What' is organised and 'who' is organising are both inseparable and affect each other. Commonality, consolidation and managing customisation are prerequisites for organising design and manufacturing across company boundaries. The relative influences of the different organising entities provide the basis for achieving commonality and consolidation. In addition to facilitating commonality and consolidation, the involvement of organising entities is also closely intertwined with the relation between design and manufacturing across company boundaries.

The status and role of the purchasing function can be described in terms of the contact patterns between the four departments of purchasing, product development, project management and product management. The project management and product management departments provide the purchasing and product development departments with directions and financial assets which influence the design specifications of purchased items and the opportunities to coordinate design and manufacturing activities across customer projects and product platforms. Close interaction with the product management department increases the potential to achieve commonality and customisation via standardised design parameters which limit customisation. Closer connection to the project management department makes standardisation of design parameters more difficult because of the focus on customisation in individual customer projects. The involvement of these organising entities can occur either directly in cross-corporate arrangements, or indirectly via cross-functional organising. They may also contribute to structural organising or act as lateral communication mechanisms. Although not referring specifically to organising entities, these findings have parallels with Wynstra et al. (1999) who refers to the management areas of product management, project management and development management in discussing purchasing involvement in product development.

'Who' is organising can provide opportunities or limitations for 'what' is organised, as in the case of the relationship with High Tech Structures. 'Who' was organising

affected the development of design activities for a long time through the emphasis on performance and customisation in individual customer projects and products, at the expensive of cost-efficiency and commonality across several customer projects and product platforms. Eventually, this organising and changes in other customer relationships caused problems for the supplier's manufacturing activities. The project-based organising and fragmented design activities caused unnecessary diversity in the design of the structural frames for the different product platforms. 'Who' was organising made it difficult to change 'what' was being organised. The limited contact between buyer and supplier did not allow joint efforts to diagnose and solve the problems related to escalating costs and lead times. Also the internal project focused organising provided few opportunities for long term investment in redesign, or proactive purchasing behaviour.

'What' is organised can also dictate 'who' is organising. Having decided that the data processor needed redesign and outsourcing, it was realised that such adjustments to the activity configuration would be impossible in the current interaction pattern between organising entities. The temporal cross-functional task force that directed the redesign of the data processor constituted an important complement to the project focused organising. By changing 'who' is organising, Signal Solutions and the supplier were able to achieve changes to 'what' was organised. These findings demonstrate that the relationship between 'what' is organised and 'who' is organising is complex, dynamic and two-sided.

Having discussed 'what' is organised, 'who' is organising as well as the interplay between the two, the final chapter offers some conclusions and implications.

9 CONCLUSIONS AND IMPLICATIONS

The study underlying this thesis set out to explicate organising purchasing and supply management across company boundaries, in light of the context in which this organising takes place. The preliminary research aim centred on linking internal and relationship organising. Following the theoretical framing of organising and challenges related to connecting two separate bodies of literature, this aim was revised to address 'what' is organised and 'who' is organising. Based on this revised research aim, an analytical framework was developed from the three network layers of the industrial network model. The three sets of organising issues, derived from this framework, were used to develop three research questions that were answered in the empirical enquiry. Building on these findings, a discussion was performed regarding 'what' is organised and 'who' is organising as well as the interplay between the two. Based on this discussion, the final chapter serves to derive conclusions from the study.

This chapter is organised as follows. The first three sections present the conclusions from the study. The main conclusion concerns organising of system boundaries, and two aspects related to this organising. Section 9.1 addresses the organising of system boundaries in terms of the physical aspects of these boundaries. Section 9.2 deals with the managing of system boundaries over time, translated to the context of organising project boundaries. In Section 9.3, organising and networks is discussed, emphasising that system boundaries and project boundaries are associated with resource structures and activity configurations that go beyond individual buyer-supplier relationships. Section 9.4 outlines some theoretical and managerial implications and Section 9.5 concludes the thesis with suggestions for future research.

9.1 ORGANISING SYSTEM BOUNDARIES

The first set of conclusions concerns organising of system boundaries. System boundaries refer to the physical and functional borders of systems. A company's offerings can be regarded as a number of connected systems. Depending on the complexity of the offerings, these systems vary in their composition, ranging from minor assemblies of a few components to advanced technological systems. Thus, systems exist at multiple levels, in product architectures that are related to one another. At the same time, a single system can be split into smaller systems while belonging to a larger aggregation of systems.

System boundaries can be analysed from different perspectives. First, as outlined above, system boundaries can be analysed in specific product offerings which are characterised by physical and functional matching in the connections between

ingoing systems. Second, system boundaries can be discussed in terms of the utilisation of systems across multiple product contexts. These boundaries contribute to the achievement of commonality in system design and purchasing and supply management. Third, system boundaries can apply to suppliers' offerings. From the perspective of the supplier, it can benefit from commonality through standardised design but require the customer to adapt the system boundaries related to each purchased system. Hence, organising system boundaries refer to organising within product offerings and across product offerings.

Organising system boundaries encapsulates the simultaneous striving for commonality and variety related to purchasing and supply management. On the one hand, commonality in purchased systems is desirable in order for the supplier to benefit from increased resource utilisation through exploitation of economies of scale and scope in design capabilities and manufacturing facilities. On the other hand, commonality restricts the opportunities for customisation and variety on behalf of the buyer. Customisation and variety are vital ingredients in the efforts of buying firms to achieve economies of innovation. The division of responsibilities between buyer and supplier largely determines the opportunities for economies of scale and scope or economies of innovation. Actors involved in design activities, either autonomously or in interaction with others, have the opportunity to influence system characteristics to increase commonality or increase customisation related to their respective resource bases.

In the organising of system boundaries, it should be emphasised that system boundaries are not uniform but differ in their connecting properties. There are functional and physical reasons why some systems are more tightly connected than others. There are also different ways to partition offerings into subsystems. This decomposition has consequences for system interfaces in terms of tight and loose connections between systems. Finally, the connections among system boundaries have direction. For example, a system can be loosely connected in relation to its composition of subsystems while simultaneously being tightly connected in relation to the aggregate structure to which it belongs.

The characteristics of system boundaries determine the opportunities for resource combining, internally as well as in relation to suppliers. When systems are tightly connected, flexibility is restricted in relation to adapting resource combinations due to design changes that spread across product offerings. In contrast, in loosely connected systems there are more opportunities to make resource adaptations that increase resource utilisation in the capabilities and manufacturing facilities of buyer and supplier. Alternatively, resource adaptations can focus on problem solving and developing new and innovative solutions related to either product or process characteristics. Hence, loose connections between systems provide for more flexibility and, therefore, further opportunities to combine resources, to benefit from,

economies of scale and scope or economies of innovation, or both. However, loose connections imply certain restrictions since they are conditioned by standardised design parameters which establish these loose connections. Changing the properties of system boundaries and, thus, how systems are connected to each other, provides opportunities to radically alter the prerequisites of current activity configurations and resource structures. In line with these conclusions, Fellows and Liu (2012) emphasise that the content of boundaries is equally important as their location.

The organising of system boundaries is determined by the involvement of actors. These actors differ according to their different interests in, knowledge about and opportunities to influence system interfaces and system boundaries, which depend on the organising entity to which they belong. Table 9-1 describes the roles of various organising entities in the organising of system boundaries within and across product offerings. Depending on the involvement of these organising entities in cross-functional interaction or cross-corporate arrangements, system boundaries are organised differently according to their representation of functional interests.

Table 9-1: Organising system boundaries.

	Organising System Boundaries Within Product Offerings	Organising System Boundaries Across Product Offerings
Purchasing	Prioritises supplier relationships. The role is either active participation in relationships or passive response to purchasing orders.	Opportunities to contribute to commonality in purchases depend on the composition of the purchasing department and status of the purchasing function.
Product Management	Prioritises long-term development of product offerings. Considers customised features and demand for variety in relation to long-term strategy.	Drives and supports strategic developments to standardise design parameters in order to achieve commonality in product offerings.
Project Management	Prioritises individual customer needs. Delegates specification and design activities as well as purchasing activities in relation to these customised requirements.	Limited involvement in organising across product offerings. Can impede commonality through promotion of customisation in individual offerings.
Product Development	Prioritises technical features of product offerings. Involvement in specification and design activities depend on the division of responsibilities between buyer and supplier.	Can contribute to commonality depending on directions guiding the specification and design activities.

The significant relationship between the physical characteristics of purchased systems and the organising of these purchases has been highlighted in the literature. For example, Araujo et al. (1999) suggest that the organisational structure of the buying function should mirror the systems bought in order to facilitate organising of these system interfaces. Others (including Sako, 2003; Modig, 2007; Sosa et al., 2004; Worren et al., 2002) emphasise the need to align product architectures and organisational structures. The table focuses on how organising entities affect the organising of system boundaries, but system boundaries also affect the need for organising. Neither system boundaries nor organising entities precedes the other; instead the two develop together. These findings are in line with Sanchez and Mahoney (1996: 64), who claim that "…although organisations design products, it can also be argued that products design organisations, because the coordination tasks implicit in specific product designs largely determine the feasible organisational designs for developing and producing those products". Sako (2003) takes a similar stance, stating that not only are organisational architectures being created around product architectures, but these existing organisational arrangements also constrain developments in the product architecture.

The notion that organising should mirror the characteristics of purchased systems works within the context of a particular system and an isolated view of the purchasing function. However, since there are multiple functional interests related to each purchased system the situation is complicated. In addition, there are multiple purchased systems with different characteristics in terms of both system boundaries and the extent of commonality versus customisation. This multiplicity implies that the organising entities are serving multiple purposes simultaneously, making it virtually impossible to establish any mirroring between system boundaries and organising of the purchasing function. A particular organising will create opportunities in relation to certain system boundaries, and restrictions in relation to certain others. These findings are in line with Araujo (2006) which suggest that there are asymmetries in the connection between technology and organisation. Araujo explains that rather than developing together, organisation and technology develop at different levels and follow different trajectories. Many others carry out similar arguments (see e.g. Brusoni and Prencipe, 2001; Sosa et al., 2004). Dubois and Araujo (2006: 25) summarise the relationship between technology and organisation by arguing that "[it] is less predictable and manageable than most of the literature reviewed thus far envisages".

9.2 ORGANISING PROJECT BOUNDARIES

The second set of conclusions pertains to the organising of project boundaries. Compared to system boundaries, project boundaries are not related to physical demarcations. Instead, they refer to the managing of system boundaries over time. Project boundaries imply temporary and time constrained handling of system

boundaries that have consequences for purchasing and supply management. These implications are especially apparent in organisations whose operations are characterised by project-like features.

Organising within project boundaries enables variation through localised adaptations to system boundaries that do not have to consider long-term or permanent solutions. In this respect, the time constraints provided by project boundaries imply advantages in terms of flexibility that facilitates customisation. In business contexts subject to heavy customisation, these project boundaries are important in order to allow for variation in customer offerings. Weick (1976) refers to such organisational arrangements as loosely coupled systems, and emphasises the variety enabled by these constellations. Project boundaries do not apply only to buying companies. In customised environments, suppliers also organise their operations around customer programmes, where each customer programme corresponds to a customised offering. Organising within project boundaries implies substantial interaction between buyer and supplier in relation to adaptations to system boundaries in individual offerings. This is in line with Andersen and Rask (2003), who report more interaction in purchasing and supply management to accommodate the high levels of customisation in project-based contexts.

Across project boundaries, there are limitations due to the temporary solutions to the organising of system boundaries. Customisation within project boundaries restricts opportunities for resource utilisation by reducing the potential to exploit economies of scale and scope. Also, the temporary nature of the solutions implies limited opportunities to transfer knowledge and experiences from one project to the other. Thus, although innovation within the project boundary is facilitated, the opportunities for innovation cutting across project boundaries in response to learning are restricted. Sometimes these limitations stem from missing coordination mechanisms across project boundaries. Sometimes the restrictions originate in lack of knowledge regarding opportunities for such coordination. The challenges related to organising across project boundaries are emphasised by research on project organisations. For example, Kreiner (1995) and O'Dell and Grayson (1998) emphasise the lack of organisational memory beyond individual projects which limits the opportunities for learning, exploiting ideas and planning beyond individual projects.

Organising project boundaries is about concurrent management of individualisation within project boundaries and organising across project boundaries. On the one hand, there is a need to customise operations within individual project boundaries to satisfy variety in terms of customer requirements on the use side of companies. On the other hand, it is necessary to consider commonality through standardised system boundaries in order for companies to achieve economies of scale and scope on the produce side. Therefore, managing resource utilisation within and across project

boundaries is a core task. Other works provide similar evidence. Lind (2006) suggests that projects are not isolated arrangements, but rather embedded entities that share a common context. She emphasises that many projects draw on a shared resource base, and that these projects need to relate to each other in order to improve the utilisation of these resources. Similarly, Lundin and Söderholm (1995) discuss the separating and relating characteristics of project boundaries necessary to achieve both specific goals and increased resource utilisation.

Organising project boundaries applies not only to managing system boundaries but also concerns managing physical material flows through consolidated purchasing and supply management across multiple projects. Commonality in system design is a prerequisite for this consolidation. Provided that commonality exists, opportunities for consolidated purchases are determined by the coupling among the manufacturing activities of buyer and supplier. When manufacturing activities are tightly coupled, it is difficult to consolidate purchases across project boundaries because of delivery times required to respond to specific projects. In contrast, decoupled manufacturing activities increase the opportunities to consolidate purchasing and supply management across project boundaries. Decoupling of otherwise closely complementary manufacturing activities is accomplished by introducing a buffer system between activities, for example, pre-manufacturing arrangements or inventory solutions. Consolidation of purchases impacts on the opportunities to exploit economies of integration. From an economising perspective, small batch sizes and frequent deliveries provide particular advantages. However, these benefits have to be weighed against other requirements. Therefore, economising on integration take different forms depending on the context, ranging from communicating estimated demand or committing to purchasing volumes to advanced just-in-time systems.

The concurrent organising within and across project boundaries is determined by actor involvement. Depending on the organising entity to which the actors belong, their interests, knowledge and influence in relation to the project boundaries, will differ. Similar to the organising of system boundaries, organising entities can be involved to various extents in cross-functional interaction and cross-corporate arrangements. The roles of organising entities in the organising of project boundaries are described in Table 9-2. The table shows that the organising entities have different influence and interest related to organising within and across project boundaries. Since these parallel requirements are facilitated by different forms of organising, managing these needs is facilitated by lateral communication mechanisms. Other authors also recognise the importance of lateral communication mechanisms to compensate for primary organisational arrangements (see e.g. Hillebrand and Biemans, 2004; Rozemeijer and Wynstra, 2005a). Depending on the primary organising practised, this lateral communication can facilitate organising within or

across project boundaries. Persson and Håkansson (2009) specifically address the need to establish cross-functional or even cross-corporate arrangements in organisations with traditional purchasing departments, in order to derive benefits beyond economies of scale and scope. These benefits are comparable to the customisation necessary in individual customer projects in response to traditional functional organising. In contrast, other authors emphasise the contribution of cross-functional teams in achieving cost reduction benefits (see e.g. Trent and Monczka, 1994). These benefits accrue when there is a need for lateral communication either across project boundaries spanning several business units, or in project organisations.

Table 9-2: Organising project boundaries.

	ORGANISING WITHIN PROJECT BOUNDARIES	ORGANISING ACROSS PROJECT BOUNDARIES
PURCHASING	Contributes with information transmission or coordination of technical and commercial aspects in individual projects, depending on the autonomy and authority of the purchasing function.	Can consolidate purchases across individual projects in case of commonality and access to financial assets, either through independent budget or via financial support from other departments.
PRODUCT MANAGEMENT	Involved in individual customer projects to guard product portfolio interests. Can oppose customised solutions in individual projects when they jeopardise long term developments.	Can support consolidation efforts in purchasing activities in case of commonality as well as system maintenance outside individual projects.
PROJECT MANAGEMENT	Responsible for project fulfilment in terms of satisfying customer requirements on time and within budget. Concerned with flexibility within projects rather than standardisation across projects.	Limited learning across projects because of localised solutions. Supports consolidation efforts only in cases where they provide benefits for individual projects.
PRODUCT DEVELOPMENT	Develops customised solutions upon direction from project management. The nature of these designs depends on the input provided by other departments.	Can contribute to system maintenance outside individual projects and develop standardised solutions through directions provided by other departments.

9.3 ORGANISING AND NETWORKS

The third set of conclusions relates to organising in business networks. Organising system boundaries and project boundaries involves not only the buying company or even the relationship dyad of buyer and supplier. System boundaries and project boundaries are associated with resource structures and activity configurations that go

beyond the buyer-supplier relationships where they are organised. Therefore, the boundaries between systems and projects are affected outside the individual relationship through network effects related to indirect suppliers and the other customers of the supplier. The existence of these network effects means that it is not enough to analyse dyads in order to understand the opportunities and limitations related to individual relationships. This was the starting point of this study and became more evident as the study unfolded. Therefore, it is argued that organising is important also from a business network perspective.

In organising purchasing and supply management related to one buyer-supplier relationship, network effects imply that organising of system boundaries and project boundaries must consider the needs of many actors. System boundaries and project boundaries have implications for activity configurations and resource structures that determine the opportunities to economise on scale and scope, innovation and integration for all parties in the business network. For example, commonality in system boundaries across multiple product offerings enables economies of scale and scope in relation to upstream suppliers. Simultaneously, such commonality restricts the opportunities for economies of innovation and variety in customer offerings. Similarly, organising across project boundaries enables consolidated purchasing and supply management, which allow upstream suppliers to better plan and synchronise their manufacturing operations. Meanwhile, such consolidation is based on commonality that limits the flexibility in customer offerings. Furthermore, standardisation of design parameters and organising across project boundaries facilitate learning and problem solving in the supply chain, providing opportunities to exploit economies of innovation.

Organising purchasing and supply management within a network context calls for the linking of technical solutions and physical material flows across multiple company boundaries. More importantly, connecting technical solutions to financial implications is a crucial organising task and ensures opportunities for economising on behalf of both buyer and supplier. The connection between technical or physical matters and commercial arrangements constitutes a mixed resource interface that provides a driver for economising in business networks. Organising this connection constitutes a prerequisite for mobilising suppliers by ensuring an allocation of costs and benefits in the buyer-supplier relationship that will attract suppliers. For example, a supplier that is responsible for realising customised designs for its customers faces substantial costs at the outset of the relationships while the benefits are earned only over time. In order to connect commercial arrangements to the early risks associated with the design investment, buyers can agree to volume commitments or contribute through provision of a development grant. Similarly, volume commitments or advance purchase orders may be necessary for the supplier’s

operations if physical limitations in upstream operations call for minimum order quantities or long lead times.

In the mobilising of suppliers, network effects imply that organising the connection between technical and commercial aspects in individual buyer-supplier relationships is not isolated from the connections in other relationships. The desired outcomes of buyers and suppliers in individual relationships are closely related to the outcomes achieved in other relationships. This is a natural effect of shared resource utilisation across many buyer-supplier relationships. The benefits associated with one relationship are dependent on achieving similar benefits in other relationships. This occurs when a supplier can design or manufacture a purchased system more cost-efficiently than the buyer. When the supplier is specialised in similar activities it can spread the fixed costs across several customers and achieve higher levels of resource utilisation.

Shared resource utilisation among actors in the business network implies that costs and benefits are not necessarily balanced within individual relationships. When connecting financial implications to technical solutions, it is sometimes necessary to accept more costs than the benefits received, in relation to one specific counterpart, because of the additional benefits that will be derived in connected relationships. Hence, suppliers may agree to a relationship where the costs exceed the benefits, in the expectation of gains in other relationships. These arrangements work as long as the net effect of the economic consequence is positive across all connected relationships. Imbalances between costs and benefits can also occur over time within individual relationships. This applies to strategic buyer-supplier relationships in which suppliers are mobilised in the expectation of long term cost benefits. Some authors point to the imbalance between costs and benefits in individual relationships. For example, Olsen et al. (2013) explain that monetary solutions are connected to the socio-material solution to which they apply; an argument that is in line with the above description of mixed resource interfaces. The same authors also argue that the complex connections emerging from the interplay between physical resources and economic consequences in business networks, imply that value or profit should be achieved in multiple relationships and not necessarily individual ones.

Network effects are related to the dynamics of organising of purchasing and supply management. To respond to changes elsewhere in the business network, organising of the connection between technical and commercial aspects may require adaptation to keep a supplier mobilised even though the content of the relationship may remain unchanged. This is because the financial implications of a technical oriented relationship rely on the supplier's resource utilisation in relation to many connected customer relationships. If the technical content or commercial arrangements of these connected relationships change, this has implications also for the outcomes in more stable relationships. Hence, what has positive effects at one particular point in time

may later have negative implications if the conditions change in the wider network of the buyer-supplier relationship.

9.4 IMPLICATIONS

This section discusses implications of the study. First, it addresses the theoretical implications. Second, the managerial implications are discussed.

9.4.1 THEORETICAL IMPLICATIONS

This study was conducted from a theoretically different perspective on company boundaries compared to the traditional purchasing literature. Rather than addressing the company boundary as a separating mechanism that distinguishes between what is internal and what is external to the firm, the company boundary was considered as an important connecting mechanism that bridges between what is ongoing inside the buying company with what takes place in suppliers. Furthermore, instead of assuming a stable border, the company boundary was treated as a dynamic and important feature of organising.

This theoretical point of departure was crucial for the study findings. By deliberately avoiding the company boundary as an analytical starting point, the study revealed crucial organising issues that matter regardless of their organisational location. Thus, the findings apply to internal as well as relationship organising, and bring together two previously separate bodies of literature. The conceptualisation of 'what' is organised and 'who' is organising enables a boundary-less discussion of organising. Application of an industrial network approach was important in this respect. By starting with analysis of resource combining and activity coordination, the boundaries between actors initially were set aside, allowing identification of crucial organising issues. The network perspective provided essential information regarding the organising within relationships; many of the findings rely on understanding activity configurations and resource structures extending to the context beyond the relationships in which the organising takes place.

The importance of the company boundary is not neglected within this perspective on organising purchasing and supply management. On the contrary, many of the findings depend on the fact that organising occurs on both sides of the company boundary. For example, the split between design and manufacturing responsibilities was crucial for the findings because of the different contextual circumstances that govern buyer and supplier operations. Shifting responsibilities across company boundaries substantially changed the coupling between design and manufacturing and constituted a crucial organising issue. Furthermore, the important role of organising in exploiting capabilities and knowledge related to the use and produce contexts, stems from the company boundary. Therefore, the company boundary plays a crucial role in organising purchasing and supply management. However, compared

to most of the purchasing literature, this study implies that 'what' is organised across the company boundary is more important than what is ongoing on either side of it.

This study also reveals the complexity inherent in patterns among organisational entities that are active in organising purchasing and supply management. This study addressed interaction patterns at several organisational levels, both cross-functional patterns and cross-corporate arrangements. By focusing on four organisational entities that play major roles in organising, the study identifies 'what' is organised in the interaction patterns among them. The study shows that different organising can provide similar outcomes because of the many opportunities for connecting organising entities. More importantly, the findings show that similar organising can provide different outcomes, depending on the context in which organising takes place and the perspective applied. First, similar interaction patterns between organising entities provide diverse outcomes depending on the context. Second, similar contexts imply contrasting outcomes depending on the actor perspective, because of the many parallel objectives inherent in organising. Positive outcomes for the supplier sometimes come at the expense of advantages for the buyer, and vice versa. Also, benefits related to the purchasing function imply restrictions on other company functions such as customisation within customer projects, or restricting design parameters in the product development function. In addition, advantages at a corporate level sometimes restrict actions in individual business units. The findings show that organising is crucial for company performance. However, because of the multifaceted connection between 'what' is organised and 'who' is organising, this performance relates to many actors and organisational levels, and raises the questions of "performance for whom?" and "what performance?" This study has contributed with insights regarding the multiple functional priorities that imply that performance can be expressed in many ways depending on the actor perspective. Performance in relation to one organising entity may come at the expense of performance in another one. For example, successfully satisfying the needs of customers in individual projects may reduce the opportunities for cost-efficient purchasing activities. Similarly, consolidation efforts on a corporate level may provide cost benefits for the group but can impose additional costs or reduced flexibility on the business unit level.

An important implication of these findings is that organising has to be understood within the context in which it takes place. Therefore, there are limited opportunities for general recommendations, a finding that is in line with previous research. Nevertheless, a lot of the literature on purchasing and supply management suggests there is a direct relationship between organising and performance. This study does not provide organising recipes, but contributes by showing the connection between certain interaction patterns among organising entities and organising outcomes in different contextual circumstances. For example, the connection between the

purchasing department and either the product management or project management departments, was shown to depend on the nature of the system boundaries and the project boundaries.

9.4.2 MANAGERIAL IMPLICATIONS

This study started from the position that organising purchasing and supply management is not limited to the purchasing department. Rather, it was emphasised that purchasing and supply management is a cross-functional issue that concerns many company departments. The findings of the study confirm this claim by identifying three organising entities in addition to the purchasing department as crucial for organising purchasing and supply management.

An important implication of the cross-functional characteristics is that the most pressing organising issue for managers is not organising within the purchasing department, but rather how the purchasing department relates to other organising entities. The status of the purchasing department in relation to other company functions determines the opportunities for organising. This status is determined by direct reporting lines that govern decision making authority, but also cross-functional interactions that enable knowledge sharing among actors. In addition, the allocation of financial assets among organising entities is crucial for the relative status of company functions since this allocation controls the deployment of resources necessary for organising action.

It was concluded that the contextual embeddedness of organising provides little room for general recommendations regarding the organising of interaction between organising entities. However, there are two important considerations that direct the outcomes of organising, regardless of the context in which it takes place. First, there is an important interplay between the organising of technical matters and commercial aspects. Therefore, organising these two is an important managerial task. Sometimes, too strong a focus on technical matters impedes the development of commercially viable solutions. However, technical developments can also facilitate commercial arrangements and, in some cases, the two are not closely connected. Depending on the interplay between technical and commercial issues, managers should organise differently. For example, in the case that technical features are driving the commercial implications, it is important to establish a connection between the organising entities responsible for developing technical and organisational arrangements. Such a connection includes the product development department that develops the design specification, and the purchasing department that is responsible for managing contractual arrangements, and also the organising entities that issue or finance design and purchasing orders. Depending on the role of the supplier, the interactions between organising entities can take place either in cross-functional interactions or in cross-corporate arrangements. In contrast, for standardised items

where there is little interplay between technology and commercial agreements, the purchasing department can operate more independently in relation to suppliers.

The second consideration includes the coordination of product and project contexts in relation to purchased items. This connection is not straightforward, but depends on the management of customisation across product offerings and the nature of system boundaries. In some circumstances, customisation within individual projects comes at the expense of long term developments in product offerings. This occurs when organising serves to prioritise the needs of individual customers related to the design and purchasing of systems before establishing long term and cost-efficient system boundaries. In other situations, however, customisation within projects is restricted, based on standardised design parameters in relation to one or several product platforms. This occurs when the organising principles prioritise development of standardised system boundaries over satisfying individual customer needs. It is possible also to organise to facilitate autonomy in both project and product contexts. This is accomplished by organising for standardised system interfaces that enable customisation within individual systems without impacting on the overall characteristics of product platforms. The connection between product and project contexts is determined by the organising of the purchasing department in relation to the product management and project management departments. When authority is assigned to the purchasing department, via decision autonomy or independent budgets, this organising entity has the opportunity to balance the needs of product and project contexts in purchasing and supply management. If the project management department is directing or financing design and purchasing activities, the project context is prioritised over the product context. When there is a closer connection between the purchasing and product management departments, the product context takes precedence, to facilitate commonality across individual projects.

The responsibilities involved in managing the relationship between commercial and technical aspects as well as product and project contexts are illustrated in Figure 9-1. It should be emphasised that there is not a contradiction between the elements of the two pairs. The figure shows that there are two important interplays to consider in the organising of purchasing and supply management. Managers should evaluate the nature of these interplays and organise to manage them accordingly. In some circumstances, organising serves to manage existing relationships between technology and commercial aspects, and between product and project contexts. At other times, organising can be used to change the nature of these interplays. Both options constitute important organising tasks for managers.

Finally, because of the multifaceted characteristics of organising, organisational arrangements facilitate managing of certain aspects while restricting others. Organising can prioritise purchasing of individual components or systems, in relation

to either individual customer projects or to the offerings of one or more product platforms. Furthermore, organising can facilitate routine communication to reduce everyday administrative efforts or contribute to complicated problem solving through collaboration between buyer and supplier. Moreover, organising can enable agile and flexible decision making or clear and systematic decision processes. Regardless of the prevailing organisational arrangements, a crucial task for managers includes assessment of their limitations in order to implement compensating lateral communication mechanisms or temporal solutions when necessary.

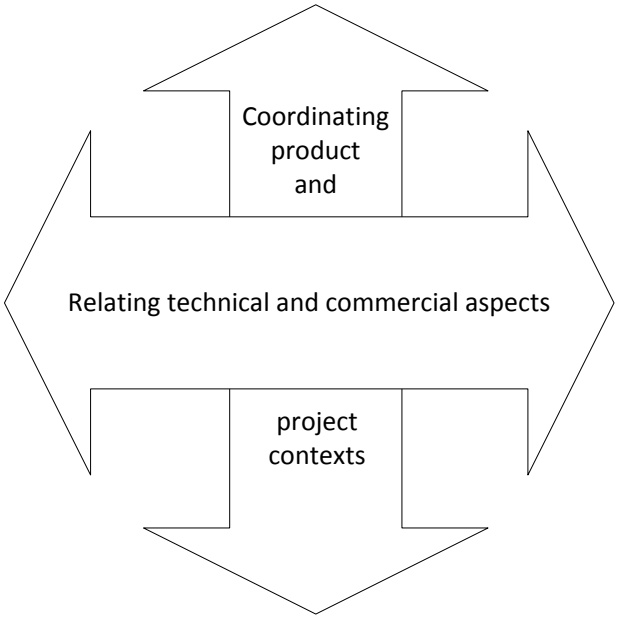


Figure 9-1: Two important considerations in organising purchasing and supply management.

9.5 FUTURE RESEARCH

Also studies of boundaries have boundaries. This thesis ends with three suggestions for future research to explore issues not addressed in the present study.

First, this study focused on organising purchasing and supply management in relation to individual supplier relationships. However, the findings show that organising in relation to individual relationships is affected by the surrounding business network because of the network effects that extend beyond buyer-supplier dyads. Although no examples of organising beyond individual relationships were found in this study, it is reasonable to assume that organising could include, for example, indirect suppliers if their operations influence purchasing and supply management. Such organising could include connections between the buying company and secondary suppliers, or collaboration between suppliers that design or manufacture related systems. Numerous works explore such supplier base organising, discussing issues such as size and structure of the supplier base, and the application of single versus multiple sourcing or hybrid forms of purchasing in supply chains and supply networks (see

e.g. Dyer and Nobeoka, 2000; Harland et al., 2001; Lambert et al., 1998; Lamming et al., 2000; Richardson, 1993). However, as emphasised by Håkansson and Snehota (1995), an understanding of individual business relationships is necessary to expand knowledge at the network level. In this respect, this study of organising purchasing and supply management in relation to individual relationships constitutes a suitable stepping stone towards future research on supplier base organising.

Second, the findings from this study reveal how organising purchasing and supply management occurs at many organisational levels. Although the analysis focuses on the interplay between organisational entities at the business unit level, there is empirical evidence that events at corporate level have an impact on this organising. Some of these events are related directly to purchasing and supply management, such as consolidation efforts, others are more general, such as mergers and acquisitions. In this study, decisions on the composition and location of the purchasing department originated in human resource management issues in post-merger integration, rather than strategic purchasing and supply management considerations. This finding points to the importance of corporate level initiatives and is in line with a study by Johnson and Leenders (2006). In studying changes in the organising of the purchasing function, they found that this function typically was reorganised as a result of changes elsewhere in the organisation, rather than being a transformation targeted only at the purchasing function. Therefore, a suggestion for future research would be to more deeply investigate the connections between different levels of organising.

Third, this study does not distinguish between the formal and informal dimensions of organising. However, the findings show that both dimensions are important for the development of purchasing and supply management. On the one hand, most of the changes in the case related to developments in attitudes and influence among the organising entities studied. On the other hand, formal mechanisms, such as top management support, sponsoring and budget systems, were identified as crucial. In order to increase understanding of organising purchasing and supply management, more research on the roles of formal versus informal organising aspects would be useful. In such efforts it is possible to draw on organisation theory, where research on formal and informal organising is addressed (see e.g. Scott and Davis, 2007).

These suggestions for future research conclude this thesis on the organising of purchasing and supply management. Hopefully, organising has come across as a complicated and dynamic endeavour that takes place across company boundaries, including multiple and sometimes conflicting interests with limited opportunities for standard solutions. However, the study shows that for practitioners actively engaged in organising efforts on the basis of these preconditions, the opportunities for exploiting potential related to purchasing and supply management seem to be as endless as the organising process itself.

“Boundaries don’t keep other people out. They fence you in.
So you can waste your lives drawing lines.
Or you can live your life crossing them.”
MEREDITH GREY, FICTIONAL CHARACTER IN TV-SERIES GREY’S ANATOMY

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APPENDIX I – BUYER INTERVIEW GUIDE

EXPLORATORY INTERVIEWS

ABOUT

- What is your present title or responsibility?
- Tell me about your background; education, previous experiences with other industries, companies and departments.

CUSTOMER MARKET

- What is your opinion regarding possible changes in customer demand?
- What new requirements on the company and its offerings do you see?
- How did you come to these conclusions?

DEPARTMENT AND ROLE

- Tell me about your department's role in the organisation and the business processes.
- Tell us about your specific role in this department.

PURCHASING & SUPPLY MANAGEMENT

- Tell me about if and how you get in contact with purchasing issues, supplier aspects or make or buy decisions.
- What is your opinion regarding how these aspects are organised and handled today?
- What problems do you feel exist with regard to the present handling of these aspects?
- Could you exemplify?
- How would you like these aspects to be addressed? What do you base these statements on?
- Are you aware of any other views? Do you think that your view is representative of your department and the company?
- Are you aware of any organisational changes that address purchasing and supply management?
- What happened with the Partner Management group and the new sourcing strategy?

FOCUSED INTERVIEWS

ABOUT

- What is your present title or responsibility?
- Tell me about your background; education, previous experience in other industries, companies and departments.

THE PURCHASED SYSTEM IN QUESTION

- Can you describe the system, its functionality and composition?
- In what product platforms is this system represented? Is it similar or different across these platforms?
- What are the functional and physical interfaces with adjacent systems in the offerings? How is the system integrated and assembled into the offerings?
- Have there been any changes in this system over time? Are there any future plans for redesign or purchasing strategy?
- When was the last delivery or event related to this system? What do the future plans look like?

THE SUPPLIER RELATIONSHIP IN QUESTION

- Can you describe the supplier of this system?
- Can you describe the relationship between you and the supplier?
- What is the contractual arrangement between you and the supplier?
- Are you satisfied with these arrangements? What are their advantages and disadvantages?
- Name three things that you would like to keep and three things that you would like to change in the current arrangements.

THE CONTACT PATTERNS

- What departments and individuals are included in the contact pattern between you and the supplier? What are the roles of these people in the relationship?
- What supplier representatives are active in the relationship?
- Describe the interaction and coordination in the relationship, in terms of form and frequency, including both formal and informal aspects.

THE INTERNAL ORGANISING RELATED TO THIS SYSTEM AND RELATIONSHIP

- What departments and individuals have been influential in the design of this system? Advantages and disadvantages?
- How does the internal organising enable or restrict the relationship?

APPENDIX II – SUPPLIER INTERVIEW GUIDE

ABOUT

- What is your present title or responsibility?
- Tell me about your background; education, previous experience in other industries, companies and departments.

GENERAL INFORMATION

- Describe the company and its main business and the most important strategic developments.
- Describe the organising of the company.
- Who are your customers in general and main customers in particular?
- What do you supply to your customers?
- Similarities and differences in relation to the particular customer and system in question?

SYSTEM IN QUESTION

- Describe the system and the manufacturing operations related to it.
- Describe the purchasing operations related to the system in question.
- What is your role in the design and manufacturing of this particular system?
- Are you satisfied with the design of this system? If you could change the system in question in any way, what changes would you make?

RELATIONSHIP IN QUESTION

- How did this relationship and the supply of the system begin?
- Are there other elements involved in the relationship? Where do you see the biggest business or biggest potential?
- How would you describe the relationship? Strengths and weaknesses?
- Are you satisfied with the contractual arrangements?
- Who is involved in the contact patterns with this customer? What are their roles? Are you satisfied with these connections?
- What kind of information do you exchange with each other? What is the typical agenda for these meetings? What events cause you to contact each other?

APPENDIX III – CUSTOMER INTERVIEW GUIDE

ABOUT

- What is your present title or responsibility?
- Tell me about your background; education, previous experience in other industries, companies and departments.

ORGANISATION AND BUYING BEHAVIOUR

- Describe the most important characteristics of your business environment.
- Describe the business of your company and your role in this company.
- Describe your needs when purchasing the offerings in question from suppliers like this particular supplier.
- What is most important when buying such an offering from these kinds of suppliers? Price? Performance? Delivery time? Open or standardised interfaces? Modularisation? The relationship to the supplier? Supplier brands?
- Do you perceive that you have a lot of special or customised requirements when buying systems?
- How detailed are your specifications? On what level do you specify? Where do the requirements come from?

THE RELATIONSHIP WITH THE SUPPLIER IN QUESTION

- For how long have you been a customer to this supplier?
- What offerings do you purchase from this supplier? Where do you see the biggest business or biggest potential?
- What is the supplier's role in the specification and design of the offerings during your buying process?
- Do you perceive that there is a lot of communication regarding the consequences of certain requirements on cost in your relationship? Are you provided with alternative designs in order to achieve shorter delivery or lower cost?
- If you could change the supplier or their offerings in any way, what changes would you make?

APPENDIX IV – TIMELINE