Collaborative New Product Development: 
Supplier Selection and Purchasing 

Lisa Melander
Abstract

Suppliers provide new technology to firms and are important in firms’ NPD. It is not sufficient for firms to select the most appropriate technology; they must also select the most appropriate supplier for their NPD. The purpose of this licentiate thesis is to map and identify criteria used in the process of selecting a suitable supplier, and explore the role of Purchasing in NPD collaborative projects.

This thesis is based on case study research where two NPD projects have been studied. The case sampling consisted of searching for projects that were believed to be rich in information about the process of supplier selection. Both studied were conducted at ABB, which is a large high-tech system integration firm. ABB was a good firm to study because as a company, it is used to implementing new technology from suppliers. The data collection consisted of interviews, factory visits, internal and external documents. The data gathered was analysed by conducting content analysis and then using categorization to structure it. In addition, within-case analysis as well as cross-case analysis were performed. The research process was inductive and its purpose was formed throughout the on-going studies.

This study has identified and categorised criteria for selecting a supplier that is suitable to become involved in NPD projects. Both criteria from existing literature and from the NPD projects studied are mapped into a process model of supplier selection in which they are classified into three categories: product and production factors, firm characteristics and relational criteria. The main findings from this study are criteria that firms use in their assessment and selection of suppliers. These supplier assessment criteria can be divided into basic, product and firm criteria. One difficult element to consider is the uncertainty of an NPD project. The thesis argues that uncertainty can be divided into technological and strategic uncertainty. Additional criteria to consider in supplier selection are divided into technological, business and relational-specific criteria.

This study has investigated the role of Purchasing in NPD and argues that Purchasing can be a trouble-shooter. This role can solve problems that emerge in collaborative NPD projects that involve suppliers. The types of problems that a trouble-shooter can solve are concerned with lack of commitment and interest from the supplier or conflicts when the supplier has changed its strategy. To solve these problems, Purchasing does not need to be present during the whole
NPD project, but can have the role of a trouble-shooter and become involved in the project when the problems have emerged. By not being a part of the NPD team, Purchasing can evaluate the situation objectively without affecting the personal relationships that exist among the individuals in the NPD.

Key words: Supplier selection, NPD, Purchasing, case studies
Acknowledgements

Holding this book in my hand almost feels unreal. What from the beginning (2009) seemed so far away, is actually here today (2011). Time has flown by as I worked in my office, participated in PhD courses, taught undergraduates, and somewhere in between I conducted research. These years at LIU have been enjoyable and I have several people to thank for making the time to licentiate intriguing.

First, I must thank Fredrik Tell, who not only believed in my ideas and allowed me to pursue my own research interest, but also has supported, questioned and shared tough times. Nevertheless, mostly I appreciate Fredrik’s positive attitude, loud voice and catching laughter. Second, Nicolette Lakemond, who agreed to be my co-supervisor, shares my research interests and always has good suggestions on which direction to go next. Moreover, her knowledge, insights and comments have been priceless.

Two persons have commented heavily on my work: Jonas Rundquist and Mattias Johansson. This book would not be the same without your efforts, it has been very much appreciated! Additionally, Mette Præst Knudsen has provided me with insights in methodological issues and inspiration for future research.

Thank you also to my co-workers at FEK and fellow PhD students at IEI. My time at the university would not have been half as interesting without you! In particularly thank you to Elisabeth, Jenny, Birgitta and Susan, who have been my PhD colleagues at business administration from almost my first day as a PhD student. I must give a special thanks to Elisabeth Borg, who has been a great colleague and friend. We have shared many laughs and frustrations. Thank you for always taking the time to listen, give suggestions and being a great friend.

Thank you also to ABB, in particular Per Halvarsson and Peter Isberg, for participating in this study and showing interest in this research. Many thanks to Michel Baujard at SKF, who not only enabled a study in Gothenburg, but also managed to include people from Austria.

These years have been a struggle at times. Persons close to me are quite aware of that. Thank you to my twin Anna, for always listening to my rambling even though I know it must bore you. You also manage to keep me in reality and stop me from drowning in academia, which is not an easy task!
Finally, thank you Alexander for not wanting to talk about work at home but never stopping me when I glide into a conversation about it.

This thesis has been a project, some at IEI would call it a baby. But as Nicolette so accurately put it “Lisa has two babies, the first is Tjarlie and the second is the thesis”. Thank you all for enduring my endless talk about my dog!

Lisa Melander
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Part I

Synthesis
Introduction

1 Introduction

1.1 Background

Firms collaborate with suppliers in new product development (NPD) in order to gain access to the supplier’s technology. To many firms, especially large system integrators that use multiple technologies, it is important to integrate new technology into their products (Brusoni et al. 2001; Takeishi 2002). The automotive industry is an example of an industry that has collaborated with key suppliers for many years in their product development (see Womack et al. 1991; Lamming 1993; Liker et al. 1996). One example of supplier involvement that has been studied in the automotive industry is the development of the air conditioning system (Zirpoli and Camuffo 2009). By involving suppliers in the development of products, the automotive industry has managed to make more use of their supplier’s knowledge and technical expertise. This has led to opportunities for lower cost, higher quality and faster innovation (Wasti and Liker 1999; Ro et al. 2008). Involving suppliers in NPD is also important to other industries as it is vital to reach the market fast with new competitive products, since it is argued that development times are shrinking (Eisenhardt and Tabrizi 1995). Wagner and Hoegl (2006) argue that supplier involvement in NPD will increase in industries other than the automotive industry. The authors present several reasons for the intensification of supplier involvement in NPD. First, a reduction of R&D resources at the firm, second, the desire to acquire supplier’s knowledge, and third to achieve a shorter time to market and a lower cost for the NPD. In addition to firms in the automotive industry, firms in other industries also have documented collaboration with suppliers (see e.g. Lakemond et al. 2006)

Wagner and Hoegl (2006) also claim that supplier involvement in NPD involves many challenges and call for more research in this area. Von Corswant and Tunalv (2002 pp. 253) show the importance of firms to collaborating with suppliers in NPD and state that in most of the cases studied “… the achieved product development performance would not have been realized without involving the suppliers.” Clearly, there are challenges related to involving suppliers in NPD. For instance, the challenge that the buying firm does not have complete control of the project and is dependent on the supplier. Another...
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The challenge is to select the most appropriate supplier for the NPD project and to establish the form of the collaboration. Since supplier involvement in NPD involves many challenges and can be difficult, this is a very interesting area to study.

Recent studies support the importance of supplier involvement in NPD by pointing to the benefits of such collaborations (see Aylen 2010; Lau et al. 2010; Oh and Rhee 2010). However, a recent review made by Johnsen (2009) shows conflicting results with regard to technological uncertainty in supplier involvement in NPD. Some studies show benefits from supplier involvement (see Petersen et al. 2003; Song and Di Benedetto 2008) while other studies cannot demonstrate any benefits (Eisenhardt and Tabrizi 1995) or even negative effects (Primo and Amundson 2002) for the buying firm when there exist technological uncertainties. This implies that firms should be careful when selecting suppliers to NPD projects where there are technological uncertainties. Previous studies have not been able to provide detailed insights into the difficulties related to supplier involvement in technological situations. Furthermore, as supplier capability has been identified as one of the most important critical success factors for supplier involvement in NPD (Handfield et al. 1999; Zsidisin and Smith 2005), the supplier selection process becomes crucial. Hence, there is a need to know more about how firms select suppliers for NPD.

For firms to be able to benefit from supplier collaboration in NPD, it is important to select the most appropriate supplier for that particular project. This can be difficult. The focus of the literature is on selecting suppliers for manufacturing of components for daily production or for outsourcing of manufacturing. In such a selection, the buying firm can evaluate the supplier according to a number of criteria. The number of criteria varies, but a recent review made by Ho et al. (2010) shows that previous research on the problem of selecting the most appropriate supplier has focused on the criteria quality, delivery and cost, while less has been written about supplier selection for strategic collaboration such as supplier involvement in NPD. For NPD projects, a number of criteria that have limited impact in the supplier selection for manufacturing could be relevant. Examples of such criteria could be trust (Ellram 1990) and fit (Bronder and Pritzl 1992). An overall picture of criteria could be useful for firms. However, in the literature, there is a lack of a systematic overview of criteria that could be used in the process of selecting a supplier for NPD projects. Therefore, a comprehensive mapping of criteria to consider would facilitate our understanding of supplier selection in NPD.
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When a supplier is chosen to manufacture standardized items, Purchasing (the Purchasing function of the firm) usually evaluates potential suppliers. However, Purchasing can also evaluate suppliers for collaborative NPD project. Therefore, this study investigates what role Purchasing has in collaborative NPD projects. As suppliers are becoming included in NPD, this requires that Purchasing evolves and becomes a strategic entity of the firm (Cousins and Spekman 2003; Schiele 2006). Previously, Purchasing may have been limited to a clerical function and the change towards becoming a strategic part of the firm puts new demands on this department entity. However, this requires that Purchasing has the organisation and knowledge necessary to be able to provide benefits to the NPD team. If Purchasing is not strategic and not sufficiently prepared to participate, it could result in the NPD becoming more bureaucratic and complex. Purchasing’s role in supply networks (Knight and Harland 2005) and managing supplier relationships has been discussed (Wu et al. 2010). However, there is little previous research on Purchasing’s role in NPD. Only recently, Schiele (2010) identified two roles for Purchasing in NPD: to support the innovation process and to be responsible for cost and integration. Purchasing can contribute to NPD, but in the literature, it is not clear how they could be included in NPD or in what capacity.

Moreover, Johnsen (2009) points out that most of the studies that have been conducted have included large, powerful buyers collaborating with less powerful suppliers. Hence, there is a lack of studies that investigate collaboration in NPD where the power balance between both parties is equal. Collaboration between two equally powerful firms poses other challenges for the buying firm. The firm needs to motivate the supplier to join the NPD project, and also consider the fact that there is a possibility that the supplier could become a future competitor. The two projects studied in this thesis both involved collaboration between firms of equal power. This thesis is about a large system integrator collaborating with suppliers in NPD.

1.2 Purpose

The purpose of this thesis is to identify criteria used in the supplier selection process, and explore the role of Purchasing in NPD collaborative projects.

In this thesis, the criteria identified include both criteria from the literature on supplier selection, and criteria identified in the two empirical studies that have
Introduction

been conducted. To accomplish this purpose, two distinct research questions have guided this study.

1) What are the criteria that firms consider when assessing and selecting suppliers for collaborative NPD projects?
2) What is the role of Purchasing in collaborative NPD projects?

In order to respond to these questions, the supplier selection processes in NPD projects involving suppliers have been studied. The projects were studied in order to find criteria that relevant in the process of selecting an appropriate supplier. In addition, Purchasing’s role in the NPD projects is investigated.

1.3 Outline

This thesis consists of two parts. The first part is the synthesis, which comprises five chapters. Chapter one introduces the subject and presents the purpose and the structure of the thesis. In chapter two, a literature review of supplier involvement in NPD is presented. Thereafter, the research methodology is described. A brief summary of the three research papers included in this thesis follows. Finally, in chapter five, conclusions are presented and the contributions are discussed.

In the second part, three papers are presented. The first is a single case study that investigates technological and strategic uncertainty in a collaborative NPD project. Paper two is another single case study that focuses on criteria for supplier selection in a NPD project. In the third paper, Purchasing’s role in NPD is investigated in a comparative case study.

In the first part of this thesis, the word ‘criteria’ is used with regards to supplier assessment and supplier selection. In the papers however, other words are used to describe criteria, such as factors or requirements. However, the words should be considered to have the same meaning.
2 Supplier involvement in NPD

In this chapter, the theoretical framework of the thesis, which looks at supplier collaboration within new product development (NPD), is presented. The research papers are about supplier involvement in NPD, a phenomenon which has been studied both in the NPD literature as well as in the supply chain management (SCM) literature. In addition, open innovation literature also argues that suppliers are important sources of external knowledge to firms. However, this stream of literature is not included in this study. This thesis is delimited to supplier involvement, which could be seen as a subset of open innovation. However, there is a stream of literature that covers supplier involvement. The sampling of the literature is based on an ISI search by searching on key words; this is further explained in chapter 3.

This chapter starts with a general presentation of firm collaboration and is followed by a discussion of the benefits and disadvantages related to such collaborations. Thereafter, the process of assessing, selecting and integrating a supplier is discussed. This is followed by a brief presentation of how firms develop their suppliers. Then Purchasing’s role in NPD is discussed, and finally a brief summary to demonstrate how the research questions are related to this chapter is given.

2.1 Firm collaboration

There are several definitions for supplier involvement. However, this study uses the definition formulated by van Echtelt et al. (2008 pp. 182) “Supplier involvement refers to the resources (capabilities, investments, information, knowledge, ideas) that suppliers provide, the tasks they carry out and the responsibilities they assume regarding the development of a part, process or service for the benefit of a buyer’s current or future product development projects”. Hence, supplier involvement is a form of close relationship that is referred to as collaboration in the literature. In the literature, other terms are also used, such as cooperation or partnership. In this thesis, the definition of collaboration by Emden et al. (2006 pp. 331) is used, which states that “Collaboration is defined as a type of cross-organizational linkage, which in addition to
high levels of integration is characterized by high levels of transparency, mindfulness, and synergies in participants’ interactions”.

Studies suggest that a collaboration is formed when firms are competing in emergent or competitive industries or are trying new technology strategies (Eisenhardt and Schoonhoven 1996). Hence, the need to implement new technology into a product can lead to collaboration between two firms. It is shown that successful collaborations with a strategic purpose involving a supplier in NPD includes trust, commitment, sense of fairness, early supplier involvement in design, joint collaboration and supplier reputation (Bensaou 1999). It is clear that both the buying firm and the supplier must strive to show their interest in the project in order to have a successful collaboration. Furthermore, it is argued that in order to manage a strategic collaboration with a supplier, the buying firm must be able to develop trust and create interfirm knowledge sharing routines (Dyer et al. 1998). Therefore, firms should consider the situation carefully before entering into a strategic collaboration.

Supplier involvement may differ between project groups. One difference is the degree of involvement in the NPD project. This degree of involvement depends on a variety of factors. For instance, it is suggested that modularity and strategic importance increase the degree of supplier involvement in NPD (Griffith et al. 2009). However, the form or degree of involvement that is most suitable may depend on the individual project. Furthermore, the characteristics of both the buying firm and the supplier influence the degree of involvement. Additionally, the suppliers’ knowledge of the technology requested also influences the characteristics of the collaboration. Studies show that firms that select suppliers on the basis of their product development capabilities, have higher levels of grey-box and black-box integration (Koufteros et al. 2007). Koufteros et al. (2007 pp. 848) distinguish between grey-box and black-box as follows “With a gray-box approach the supplier and the customer work alongside each other. The supplier provides expertise, suggestions and other input towards the product development effort but typically will not assume sole responsibility for developing parts, let alone modules for the final product. On the other hand, a black-box approach implies that each company would concentrate on certain tasks and components. The supplier can be ‘trusted’ to develop parts, components, or subassemblies”.

In these cases, the suppliers have a higher level of responsibility for implementing the new technology into the products. Wynstra and Pierick (2000) argue that firms must decide what form of supplier involvement is appropriate if they are to benefit from the collaboration.
Collaboration is not necessarily limited to one partner but can encompass a number of organisations. In fact, it is argued that simultaneous collaboration with suppliers and customers has a positive impact on project performance (Mishra and Shah 2009). Furthermore, it is suggested that it is more beneficial for firms to collaborate with partners that have different characteristics than with partners that are similar. That is because the knowledge basis is less diverse in similar firms and conflicts can arise between competing firms (Baum et al. 2000). However, collaboration between firms that are similar may facilitate integration and collaboration, since these organisations could have similar routines and technical knowledge. Thus, deciding with which firm to collaborate can be problematic.

Considering the issues above, it can be argued that supplier collaboration is complex and may require firms to have adequate routines and experience in order to succeed. Hence, it is not surprising that strategic partnering is more common in larger firms than in smaller ones (Hagedoorn and Schakenraad 1994). While larger firms may have the necessary resources and experience, smaller firms may not have routines or processes to manage a strategic collaboration. Further distinctions have been made by Kaufman et al. (2000), who develop a supplier typology, where the problem-solvers are the most advanced and competitive suppliers. The supplier’s technical know-how, from linkages with a number of OEM customers, is a competitive advantage. In product development, suppliers have different roles, depending on the buying firm. Moreover, these differences manifest in the varying level of the suppliers’ responsibility in NPD (Petroni and Pancioli 2002).

Firm collaboration can be divided into two groups; internal and external collaboration. A firm’s collaboration with a supplier, a competitor, a buyer or a university are forms of external collaboration. It is argued that firms that are open to external collaboration are more likely to have a higher level of innovative performance (Laursen and Salter 2006). Even though internal and external collaboration norms are similar, it is suggested that external collaboration may stimulate internal collaboration (Hillebrand and Biemans 2004). Hence, supplier involvement can lead to collaboration between different internal departments in a firm. This can be seen in NPD, where project team members can originate from different parts of the firm. However, Croom (2001) asserts that effective collaboration is dependent on the management of relationships on the part of both the supplier and the buyer.
2.2 Is collaboration advantageous for the buying firm?

Literature has identified that it is beneficial for buying firms to involve suppliers in NPD projects. This is nothing new; a comparison between two rival firms of wide strip mill development in the 1920s shows that the firm that chose to collaborate with suppliers was successful (Aylen 2010). A more recent study of product development has identified that one benefit of including suppliers in NPD is that the firm’s product innovation improves (Lau et al. 2010). Furthermore, it is demonstrated that R&D collaborations with suppliers have a more positive impact on product innovation than does collaboration with universities, customers or competitors (Un et al. 2010). Hence, when comparing different external collaborations, collaboration with a supplier is most beneficial in regard to product innovation. Even though collaborations have been demonstrated by several studies to be beneficial to firms, there are studies that show no benefits or even negative impacts from collaboration with suppliers (Handfield et al. 1999; Su et al. 2009). Hence, the literature shows differing views of whether supplier involvement in NPD is beneficial or not.

It is argued that involving suppliers early is strategically the right thing to do (Wagner and Hoegl 2006). This is due to the possibilities of gaining benefits (Oh and Rhee 2010). To be more precise, studies show that there are benefits to be gained for firms that proactively integrate key suppliers early in the definition stages of the NPD project (Bozdogan et al. 1998). By involving suppliers early, it is possible for buying firms to receive comments on their design in an early phase when it is easier to make modifications. Further advantages of involving suppliers early in the project are possibilities to receive their opinions on the product’s design and on the implementation of technology. Dowlatshahi (1998) develops a conceptual framework for implementing early supplier involvement, which consists of four building blocks: design, procurement, supplier and manufacturing. However, this framework could be extended to include more activities, such as strategy and research. Traditionally, it is argued that firms can gain benefits such as higher flexibility and lower costs by delegating manufacturing to suppliers (Baldwin and Clark 2003). These factors are also important for supplier involvement in NPD. Additionally, there are factors that reduce the impact on technology risk. These factors are identified as: the supplier’s experience, that the technology risk is taken by the supplier, that the buying firm can influence the supplier’s R&D activities and that the supplier shares information (Handfield et al. 1999).
The discussion above has demonstrated that firms can gain a number of benefits by involving suppliers in NPD. However, Wagner and Hoegl (2006) argue that even if there are benefits involved with collaborating with suppliers, it is difficult to capitalize on these benefits in individual projects. In contrast to the benefits listed above, there are also disadvantages of involving suppliers in NPD. For example, a recent study has identified that collaborations with suppliers did not contribute to innovativeness (Su et al. 2009). Hence, in that study, suppliers do not share their technological knowledge in a way that makes buying firms more innovative. Furthermore, there are negative impacts on technology risk; there is a risk that the buying firm becomes locked into one technology. By being locked into one technology, there is a risk that the buying firm loses flexibility and that once the collaboration has started, the supplier lacks incentive to innovate (Handfield et al. 1999). Involving suppliers can also be more difficult than what was expected, both in taking longer time than planned and being more difficult to manage (Von Corswant and Tunalv 2002). An overview of literature that identifies benefits or no benefits by involving suppliers in NPD is given in table 2-1. The table is limited to presenting whether or not there are benefits and it does not discuss why or in what way supplier involvement could be beneficial. As shown in the table, this research field consists of both case studies and surveys. Hence, individual projects have been deeply investigated as well as firms’ general views of the impact of supplier involvement.
## Literature review

### Table 2-1 Benefits and no benefits with supplier involvement

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bozdogan et al.</td>
<td>Case</td>
<td>Benefits by integrating key suppliers early in the definition stages of the NPD project</td>
</tr>
<tr>
<td>Handfield et al.</td>
<td>Case and survey</td>
<td>Positive and negative impact on technology risk</td>
</tr>
<tr>
<td>Von Corswant and Tunalv</td>
<td>Case</td>
<td>Without the supplier's involvement the product would most likely not have been developed. Disadvantages consisted of difficulties in management and longer duration than expected</td>
</tr>
<tr>
<td>Baldwin and Clark</td>
<td>Conceptual</td>
<td>Benefits are higher flexibility and lower costs</td>
</tr>
<tr>
<td>Wagner and Hoegl</td>
<td>Case</td>
<td>Strategically right to do but it is difficult to capitalize benefits in individual projects</td>
</tr>
<tr>
<td>Su et al. 2009</td>
<td>Survey</td>
<td>No contribution to innovativeness</td>
</tr>
<tr>
<td>Aylen 2010</td>
<td>Case</td>
<td>Collaboration is beneficial</td>
</tr>
<tr>
<td>Lau et al. 2010</td>
<td>Survey</td>
<td>Improved product innovation</td>
</tr>
<tr>
<td>Oh and Rhee 2010</td>
<td>Survey</td>
<td>Supplier involvement is beneficial</td>
</tr>
<tr>
<td>Un et al. 2010</td>
<td>Survey</td>
<td>Positive impact on product innovation</td>
</tr>
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### 2.3 Models

In this chapter, a simple conceptual model will be designed and further expanded and elaborated in chapter 5. Therefore, this section will present some models that exist in the literature. A few of these are later used to construct the model created in this thesis. In the literature, there are a number of models that have been designed to explain or demonstrate supplier involvement in NPD; a few of these are listed in table 2-5. In the model developed by Spekman (1988), the selection of a collaborating partner is described as a two-stage model. Firstly, a pool of potential strategic suppliers is identified, thereafter the suppliers are analysed and from there a strategic partner is selected. This model can be interpreted as including supplier assessment and supplier selection, and here the identification of potential suppliers constitutes the assessment. Accordingly, the analysis and selection of suppliers belong to supplier selection. An additional model of partner selection is the three-phase alignment, where the partner's
technical, strategic and relational fit influences the potential of the collaboration (Emden et al. 2006). According to this model, a partner selection should consider the partner’s technical ability and knowledge, correspondence in motivation and goals, and finally cultural compatibility, adaptation and long-term orientation. Even though these two models attempt to explain supplier selection, they do not fully capture the complexity of the various criteria that are discussed in the literature. Hence, these models are not entirely comprehensive.

A process model based on best practice of supplier integration has been developed by Handfield et al. (1999). This model starts with a product development team and a commodity team that identify potential suppliers, and that is what can be viewed as the assessment and selection processes. An additional model for integrating suppliers has been created by Petersen et al. (2003) where activities to successfully integrate suppliers into the NPD process are identified. These five activities were customer knowledge of supplier, technology and cost information sharing, supplier involvement in decision-making, technology uncertainty and project outcome. This model was built on theoretical premises as well as variables from case studies. Thus, the two models suggested by Handfield et al. and Petersen et al. discuss supplier integration from an activity perspective. However, some aspects of supplier integration are missing, for instance the supplier’s view of integration. Consequently, these models could be further developed.

A model of the management processes has been developed by van Echtelt et al. (2008). This model includes strategic and operational processes related to supplier involvement. The strategic part has seven processes in a cycle which stretches long term prior to and across different projects while the operational part is intended to efficiently manage collaborations in NPD. Hence, this model has two levels, one strategic for long-term issues and one operational for issues concerning the management of the on-going projects. This model describes how firms could coordinate in NPD projects in a way that ensures their strategic involvement in each NPD project. While the distinction of the two levels is clear in the model, it is not sure that in reality firms make such a clear differentiation between managing NPD projects strategically and operationally. These processes could overlap or it might not be possible to separate the two processes, which could be seen as one process that has strategic and operational levels intertwined.
### Literature review

#### Table 2-2 Models for supplier involvement in NPD

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Model</th>
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<tbody>
<tr>
<td>Spekman 1988</td>
<td>Case</td>
<td>Two-stage process</td>
</tr>
<tr>
<td>Handfield et al.</td>
<td>Case and survey</td>
<td>Process model of supplier integration</td>
</tr>
<tr>
<td>Petersen et al. 2003</td>
<td>Case and survey</td>
<td>Model with activities required to successfully integrate suppliers into the NPD process</td>
</tr>
<tr>
<td>Emden et al. 2006</td>
<td>Case</td>
<td>Theoretical model of technological, strategic and relational aspects of partner selection in development collaborations</td>
</tr>
<tr>
<td>van Echtelt et al. 2008</td>
<td>Case</td>
<td>Model of management processes; strategic and operational</td>
</tr>
</tbody>
</table>

#### 2.4 The assessment-selection-integration process

In this thesis, supplier involvement is divided into a process of supplier assessment, selection and integration phases according to time and activity; this is illustrated in figure 2-1. First, the buying firm performs an assessment of available suppliers and thereafter realizes a supplier selection of potential suppliers. These two phases can be found in the model presented by Spekman (1988), and thus figure 2-1 is partly based on his process model. Supplier integration has been described in models by several authors (see Handfield et al. 1999; Petersen et al. 2003), and therefore the process model in figure 2-1 was constructed by combining several models from table 2-5. In this section, the three different phases (supplier assessment, supplier selection and supplier integration) will be described separately. The focus of this study is on the supplier assessment and supplier selection. However, supplier integration is described in order for the reader to gain a more complete understanding of the process. This model will be further developed in this chapter to include criteria that need to be considered in each phase.

![Figure 2-1 Supplier assessment-selection-integration process model](image-url)
Figure 2-1 shows how supplier involvement could be separated through time and activity. However, the figure is not an accurate representation of all NPD projects as some firms do not conduct an assessment or selection of supplier and instead they might start a NPD project together with their regular supplier and thus do not consider other alternatives. Another flaw of this figure is that some firms might not integrate their suppliers in the NPD project. Hence, figure 2-1 is only a suggestion of how supplier involvement could take place in a NPD project. Moreover, supplier involvement does not have to be a linear process. For instance, it is possible for firms to conduct the assessment and selection of suppliers simultaneously. Furthermore, assessment and selection are closely linked and can overlap. Hence, the border between assessment and selection can be ambiguous. An additional interesting area in this process concerns what part of the firm is responsible for the different phases. For instance, it could be the R&D department that is responsible for the entire process, or, it could be Purchasing that is responsible for the assessment and the NPD team that is responsible for the selection and integration of the supplier. Hence, the responsibility for the process can vary between firms or even between different projects within the same firm.

2.4.1 Supplier Assessment
Several studies have been conducted to identify criteria that firms use in their supplier assessment, many of which have been case studies, (see Handfield et al. 1999; Petersen et al. 2003; Zsidisin et al. 2004). In these studies, criteria that firms consider are presented. However, these criteria are not easily quantified; the firm must evaluate the suppliers according to their own judgement. The firm should also consider the technology selected, the product to be developed and the project itself, these three issues affect the number of potential suppliers.

As an example, Spekman (1988) identified several criteria for supplier assessment: managerial concerns, supplier commitment, supplier growth potential, technical support, win-win attitude, senior management support, future planning, business knowledge, supplier's view of collaboration, trust and openness. As can be seen, these criteria are not easy to evaluate in the case of a large number of suppliers, nor are they easy to compare. It could be said that these criteria are not rational. An additional problem is that it requires the buying firm to have access to and knowledge of the suppliers' qualities and characteristics. Handfield et al. (1999) present similar criteria that firms should consider in a supplier assessment: targets (cost, quality, performance), timing, ramp-up
possibilities, innovation and technical competence and training. Furthermore, similar criteria: the ability to hit targets, ramp-up capacity, innovation & technical expertise, required training of personnel and supplier's top management commitment are discussed by Petersen et al. (2003). However, the criteria presented by Handfield et al. and Petersen et al. are more technical and product oriented than the criteria presented by Spekman who is more oriented towards the relationship between the firms and argues that “These partnerships present a complex web of the less tangible issue of trust, openness and commitment” (Spekman 1988 pp. 81). Hence, a supplier assessment can be difficult to perform and requires the firm to have in-depth knowledge of the suppliers available.

An additional assessment would concern supply risks, which can be performed by addressing quality issues, improving processes and reduce the likelihood of disruptions (Zsidisin et al. 2004). These criteria require firms to have knowledge of the suppliers' production processes in order to evaluate the risks, something which could be difficult to access. Further assessments may be necessary depending on the supplier’s geographical region. A study of Chinese suppliers shows that the suppliers' senior management need to be assessed in order to ensure that they have a compatible alignment of mind-set, culture and strategic orientation (Lockström et al. 2010). However, it may be difficult to gain the necessary information that is needed to assess a supplier according to these criteria. Another difficulty can be that firms do not assess criteria that are important. For instance, it is argued that supplier willingness and ability to share information affect the buying firm’s performance, but firms consider these criteria to be unimportant (Kannan and Tan 2002). Table 2-2 presents a brief overview of the criteria used for supplier assessment that are discussed in the literature.
### Table 2-3 Assessment contributions

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Identified criteria</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spekman 1988</td>
<td>Conceptual</td>
<td>Managerial concerns, supplier commitment, supplier growth potential, technical support, win-win attitude, senior management support, future planning, business knowledge, supplier’s view of partnership, trust, openness</td>
<td>Identified criteria for supplier assessment</td>
</tr>
<tr>
<td>Handfield et al. 1999</td>
<td>Case and survey</td>
<td>Target (cost, quality, performance), timing, ramp-up possibilities, innovation and technical competence, training</td>
<td>Identified criteria for supplier assessment</td>
</tr>
<tr>
<td>Kannan and Tan 2002</td>
<td>Survey</td>
<td>Supplier willingness and ability to share information</td>
<td>Tested criteria for supplier assessment</td>
</tr>
<tr>
<td>Petersen et al. 2003</td>
<td>Case</td>
<td>Ability to hit targets, ramp-up capacity, innovation &amp; technical expertise, required training of personnel, supplier’s top management commitment</td>
<td>Identified criteria for supplier assessment</td>
</tr>
<tr>
<td>Zsidisin et al. 2004</td>
<td>Case</td>
<td>Quality</td>
<td>Assessing supply risks</td>
</tr>
<tr>
<td>Lockström et al. 2010</td>
<td>Case</td>
<td>Senior management’s culture, mind-set and strategic orientation</td>
<td>Identified criteria</td>
</tr>
</tbody>
</table>

#### 2.4.2 Supplier Selection

When discussing supplier selection in NPD, another type of selection should also be mentioned: technology selection. This selection also requires evaluation of several criteria particularly the uncertainty of the future development of the technology. In a rational model, firms tend to first select technology and thereafter the supplier. Hence, the technology selection constrains which suppliers are available for the supplier selection. In table 2-3, contributions to the literature on supplier selection criteria discussed in this section are listed. As can be seen in the table, when identifying criteria, the case study method has been used, and when authors have tested their chosen criteria, surveys have been the methodology selected.
Literature review

Standard criteria such as quality and delivery performance have been identified as important aspects of supplier selection (see Weber and Ellram 1993; Choi and Hartley 1996; Verma and Pullman 1998; Vonderembse and Tracey 1999), these criteria are also relevant in supplier assessment. These aspects are important in traditional supplier relationships and in product development. A review of academic papers shows that the most popular criterion for selecting and evaluating suppliers is quality (Ho et al. 2010). This is followed by the criteria delivery and cost. However, a criterion that is under dispute in the literature is cost. In the study made by Verma and Pullman (1998), it is demonstrated that managers claim that quality is the most important attribute in a supplier, but firms actually choose suppliers on the basis of cost and delivery performance. Thus, what firms said that they were doing was not the same as what they actually did. In contrast, Choi and Hartley (1996) found that price was one of the least important criteria in supplier selection. With regard to this, it is possible to make a distinction between manufacturing and non-manufacturing firms. It is argued that supplier collaborations in non-manufacturing firms consider a cost reduction of procurement and administration as well as price and reliability as important criteria for entering the collaboration, while manufacturing firms highlight price, quality and delivery as important criteria (Ellram and Krause 1994). Hence, this is an area where the literature ambiguous and more research could help us understand which criteria are important in supplier selections.

It is argued that, in the selection of a supplier it is important to find a partner that fits the buying firm. Different forms of fit can be classified into fundamental fit, strategic fit and cultural fit (Bronder and Pritzl 1992). These forms of fit classify the supplying firm from different perspectives; for example, a strategic fit does not imply that there necessarily exists a cultural fit. Hence, it is important to consider all three classifications of fit. In order to do this, firms could implement supplier selection criteria, which has been shown to have a positive impact on performance (Vonderembse and Tracey 1999).

Suppliers can be evaluated across multiple dimensions in order to cover different aspects of the supplying firm, such as its organisation and technical skills. An extensive list has been developed by Ellram (1990), who has made a classification of selection criteria consisting of financial issues, organisational culture and strategy issues, technology issues and other criteria. Each of these classifications includes several criteria, which can be found in table 2-4. The financial issues, technology issues and other criteria include criteria that can more easily be evaluated than organisational culture and strategy issues, which to some
Literature review

extent require deeper knowledge of the supplier and its organisation. One similar consideration is the supplier’s strategic focus on innovation, which is considered to have an impact on the supplier’s product development activity (Wynstra et al. 2010). Moreover, strategic commitment from the supplier could be important. However, a study by Kannan and Tan (2002) showed that firms considered strategic commitment to be unimportant. Nevertheless, the same study also revealed that in reality strategic commitment had a greater impact than supplier capacity on the buying firm’s performance.

One approach in supplier selection diverged from the majority of the literature. Zsidisin and Smith (2005) argue that when the firm involved multiple suppliers in the initial stages of the product conception, it had the possibility to gather information about these suppliers. After reviewing the suppliers’ philosophies, capabilities, experience and goals, the firm could then select the most appropriate supplier. This confirms the discussion where it is stressed that for buyers it is important to be familiar with the supplier and that the supplier demonstrates adaptability (Croom 2001).
## Literature review

### Table 2.4 Selection contributions

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Identified criteria</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellram 1990</td>
<td>Case</td>
<td>Financial issues (economic performance, financial stability), organisational culture and strategy issues (trust, management attitude, strategic fit, top management compatibility, compatibility across levels and functions of buyer and supplier firms, organisational structure and personnel), technology issues (current manufacturing capabilities, future manufacturing capabilities, design capabilities, speed in development), other factors (safety record of supplier, business references, customer base)</td>
<td>Identified several selection criteria</td>
</tr>
<tr>
<td>Bronder and Pritzl 1992</td>
<td>Case</td>
<td>Fundamental fit, strategic fit, cultural fit</td>
<td>Criteria for partner selection</td>
</tr>
<tr>
<td>Weber and Ellram 1993</td>
<td>Case</td>
<td>Price, quality, delivery</td>
<td>Investigating supplier selection in JIT environment</td>
</tr>
<tr>
<td>Ellram and Krause 1994</td>
<td></td>
<td>Price, reliability, quality, delivery</td>
<td>Different criteria is important in manufacturing and non-manufacturing firms</td>
</tr>
<tr>
<td>Choi and Hartley 1996</td>
<td>Survey</td>
<td>Quality and delivery</td>
<td>Testing selection criteria</td>
</tr>
<tr>
<td>Vonderembse and Tracey</td>
<td>Survey</td>
<td>Product quality, product performance and delivery reliability</td>
<td>Testing impact of sup-</td>
</tr>
</tbody>
</table>
2.4.3 Supplier Integration

Integrating suppliers in NPD could make supply management more complex, which in turn would require coordination and leadership (Monczka and Morgan 1996). Furthermore, integration could become more complex due to the need for close collaboration and extensive sharing of information. When integrating suppliers, the supply management might need to consider additional aspects in the supplier selection, for instance, collaboration forms needs to be negotiated and the extensiveness of information sharing needs to be established. This is a process that can be difficult to implement. Furthermore, throughout an NPD project, the type of coordination that is most suitable may change from phase to phase (Lakemond et al. 2006). This could make supplier integration even more difficult. Despite the fact that supplier integration can be difficult and complex, it is argued that there are benefits to be gained: improved total cost, quality, time, better solutions, and faster to market (Monczka and Morgan 1996).

Nevertheless, key enablers for supplier integration are identified as: long-term commitment to suppliers, co-location, joint responsibility for design and configuration control, seamless information flow and retaining flexibility in the definition of system configuration (Bozdogan et al. 1998). These enablers are not a requirement for success in integrating suppliers, but they facilitate the
process. Moreover, it is suggested that in order to enable a high degree of integration, it is important to have adequate procedures and routines (Danilovic and Winroth 2005). Consequently, firms need to have an adequate organisation to succeed in implementing supplier integration. Further, contributing criteria to supplier integration have also been identified: supplier-capability-enhancing investments, target costing and incentive mechanisms (Bozdogan et al. 1998). Hence, to facilitate integration, firms need to invest in activities related to the integration process.

Just as in the assessment and selection of suppliers, there are strategies and criteria that the buying firm needs to consider in supplier integration. It is argued that strategies that enhance vertical integration are focused on joined collaboration and sharing operational procedures (Soosay et al. 2008). In this study, vertical integration refers to the integration of a supplier in an NPD project. Examples of criteria to consider in supplier integration are the rate of change of the technology and the level of supplier expertise in that technology (Handfield et al. 1999). Firstly, having a technology that has a high rate of change implies that a new technology can become preferred within the near future, and hence it would be advisable for the firm to have the possibility to change technology, and possibly supplier, quickly. Secondly, expertise in the technology is important since the buying firm needs to rely on the supplier’s knowledge of the new technology. Table 2-4 shows a selection of criteria to consider as well as benefits and strategies related to supplier integration.
Table 2-5 Integration contributions

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Identified criteria</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monczka and Morgan 1996</td>
<td>Conceptual</td>
<td>Benefits: improve total cost, quality, time, better solutions, faster to market</td>
<td>Identified benefits with supplier integration</td>
</tr>
<tr>
<td>Bozdogan et al. 1998</td>
<td>Case</td>
<td>Key enablers: long-term commitment to suppliers, co-location, joint responsibility for design and configuration control, seamless information flow, retaining flexibility in the definition of system configuration</td>
<td>Identified key enablers and contributing factors in supplier integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contributing factors: supplier-capability-enhancing investments, target costing, incentive mechanisms</td>
<td></td>
</tr>
<tr>
<td>Handfield et al. 1999</td>
<td>Case and survey</td>
<td>Criteria to consider: rate of change of the technology and the level of supplier expertise in that technology</td>
<td>Identified technical criteria to consider in supplier integration</td>
</tr>
<tr>
<td>Soosay et al. 2008</td>
<td>Case</td>
<td>Maintaining standardised operations, joint planning, sharing knowledge and information, sharing processes, joint investing, synchronising and interfacing</td>
<td>Identified strategies to enhance vertical integration</td>
</tr>
</tbody>
</table>

2.5 Buying firms’ development of suppliers

Two motives for interfirm collaboration have been identified as market and technology-related (Hagedoorn 1993). Consequently, firms can strive to gain a new market or expand the existing market. However, in this study the firms include suppliers in their NPD to gain access to new technology and to implement that technology into the firm’s product. In such collaboration it is suggested that buying firms often involve themselves in suppliers’ performance and capabilities problems (Krause and Ellram 1997b). Instances when the buy-
Literature review

ing firm becomes involved in developing its supplier can be when the supplier possesses technology that is valuable to the buying firm but does not have the necessary skills to develop what was requested. If the buying firm has a good relationship with the supplier, they might decide that it is more advantageous to develop that supplier than to find a new supplier.

Supplier development is defined as any effort of a buying firm to increase the performance or capabilities of the supplier to meet the buying firm’s needs (Krause and Ellram 1997a). This is relevant in NPD where the buying firm is implementing the supplier’s technology. Buying firms develop their suppliers because it is in the buying firm’s interest to have a competent supplier that can develop its component at a competitive cost for the buying firms. Furthermore, the operational effectiveness of the buyer is enhanced if joint actions and trust exist between the buyer and the supplier (Li et al. 2007) For most firms, it is important to have a supplier that has sufficient quality and the competence to provide a high quality product. However, if the supplier’s quality is not sufficient, then the buying firm could decide to develop the supplier. To develop a supplier can improve the supplier as well as increase the buying firm’s understanding of the technology. However, communication can be problematic, for instance the buying firm may believe that it is providing sufficient information while the supplier perceives that it is not receiving as much information as was intended (Blancero and Ellram 1997).

It is suggested that firms that help suppliers to develop can gain additional benefits, such as continued collaboration in the future in joint innovation and product development (Hartley and Choi 1996). It is reasonable that a firm that has invested in a supplier would prefer to continue to collaborate with that supplier. However, success in developing a supplier is shown to be dependent on the buying firm gaining commitment from the supplier’s top management (Hartley and Choi 1996). Without these elements, it is difficult to implement changes in the supplier’s manufacturing and organisation. Further factors that have been identified as relevant for supplier development are: long-term strategic goals, effective communication, collaboration strategy, top management support, supplier evaluation, direct supplier development and perception of supplier’s strategic objective (Wen-li et al. 2003). Hence, it seems that the considerations to be taken in supplier development are similar to those for supplier integration. In fact, supplier integration could include supplier development, but is usually regarded simply as integration efforts and not development efforts. Similar reasoning could be applied to supplier development. A firm that
develops its supplier could be performing activities that are closely linked to supplier integration.

The competitive performance of a buyer can be enhanced by developing its suppliers. It is argued that improving the buying firm’s performance in quality, delivery and flexibility is dependent on supplier development activities such as: allocating personnel, a dedicated supplier development team and regular visits (Krause et al. 2007). Additional studies demonstrated that critical factors included increasing the performance goals and providing education and training for personnel (Monczka et al. 1993), joint actions and developing trust between the firms (Li et al. 2007). Hence, the buying firm needs to actively participate in the development of their supplier. However, to increase supplier’s performance, it is argued that firms should have an effective communication of their requirements and active facilitation of the supplier’s increase in performance and capability (Krause 1997). Table 2-6 shows relevant factors in supplier development that have been discussed in this section. As can be seen in the table, recurrent factors are the training of personnel and the formulating of goals for the development. Since these factors can be found in several studies, they can be considered important elements in supplier development.
Table 2.6 Supplier development factors

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Relevant Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monczka et al.</td>
<td>Survey</td>
<td>Performance goals, education and training</td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hartley and Choi</td>
<td>Interviews</td>
<td>Commitment from the supplier’s top management</td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krause 1997</td>
<td>Survey</td>
<td>Training of supplier’s personnel, visits, investment in supplier</td>
</tr>
<tr>
<td>Wen-li et al. 2003</td>
<td>Survey</td>
<td>Long-term strategic goals, effective communication, collaboration strategy, top management support, supplier evaluation, direct supplier development and perception of supplier’s strategic objective</td>
</tr>
<tr>
<td>Krause et al. 2007</td>
<td>Survey</td>
<td>Allocating buyer personnel, dedicate supplier development team, regular visits by the buying firm’s engineering personnel</td>
</tr>
<tr>
<td>Li et al. 2007</td>
<td>Survey</td>
<td>Joint actions, trust, training personnel</td>
</tr>
</tbody>
</table>

2.6 Overview of supplier assessment, selection and integration

In figure 2-2, the different criteria identified in the literature are presented in an elaborated version of the process model displayed earlier in figure 2-1. It should be noted that the focus in this study is on supplier assessment and supplier selection. However, supplier integration is also a part of the model. All three phases present an overview of different stages in the NPD process involving suppliers. However, there are other phases that are not included in the model, such as for example technology selection. This is not included here since technology selection can be made in a pre-phase where possible suppliers are not yet considered.

In this figure, there are many criteria that are associated with the supplying firm’s characteristics and relational criteria. When considering the assessment and selection of a supplier, there seem to be several criteria that are suitable for Purchasing to evaluate. This implies that Purchasing is important in NPD, and thus Purchasing’s role in NPD will be further developed in this chapter.
## Literature review

### Supplier Assessment

**Product and Production factors**
- Cost
- Quality
- Product performance
- Timing
- Ramp-up possibilities
- Ability to hit targets
- Innovation, technical competence and expertise

**Firm characteristics**
- Senior management’s support, culture, mind-set and strategic orientation
- Supplier commitment and its top management commitment
- Supplier willingness and ability to share information
- Supplier growth potential
- Win-win attitude
- Future planning
- Business knowledge
- Training of personnel
-Technical support

**Relational criteria**
- Supplier’s view of partnership
- Trust
- Openness

### Supplier Selection

**Product and Production factors**
- Quality
- Cost
- Delivery
- Reliability
- Product performance
- Production capabilities
- Design capabilities
- Speed in development
- Technological capabilities

**Firm characteristics**
- Desired goals/objectives
- Economic performance and stability
- Management attitude
- Top management compatibility
- Compatibility across levels and functions
- Organisational structure and personnel
- Safety record
- Business references, customer base

**Relational criteria**
- Familiarity and past experience
- Empathy
- Ability to adapt
- Philosophies
- Fit
- Trust

### Supplier Integration

**Product and Production factors**
- Rate of change of the technology
- Retaining flexibility in the definition of system configuration

**Firm characteristics**
- Level of supplier expertise in technology
- Long-term commitment
- Co-location
- Joint responsibility for design and configuration control
- Seamless information flow
- Maintaining standardised operations
- Joint planning
- Sharing knowledge and information
- Sharing processes
- Joint investing
- Synchronising and interfacing
- Education and training

**Relational criteria**
- Effective communication
- Trust

---

*Figure 2.2 Process model with criteria to evaluate suppliers identified from literature*
2.7 Purchasing’s role

In this thesis, Purchasing refers to the purchasing department, procurement or the so-called supply management at a firm. Traditional views of Purchasing consist of managing inputs, ensuring that these inputs are delivered on time, have sufficient quality, and are at an acceptable price. Additionally, the traditional function of Purchasing involves negotiating costs and contracts with suppliers. In firms, Purchasing is responsible for the contact with different suppliers and the search for new suppliers. However, in the search for suppliers for NPD, Purchasing may not be involved if the supplier search is conducted for instance by the NPD project team. In this section, the traditional role of Purchasing and how it has changed to become more strategic will be discussed.

2.7.1 Purchasing’s evolvement towards a strategic position

Brandes et al. (1997) suggest that an increased degree of purchasing and outsourcing is an important strategic change. The activity of purchasing is important in firms, and often firms have a department that handles issues concerned with purchasing and suppliers. In cases of NPD that involves suppliers, Purchasing is important for instance because it can evaluate potential suppliers and negotiate commercial issues. Furthermore, Purchasing’s evolution towards becoming more strategic (Cousins and Spekman 2003) suggests that it should be included in firms’ strategic decisions, which includes NPD.

Purchasing has evolved to include additional activities, some of which are strategic. An example of a strategic activity is Purchasing’s involvement in NPD. Additionally, studies have showed that the traditional role of Purchasing has changed to include more aspects of the relationship with suppliers. Several researchers have noted these changes, (see Kraljic 1983; Burt and Soukup 1985; Lamming 1993). Hence, Purchasing has become more strategic. Furthermore, it has been argued that the view of efficient Purchasing has changed (Gadle and Håkansson 1994). These authors show that Purchasing has changed from a department that formulates procedures for efficient Purchasing, which for instance includes minimizing the number of bids, to a more strategic Purchasing. However, this change could be problematic and could face internal barriers. Hence, Purchasing’s transition from a clerical function to a strategic partner can be a slow process (Cousins and Spekman 2003). However, the literature suggests that firms need to recognize Purchasing as a contributor to providing quality products and services to internal customers (Stanley and Wisner 2001).
Traditionally, firms consider Purchasing to be a support function, but Purchasing’s activities should be repositioned to become more strategic (Birou and Fawcett 1994).

As mentioned, making Purchasing more strategic partly means that it could become involved in NPD activities. Traditionally, Purchasing has conducted supplier selection for delivery of items to the firm’s production; this activity is now expanded to include supplier selection for collaborative NPD projects and therefore Purchasing needs to consider additional characteristics of the supplier, such as its development capabilities. Furthermore, it is suggested that Purchasing’s activities have become decentralized and now include collaborating with key suppliers in NPD projects (Gadde and Håkansson 1994). This in turn requires Purchasing’s organisation to adapt to these new responsibilities. Additionally, it is argued that Purchasing has to change and adopt new strategic initiatives to handle suppliers, which includes working with complex organisational collaboration agreements (Cousins 2002). It has been argued that further responsibilities for Purchasing include identifying which suppliers have the potential to contribute to NPD (Schiele 2006).

Firms can add value to their products by using suppliers; an example is the case when firms let suppliers produce a major part of their products but continue to test the products in-house. The literature suggests that Purchasing has a key role in NPD (Williams and Smith 1990). However, inclusion in NPD projects has led to further changes for Purchasing, for instance the fact that purchasers now are working closer to specialists from other departments (Gadde and Håkansson 1994). This requires Purchasing to further develop its skills in intra-firm collaboration. However, not all firms include Purchasing in their NPD projects. It has been shown that firm factors that influence Purchasing’s involvement in NPD are: top management’s support, innovation strategy and Purchasing manager’s level of experience and education (Nijssen et al. 2002).

An overview of literature that considers that Purchasing is evolving and thus becoming more strategic is presented in table 2-7.
## Literature review

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kraljic 1983</td>
<td>Conceptual</td>
<td>Purchasing is becoming more strategic</td>
</tr>
<tr>
<td>Burt and Soukup</td>
<td>Conceptual</td>
<td>Purchasing is slowly becoming included in NPD</td>
</tr>
<tr>
<td>Williams and Smith</td>
<td>Conceptual</td>
<td>Purchasers should be more involved in firms’ product development</td>
</tr>
<tr>
<td>Lamming 1993</td>
<td>Case</td>
<td>The traditional role is changing</td>
</tr>
<tr>
<td>Birou and Fawcett</td>
<td>Survey</td>
<td>Purchasing's activities should be repositioned to a strategic position and thus contribute to the firm's NPD</td>
</tr>
<tr>
<td>Gadde and Håkansson 1994</td>
<td>Conceptual</td>
<td>Purchasing activities have become decentralized</td>
</tr>
<tr>
<td>Baldwin and Clark 1997</td>
<td>Conceptual</td>
<td>Changes in the supply chain are related to increased modularity</td>
</tr>
<tr>
<td>Dowlatshahi 1998</td>
<td>Case</td>
<td>Purchasing contributes to the product design</td>
</tr>
<tr>
<td>Stanley and Wisner 2001</td>
<td>Survey</td>
<td>Purchasing needs to become a strategic player within organisations</td>
</tr>
<tr>
<td>Cousins 2002</td>
<td>Case</td>
<td>Purchasing has to change and adopt new strategic initiatives to handle suppliers</td>
</tr>
<tr>
<td>Nijssen et al. 2002</td>
<td>Interviews</td>
<td>Identified factors that influence Purchasing's involvement in NPD</td>
</tr>
<tr>
<td>Cousins and Speckman 2003</td>
<td>Case and survey</td>
<td>Transition from a clerical function to a strategic partner</td>
</tr>
<tr>
<td>Hult and Swan 2003</td>
<td></td>
<td>Identifying interface between product development and supply chain man-</td>
</tr>
<tr>
<td>Schiele 2006(Schiele 2006)</td>
<td>Conceptual</td>
<td>Identified new tasks for Purchasing</td>
</tr>
</tbody>
</table>

### 2.7.2 Purchasing as a strategic asset

In previous research, it has been argued that Purchasing should be involved in the product design (Dowlatshahi 1998). Furthermore, it is argued that Purchasing is an important player when firms develop new products (Schiele 2010).
Studies suggest that together with the R&D department, Purchasing is the most relevant internal actor in NPD which includes suppliers (van Echtelt et al. 2007). Purchasing needs to be able to support NPD, and in order to manage this, involvement in other parts of the firm is necessary. One activity related to Purchasing’s involvement in NPD that has been identified was the firm’s Purchasing managers and the R&D specialists meeting important suppliers to discuss potential NPD (Wynstra et al. 1999).

One attribute of firms with strategic Purchasing is that they have a higher level of collaboration with their suppliers (Carr and Smeltzer 1999). However, it is argued that in organisations where Purchasing is perceived as strategic, buyers are more likely to play a prominent role in the NPD process (Atuahene-Gima 1995). This indicates that firms with a high level of collaboration with suppliers do not simply rely on their suppliers to develop the product. On the contrary, buyers have a significant role in NPD where there is strategic Purchasing. Studies suggest that Purchasing’s involvement in NPD can be explained by driving and enabling factors (Wynstra et al. 2000). Firstly, driving factors are company size, the importance of product development, overall supplier dependence and product complexity. Secondly, enabling factors are the organisation of Purchasing department, exchange and recording of information and the quality of human resources.

As stated earlier, firms that have strategic Purchasing include it in their NPD, where it can contribute to the projects. For instance, it is suggested that Purchasing’s role in NPD includes being involved early in the project, taking a cross-functional leadership role and identifying suppliers (McGinnis and Vallopra 1999). McDermott and Handfield are clear in their statement of what they believe Purchasing could contribute in NPD projects with radical innovation. “Project managers must involve purchasing personnel in helping to identify potential suppliers with a demonstrated record that offer technological solutions to meet market needs.” (2000 pp. 54) The early inclusion of Purchasing in NPD facilitates it affecting the course of the project by providing input to it in a stage where it can be reconstructed.

Another aspect is Purchasing’s responsibilities in NPD. It has been argued that Purchasing has dual roles in NPD; to support the innovation process and to maintain cost and integration responsibilities over the product life cycle (Schiele 2010). Managing cost levels and supplier integration suggests that Purchasing should be involved in the later stages of the NPD project, in cases when the
supplier is included. Furthermore, as argued previously, by being involved early in the process, Purchasing contributes by analysing suppliers in the supplier selection, and later by coordinating and controlling supplier involvement (McGinnis and Vallopra 1999).

It has been argued that firms can benefit by involving suppliers. However it is shown that long-term benefits require Purchasing to provide input to the relationships (Zsidisin and Ellram 2001). Hence, it is important to include Purchasing in any longer collaboration with suppliers. It has been demonstrated that Purchasing’s involvement contributes to new product success (McGinnis and Vallopra 1999) and thus, it is advantageous to firms to implement strategic Purchasing. This is shown in the enhanced value delivered to customers (Chen et al. 2004). Studies also report that strategic Purchasing has a positive impact on firm performance (Carr and Pearson 2002; Chen et al. 2004). Other studies are not as specific, but report that by including Purchasing in NPD, firms can gain benefits (Tracey 2004). Hence, Purchasing is an important part of the firm and contributes, not only by performing traditional tasks, but also by contributing to NPD projects. Including Purchasing in NPD is thus a strategic decision. Moreover, it is suggested that it is important to emphasize that firms can benefit by strategically managing their Purchasing department (Rozemeijer et al. 2003). Table 2-8 presents a brief overview of literature where Purchasing is viewed as playing a strategic role.
### Literature review

#### Table 2-8 Strategic Purchasing

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atuahene-Gima</td>
<td>Survey</td>
<td>Where Purchasing is perceived as strategic, buyers are more likely to have a prominent role in the NPD process</td>
</tr>
<tr>
<td>Carr and Smeltzer</td>
<td>Survey</td>
<td>Firms with strategic Purchasing have higher level of collaboration with their suppliers</td>
</tr>
<tr>
<td>McGinnis and Vallopra</td>
<td>Survey</td>
<td>Purchasing’s involvement contributes to new product success</td>
</tr>
<tr>
<td>Wynstra et al.</td>
<td>Case</td>
<td>Identified activities related to Purchasing’s involvement in NPD</td>
</tr>
<tr>
<td>McDermott and Handfield</td>
<td>Case</td>
<td>Purchasing should help project managers to identify potential suppliers to NPD projects</td>
</tr>
<tr>
<td>Carr and Pearson</td>
<td>Survey</td>
<td>Strategic Purchasing has a positive impact on firm performance</td>
</tr>
<tr>
<td>Rozemeijer et al.</td>
<td>Survey</td>
<td>Firms can gain benefits by strategically managing their Purchasing department</td>
</tr>
<tr>
<td>Chen et al.</td>
<td>Survey</td>
<td>Identified benefits gained by strategic Purchasing</td>
</tr>
<tr>
<td>Tracey</td>
<td>Survey</td>
<td>Firms can gain benefits by including Purchasing in NPD</td>
</tr>
<tr>
<td>Schiele 2010</td>
<td>Case</td>
<td>Purchasing’s dual roles in NPD</td>
</tr>
</tbody>
</table>

#### 2.7.3 Purchasers

The literature has identified several Purchasing (supply management) roles (see Knight and Harland 2005; Wu et al. 2010). In one study, six supply management roles are identified (Knight and Harland 2005). These roles are innovation facilitator, co-ordinator, supply policy maker and implementer, advisor, information broker and network structuring agent. Additionally, four roles have been identified that are enacted when Purchasing manages supplier relationships: negotiator, facilitator, supplier’s advocate and educator (Wu et al. 2010). A negotiator negotiates contracts, a facilitator resolves conflicts and issues arising in daily operations, a supplier’s advocate communicates the supplier’s need to the buyer, while an educator keeps internal customers up to date on the relationship. To facilitate the work of Purchasing managers, it is argued that firms can lend them greater autonomy, something which enhances the supplier’s trust in them (Perrone et al. 2003).
Purchasing can be said to have boundary spanning roles; as it handles relationships with external suppliers while responding to the internal organisation’s needs. It is suggested that this boundary spanning can lead to role conflicts on an individual level (Friedman and Podolny 1992), which is troublesome for some supply managers. However, it is argued that boundary spanning roles bring benefits as they increase the employees’ skills and job satisfaction (Hallenbeck et al. 1999).

2.8 Summary

This chapter has discussed supplier involvement in NPD by starting with an overview of the collaboration between two firms. It included reasons for firms to collaborate with suppliers in NPD and provided a short presentation of previous studies. After this introduction to the subject, literature strongly related to RQ1 was presented. The section about supplier assessment and supplier selection in particular provides a discussion of RQ1. This was followed by a brief presentation of firms’ development of suppliers. Such a development could be related to the selection of supplier, firms may choose to develop rather than change their supplier. Figure 2-2 gives an overview of the supplier assessment, selection and integration process. From this figure, it becomes evident that Purchasing is important in this process, in particular in the supplier assessment and selection. There are several criteria presented in the figure that could be suitable for Purchasing to evaluate. Therefore, the next step in this thesis was to investigate Purchasing’s role in collaborative NPD, which relates to RQ2.
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3 Research methodology

In this chapter, the methodology and the research process are described. Two NPD projects, which have supplier collaborations, are studied. More specifically, uncertainties, supplier assessment, supplier selection, supplier integration and the Purchasing function in NPD projects are investigated. These research areas are often presented separately in the literature, but they are connected and affect each other. In this thesis, a comprehensive overview of both of these areas is presented and their relationship discussed. The structure of the chapter is as follows; first, the research design is presented. Thereafter the process of the case studies is described. This process starts with case sampling and case selection, followed by data collection and data analysis. Validity and reliability are discussed and finally, how the material is presented is described.

3.1 Research design

This research was designed to investigate and understand the phenomenon of supplier involvement in NPD projects. Much has been written about this subject in general, but less has been written about the criteria for selecting suppliers in NPD and Purchasing's role in collaborative NPD. Therefore, case study is a suitable method for this study, since qualitative methods allow the researcher to understand more aspects than quantitative methods would allow. Processes, such as for instance supplier selection, are difficult to investigate by conducting surveys. In the process of supplier selection there can be qualitative judgements and complex reasoning behind the choice of supplier. Hence, to explore this phenomenon, qualitative case studies of NPD projects at high-tech firms that collaborate with suppliers were conducted. To be more precise, the object of analysis is the NPD project that the firms are conducting.

A case study is a method to systematically study a phenomenon and is recommended for the study of a complex unit which has multiple variables (Merriam 1994). Additionally, when trying to understand a phenomenon, in this study collaborative NPD, case studies are also a recommended method (Strauss and Corbin 1998; Yin 2009). However, as discussed by Stuart et al. (2002 pp. 421-422) case studies have even further uses in research: “Case studies should not be seen as a methodology appropriate only for understanding and the prelimi-
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nary stages of theory development. Because of their observational richness, they also provide a means of refutation of, or extensions to, existing concepts”. Hence, case studies are useful to further develop existing ideas. Finally, the flexibility provided by this method was useful for this study, since the scope could be adjusted. Thus, changes in the research interest could be made and hence it was possible to explore additional research areas that emerged. In this study, the research area was modified and further developed throughout the study.

The research design is the logic which connects the collected data to the research questions (Yin 2009). It is the researcher’s plan for conducting the investigation and defining cases to study. Figure 3-1 visualizes the research design and the process of this study. The first phase consists of an initial formulation of the purpose of the thesis, and of defining appropriate literature to include in the study. However, the purpose and theory were changed and modified throughout the study. Hence, the purpose and theory of this study partly depended on which projects it was possible to study. Thereafter, a case sampling was conducted and the cases included in the study were chosen. In the second phase, case studies were conducted and detailed case descriptions for each case written (Miles and Huberman 1984). The third phase consisted of writing three papers based on the case studies. This includes a cross-case analysis, which is the basis of paper 3.

In paper 3, case 1 is presented as two cases. In the paper, case 1 is divided into project Alpha and project Beta due to the fact that the NPD project started with supplier A but this collaboration was later terminated. Thereafter, the firm started the NPD with a new technology and a new supplier (supplier B). Hence, it can be argued that case 1 included two projects since the NPD had two phases: phase 1 with supplier A and technology A, phase 2 with technology B and supplier B. Moreover, the firm had to start the NPD almost from the beginning after terminating the collaboration with supplier A due to the change of technology and supplier. However, in the compiled summary case 1 is viewed as one case although it is presented in paper 3 as two distinct projects. The exception is section 3.6.3 (cross case analysis), where an analysis of three projects is conducted.

In paper 1 and paper 2, criteria for supplier assessment and supplier selection were identified. This in turn led to an increased interest in Purchasing, which is why the Purchasing functions are compared in paper 3. Thereafter, the two
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Case studies are also discussed in the compiled summary. During the research design, some activities have been conducted parallel. For instance, paper 3 and the compiled summary have been written partly parallel. Hence, figure 3-1 illustrates the research design, but it is not a perfect picture of the research process. In the process, there were elements of writing, re-writing and additional data collection, which are not visualized in the figure. However, the figure generally describes how the process developed and how it consisted of three phases, and the elements in each phase and their connection are described. In case studies, there is often an overlap of data collection and data analysis; this allows the researcher to modify the data collection by being flexible (Eisenhardt 1989). This analysis overlap is presented in the figure in phase two and in phase three.
Figure 3-1 Research Design (modified from Yin 2009, p 57)
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Empirical research begins with a review of literature, finding a research gap and composing research questions that address the gap identified (Eisenhardt and Graebner 2007). Literature was searched on ISI and sorted by those with most citations. Key words for the literature search included: supplier involvement, NPD project and supplier, Purchasing and NPD, and supplier selection. Additionally, more articles were discovered by finding key references in the articles discovered on the ISI search. The tables in chapter 2 consist of literature that has been identified either through the ISI search or by finding references used in those papers. It can be argued that additional key words could have been used. However, in order to try to limit the study and stay to the point and not using general key words such as innovation and collaboration were omitted since there is already extensive research related to a number of literature streams affined to these words.

Most likely, there exists more literature on collaborative NPD but this thesis is limited to the ISI search and references used in the papers found there. Although the key words lead to my central references, some of the hits on the ISI database were not relevant. Some articles for instance investigated the collaboration between firms and universities or studied firms’ outsourcing and joint ventures. However, in general the snowball effect proved to be very important for finding new relevant papers and references used in relevant papers often led to other relevant papers.

3.2 Case sampling

It is argued that the decision and strategy for sampling cases depends on the research question (Flick 2006). Hence, the sample size and sampled strategy depends on the unit of analysis (Patton 2002). In qualitative research, the sample may be small and sometimes limited to a single case study. In such cases, the case is selected purposefully. This is described by Patton (2002 pp. 230) who points out that “Purposeful sampling focuses on selecting information-rich cases whose study will illuminate the questions under study”.

The strategy for sampling is used to disclose a field; this can be done by selecting cases that are viewed as extraordinary (Flick 2006). Intensity sampling is a sampling strategy which consists of sampling information-rich cases that are not extreme, but demonstrate the phenomenon intensely (Patton 2002). Hence, the researcher looks for cases that are rich examples for the subject under study, but where the cases are not unusual. The sampling strategy used here was
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Based on finding cases that were rich in information and demonstrated the phenomenon supplier involvement in NPD. To ensure that the cases had rich information, the firms actively participated in the sampling. Thus, projects were discussed and those perceived as interesting for this study were selected. To capture this information, case studies were conducted and interviews made with individuals that were involved in the two NPD projects under study. If a survey had been conducted instead, it would not have been possible to capture the depth and richness that was needed. Further, technical performance was studied, something that would have been difficult to study with a survey, since the technologies used need to be discussed and compared with other options and possibilities that the firms had.

There are several strategies for selecting cases. A method to maximize the helpful information from a single case was used, an information-oriented selection (Flyvbjerg 2004). Thus, random sampling was not used, but instead an information-oriented selection based on expectations of content in the case was used. Eisenhardt (1989) suggests that the case selection should be a theoretical sampling where the cases are selected on the basis of their theoretical usefulness. Moreover, researchers should strive to select cases that are either extreme or typical (Alvesson 2011). In the sampling, it was necessary to consider that the cases were to be used in three articles for the licentiate thesis. The first case was used as a single case in the first article and the second case was used as single case in the second article. However, in the third article, the first case study is divided into two cases. These two cases and the case used in the second article are compared in the third article. This has affected the sampling; cases needed to be interesting on individual level in addition to being comparable cases for the third article.

In sampling, unusual cases are not the same as extreme cases. However, both the cases investigated are extreme although not unusual, and therefore useful to study. The first case was extreme due to the difficulties with the collaboration with the first supplier, which finally led to a change in supplier and a change in technology. Furthermore, Purchasing did not participate in the project. In contrast, the second case study is extreme in that the collaboration with the supplier was viewed as devoid of large problems and without conflict. In this project, Purchasing was involved and the supply manager was a member of the project team. Thus, these cases are polar in the sense of the existence of problems and the degree of involvement on the part of Purchasing. This can be viewed in table 3-1. However, to enable comparison of the cases, it was also necessary
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that they had many variables in common. This will be discussed later in the chapter.

Table 3-1 Case sampling

<table>
<thead>
<tr>
<th>Case sampling</th>
<th>Case 1</th>
<th>Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme case</td>
<td>Difficulties with technology and collaboration with the first supplier</td>
<td>Smooth project that did not have any problems</td>
</tr>
<tr>
<td>Polar case</td>
<td>Purchasing was absent in the project</td>
<td>Purchasing was included in the project</td>
</tr>
</tbody>
</table>

This research is a part of a larger research project, in which four Swedish high-tech firms are collaborating partners. Thus, it was preferred that the case studies were to be conducted on one or several of these firms. This has affected the case selection by limiting it to these four firms. However, these four firms are very good to study as they have a wide selection of R&D projects with suppliers. In the case sampling process, the firm was first selected and thereafter there were discussions with the firm regarding suitable NPD projects that could be studied. The selection process is visualized in figure 3-2. As shown in the figure, there are two samplings: firm sampling and project sampling. Additionally, there are two selections in the figure: firm selection and project selection.

Figure 3-2 Sampling and selection process

The four firms that are collaborating partners were good for sampling cases with regards to the research questions because they are high tech firms with R&D activities involving different products and technology. Furthermore, accessibility was important and the firms had promised to collaborate and allow studies of projects at their firms. In the sampling of cases for understanding
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collaborative R&D, it was important that the case was a NPD project and involved technology that was new to the firm to which a supplier contributed. The objects of study were the NPD projects, which were studied from the buyer's viewpoint, and in the second case, these were also studied from the supplier's viewpoint. The original objective was to include the supplier in the first study. However, this was not possible due to restrictions from the buying firm, and therefore only the buying firm was studied.

3.3 Case selection

The first case study started with firm selection and ABB and the division Power Systems were selected. This firm was selected because I had previously worked at ABB, but at a different division. The study was at this division because of an earlier agreement to allow a study of an NPD project there. Since I had prior knowledge of this firm, it seemed to be a good firm to start studying. There are both advantages and disadvantages connected to my previous work at ABB. It is an advantage to know the organisation, internal structure, technology and culture of a firm but this can also prevent the researcher from seeing how things actually are. To deal with this I reminded myself that I was at another business unit of ABB and kept an open mind.

ABB was contacted and an initial meeting at the firm was arranged. In this meeting, the research idea was presented to the senior vice president, the technology manager, the manager of marketing and sales and the manager of business development. The firm's managers discussed which of their NPD projects would be most appropriate to study. It was important that the project fit the following criteria: that it should be a NPD project involving an external supplier with new technology, and it should be in its end phase. These criteria were developed to facilitate data gathering and ensure that a suitable project for the selected purpose of this study was selected. Other important criteria involved secrecy and resources; it should be possible to gain access to the project and information involving it, and in addition project members also needed to be able and willing to reserve time for interviews. A number of NPD projects were assessed and a suitable NPD project that fitted the criteria was selected in agreement with the firm.

The selection of the second case was similar to the first, but with the difference that the firm ABB and the department Machines were identified from the researcher's personal connections. I personally knew the technical manager at the
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firm and contacted him by phone to ask whether it was possible to conduct a study at the firm and if he knew of any suitable projects. The technical manager expressed an interest in my research and I went to Västerås to have a meeting with him to discuss the possibilities of conducting a case study there. The criteria were the same as for the first case, with the addition that it should allow access to the external supplier in the NPD project and that the supplier should be included in the study. The project selection was partly based on the findings from the first case study, as it was necessary to be able to compare the first case study with the second case study. Based on the theoretical dimension, a case was searched for that included the initial phases of NPD collaboration, that is to say supplier assessment and supplier selection. Furthermore, it was an advantage to find a case that also had supplier integration. During the sampling process at the initial meeting, the technical manager presented several NPD projects with external suppliers. One project was chosen since it was about to be finalized, was a success, involved new technology and included an international supplier. The technical manager contacted the supplier, and when the supplier agreed to be included in the study, the project was selected. As in the first case study, here too the selection was based on the expectation of information contribution from the case with regards to my research interests.

3.4 Case study

Case studies can be classified according to the number of cases that are studied: single case studies and multiple case studies. Additionally, it can be classified according to the dimension of time; retrospective studies, snapshots and longitudinal studies. This study started with a single case and thereafter one more case study was added. Dubois and Gadde (2002 pp. 554) argue that “Learning from a particular case (conditioned by the environmental context) should be considered a strength rather than a weakness”. Hence, single case studies are valuable for understanding in cases where the context has been properly selected. Both of the studies were retrospective studies, and started at the end phase of the NPD projects and during that time the projects were being finalized. In retrospective studies, the study’s boundaries need to be defined and informants that are meaningful to the study have to be selected (Flick 2006). One advantage of a retrospective study is that the outcome is clear and whether or not the projects were a success or a failure is known. However, a disadvantage could be that informants do not recognize an event as important, even if it is important to the researcher, and thus do not remember it (Leonard-Barton 1990). Another disadvantage is that it may be difficult to remember dates and
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details from occurrences that took place some years ago. Furthermore, key individuals could have left the firm thus making it difficult to interview them.

An overview of the two case studies can be found in table 3-2. Both NPD projects were conducted at ABB in Västerås, SWE. However, although the two firms belong to the same corporate group, they were located in different parts of the city, operating in different industries and belonging to different divisions within ABB. The two cases are similar with regards to the firm, company culture and location. Moreover, both cases involve a product that is important to the firm, as well as the inclusion of technology that is new to the firm and is delivered by an external supplier. However, the cases are polar cases, as I have explained earlier was due to the amount of problems in the projects and the degree of involvement of Purchasing. Further characteristics that differentiate the cases and could have affected the number of problems are the degree of technological uncertainty and the degree of innovation.

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
<td><strong>Energy storage</strong></td>
</tr>
<tr>
<td><strong>NPD duration</strong></td>
<td><strong>11 years</strong></td>
</tr>
<tr>
<td><strong>Industry</strong></td>
<td><strong>Power transmission</strong></td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td><strong>Battery</strong></td>
</tr>
<tr>
<td><strong>Technological uncertainty</strong></td>
<td><strong>High</strong></td>
</tr>
<tr>
<td><strong>Degree of innovation</strong></td>
<td><strong>High</strong></td>
</tr>
<tr>
<td><strong>Number of suppliers</strong></td>
<td><strong>Two</strong></td>
</tr>
</tbody>
</table>

The first NPD project was operating in the power transmission industry and was developing energy storage to a larger product that transports electricity to the grid. The duration of the project was 11 years and two different battery technologies and suppliers participated during that time. Both the technological uncertainty and the degree of innovation were high, and consequently this NPD project involved much research. Some characteristics of the project included complexity, radical innovation, high uncertainty, long duration and many problems during the development. This study has been made from the buyer's perspective; the suppliers' views could not be included because it was not possible to gain access to them. Moreover, ABB did not want their suppliers name to be mentioned and therefore they are anonymous.
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The second NPD project was within the railway motor industry, also known as the power train industry. A hybrid bearing was developed and the project involved both developing a new product and creating a standardised assortment to limit the number of available bearings. The duration of the project was one year and it involved one supplier, SKF. The technological uncertainty was limited and the degree of innovation was low, and thus this NPD involved a lot of development. Project characteristics included incremental innovation, low uncertainty and smooth collaboration. In this study, both the buyer’s and the supplier’s views of the NPD project are included.

3.4.1 Data collection

Case study data collection involves several data sources, something which strengthens the data collection. However, it is important to maintain the research focus and to avoid being overwhelmed by the large volume of data (Eisenhardt 1989). It is suggested that researchers should use triangulation to acquire data, thus applying a number of methods to search for and gather data (Golafshani 2003). The data collection conducted here included interviews, internal and external documents, brochures, home pages, factory visits, and technical information documents.

3.4.2 Interviews

The main data was collected during interviews with individuals involved in the NPD projects. Interviews can be distinguished and categorised according to their structure, size, communication and type of interview (Alvesson 2011). The first category, the degree of structure of an interview, can be divided into three levels: structured, semi-structured and unstructured. The interviews in this study can be classified as semi-structured and the interview focused on the NPD project and themes regarding it. Before starting the interviews, an interview guide that contained the main topics for discussion with the respondents was prepared. The interview guide was developed to be flexible and allow for follow-up questions to be asked. With regards to the number of interviewees, the second category, it can be conducted as an interview with only one individual, or it can be an interview of a group of people. The interviews in this study were conducted with one respondent at a time in order to gain that respondent’s view of the project. A group interview could have resulted in some respondents refraining from speaking freely; this was avoided by conducting the interviews individually. However, the initial meeting at the firm for the first case study was with a group of individuals from the firm.
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The third category is the medium of communication. Interviews can be made face-to-face, over the phone or in writing. Here, the ambition was to have face-to-face interviews, and when that was not possible, phone interviews were conducted. Face-to-face interviews allow the researcher a more in-depth understanding than a phone interview. Hence, in order to gain as much information as possible, face-to-face interviews are to be preferred. Conducting interviews is a highly efficient method for gathering detailed empirical data (Eisenhardt and Graebner 2007). In this study, the respondents often answered questions with much detail and with rich information. Finally, the fourth distinction is the type of interview. This applies to consideration for the respondent as some interviews concern sensitive or personal information and in such cases, considerations must be taken. However, the interviews described have not dealt with information of the sensitive nature that Alvesson (2011) discusses; namely death, disease and violence. The interviews conducted have not dealt with the respondents’ private lives.

The selection of respondents involves two principles: representativeness and quality sampling (Alvesson 2011). The first principle focuses on giving the researcher a clear picture and avoids individuals’ possible skewed views of the phenomenon. Thus, the sampling should be wide and include a variety of respondents. The second principle focuses on the respondents, and especially on their insight and the relevance of their information is. In these cases, a sampling of individuals that includes both principles has been made. By selecting individuals that have access to the NPD projects or are project members, it was ensured that the respondents had insight into the project and could provide relevant information. Furthermore, all of the respondents had been involved, if not the whole process then at least in some of the part of the projects that are studied. A problem with interview data is that there can exist bias. This can be avoided by using knowledgeable informants who view the phenomena from diverse perspectives (Eisenhardt and Graebner 2007). To ensure representativeness, interviews with individuals with different areas of responsibility, who belong to different departments and who have different roles and responsibilities in the project, have been conducted. In this study, it was possible to gain different views of the projects, processes, meetings and decisions that the firms have made.

An overview of the data collected through interviews is presented in table 3-3, where each case is presented separately. In total, 21 interviews were conducted during the period January to September 2010.
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Table 3-3 Interview overview

<table>
<thead>
<tr>
<th>Case</th>
<th>Number of interviews</th>
<th>Interview time</th>
<th>Time period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>10</td>
<td>14 h</td>
<td>January-August 2010</td>
</tr>
<tr>
<td>Case 2</td>
<td>11</td>
<td>16 h 30 min</td>
<td>April-September 2010</td>
</tr>
</tbody>
</table>

3.4.3 Case 1

In the first case study, the interview data was collected through semi-structured interviews which were mainly conducted face-to-face as it is important that the researcher is present in person, in order to ask follow-up questions (Kreiner and Mouritsen 2005). However, it was not possible to conduct two of the interviews face-to-face, and thus two phone interviews were made. Nevertheless, I briefly met these interviewees in person prior to the interviews. Respondents were individuals involved in the project, and they were selected in close discussion with the managers at the firm. In total, 10 interviews were conducted. These are presented in table 3-4, where information regarding respondent, duration of the interview and interviewers are included. During the project there had been two different project managers, both of whom were included in the study and were interviewed.
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Table 3-4 Respondents, duration, number of interviews, project role and interviewer in case 1

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Duration</th>
<th>No. of interviews</th>
<th>Role in the project</th>
<th>Interviewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager (2)</td>
<td>1 h 30 min</td>
<td>1</td>
<td>The second project manager, responsible for the project’s progress</td>
<td>Fredrik Tell (FT) and Lisa M (LM)</td>
</tr>
<tr>
<td>Technical Manager</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Responsible for technical resources to the project</td>
<td>FT and LM</td>
</tr>
<tr>
<td>Market Communicator</td>
<td>2 h</td>
<td>1</td>
<td>Responsible for marketing material</td>
<td>LM</td>
</tr>
<tr>
<td>Business Development Manager</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Idea generator and have followed the project continuously</td>
<td>LM</td>
</tr>
<tr>
<td>Manager Marketing and Sales</td>
<td>1 h</td>
<td>1</td>
<td>Responsible for the sales of the firm’s products</td>
<td>LM (by phone)</td>
</tr>
<tr>
<td>Senior Vice President</td>
<td>1 h</td>
<td>1</td>
<td>No direct participation in the project, but member in the project’s steering committee</td>
<td>LM (by phone)</td>
</tr>
<tr>
<td>Supply Manager</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Partly responsible for the contact with the second supplier in the project</td>
<td>LM</td>
</tr>
<tr>
<td>R&amp;D Manager</td>
<td>1 h</td>
<td>1</td>
<td>Responsible for development projects</td>
<td>LM</td>
</tr>
<tr>
<td>Regional Sales Manager</td>
<td>1 h</td>
<td>1</td>
<td>Responsible for educating the sales people about the developed product</td>
<td>LM</td>
</tr>
<tr>
<td>Project Manager (1) Today: Global R&amp;D Program Manager</td>
<td>2 h</td>
<td>1</td>
<td>The first project manager, responsible for the project’s progress</td>
<td>LM</td>
</tr>
</tbody>
</table>

*Total* 14 h 10
Methodology

Company material was collected through the firm’s home page and internal documents. In addition, extensive marketing material in the form of brochures, presentations and documents were studied. Additional secondary data about the project were the company’s internal documents, such as the description of the stage-gate system used for developing projects. Technical information about the product’s technologies was collected through articles about the technology, technical brochures, technical descriptions of the technologies and the supplier’s home page and marketing material. Information about the development of energy storage systems included reports available from the DOE, the United States Department of Energy.

3.4.4 Case 2

The data used in the second case was collected at two firms: the buying firm and the supplier. In this study, individuals from two different firms and with different positions within the respective firms were interviewed. This approach limited potential bias in the study. The study began by conducting semi-structured interviews at ABB, with the employees involved in the NPD project. This project team comprised of four project members; project manager, technical manager, supply manager and general manager. After having interviewed the project members at ABB, the study at the supplier, SKF began. First the supplier’s project team in Sweden were interviewed and thereafter the supplier’s project team in Austria. The project team at SKF consisted of six members; key account manager SWE, project manager SWE, application engineer SWE, development engineer AUT, product manager AUT, and business engineer, AUT. Table 3-5 lists the project members that were interviewed for respective companies, the duration of the interviews and the project members’ roles in the project. ABB’s technical manager was interviewed twice with an interval of several months between the interviews; the second interview was conducted because this respondent had very valuable insight into the project. The other project members were interviewed once. Face-to-face semi-structured interviews were conducted between April and September 2010. The interviews ranged from 1 hour and 15 minutes to 2 hours and 30 minutes and the interviews were recorded.
Methodology

Table 3-5 Respondents, firm, duration, number of interviews, project role and interviewer in case 2

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Firm</th>
<th>Duration</th>
<th>No. of interviews</th>
<th>Role in the project</th>
<th>Interviewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>ABB</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Responsible for technical discussions with SKF</td>
<td>Lisa Me-lander (LM)</td>
</tr>
<tr>
<td>Technical Manager</td>
<td>ABB</td>
<td>2 h 30 min (1h, 1h 30 min)</td>
<td>2</td>
<td>Technical support and initiator of the NPD project</td>
<td>LM</td>
</tr>
<tr>
<td>Supply Manager</td>
<td>ABB</td>
<td>2 h</td>
<td>1</td>
<td>Responsible for commercial discussions with SKF</td>
<td>LM</td>
</tr>
<tr>
<td>General Manager</td>
<td>ABB</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Strategic role</td>
<td>LM</td>
</tr>
<tr>
<td>Key Account Manager</td>
<td>SKF</td>
<td>2 h</td>
<td>1</td>
<td>Responsible for commercial discussions with ABB</td>
<td>LM</td>
</tr>
<tr>
<td>Project Manager</td>
<td>SKF</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Responsible for SKF’s railway segment</td>
<td>LM</td>
</tr>
<tr>
<td>Application Engineer</td>
<td>SKF</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Responsible for technical discussions with ABB</td>
<td>LM</td>
</tr>
<tr>
<td>Development Engineer</td>
<td>SKF</td>
<td>1 h 30 min</td>
<td>1</td>
<td>Traction motor specialist at SKF factory, has technical discussions with SKF in Gothenburg</td>
<td>LM</td>
</tr>
<tr>
<td>Product Manager</td>
<td>SKF</td>
<td>1 h 15 min</td>
<td>1</td>
<td>Sales responsible SKF factory, commercial and strategic role</td>
<td>LM</td>
</tr>
<tr>
<td>Business Engineer</td>
<td>SKF</td>
<td>1 h 15 min</td>
<td>1</td>
<td>Responsible for hybrid bearings</td>
<td>LM</td>
</tr>
</tbody>
</table>

Total 16 h 30 min 11
Methodology

Complementary data sources were gathered through company documents, catalogues, technical information sheets, home pages and marketing material. Extensive marketing material was studied, including videos, catalogues, brochures, presentations and information sheets. Additionally, competitor suppliers were studied through their homepages, brochures and marketing material. Innotrans, the world’s largest railway fair, which was held in September 2010 in Berlin, Germany, was visited in order to learn more about the railway industry. ABB, SKF and their potential customers and competitors also participated in Innotrans. Table 3-6 lists additional data gathering that was not in the form of documents or videos. In order to better understand the products, that is to say traction motors and hybrid bearings, both ABB’s and SKF’s factories were visited. The factory visits and the fair visit were rich in information and enhanced understanding of the product and the industry. Viewing the product and the production processes facilitated an understanding of the information in the documents about the product and what the respondents had been describing. The fair visit helped to contextualise and understand where the products were integrated, and how the new technology would have an impact on the end product.

Table 3-6 Additional data sources

<table>
<thead>
<tr>
<th>Data source</th>
<th>Firm</th>
<th>Duration</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB factory visit, SWE</td>
<td>ABB</td>
<td>1 h</td>
<td>Increase understanding for the traction motor and its manufacturing</td>
</tr>
<tr>
<td>SKF factory visit, AUT</td>
<td>SKF</td>
<td>1 h</td>
<td>Increase understanding for the hybrid bearings and its manufacturing</td>
</tr>
<tr>
<td>Innotrans, DE</td>
<td></td>
<td>1 day</td>
<td>Learn more about the railway industry and the products within it</td>
</tr>
</tbody>
</table>

3.5 Data analysis

Qualitative analysis helps the researcher understand different occurrences and explain why differences exist. The data analysis was systematically conducted and analysed. The collected data was analysed, hence the data was organised, divided, categorised and partly coded to facilitate the analysis for both case studies. The data analyses were conducted with a similar systematic structure. Interpretation of the gathered data is very important in a researcher’s work; awareness, assumptions and pre-understanding are important elements in the interpretation (Alvesson and Sköldberg 2009). It is not only the researcher who interprets but also the respondents interpret during the interview. From the
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Interview-data collected a microanalysis was made, which takes the interviewees' interpretations into consideration (Strauss and Corbin 1998). What the respondent said as well as how it was said was taken into account. Because the interviews were made face-to-face, it was easier to understand the respondents. The respondents' answers depend on various conceptions about the interviewer and the context of the interview and this can be at more or less unconscious levels of the respondent (Alvesson and Sköldberg 2009).

3.5.1 Content analysis and categories

Miles and Huberman (1984) suggest that the researcher should conduct analysis during the data collection phase in order to collect better data and generate reports during the field work. As demonstrated in the research design, the analysis was partly made during the same phase as the data collection for the case studies. The analysis procedure must be unambiguous (Paisley 1969) and this can be difficult since there is a large volume of text to be analysed. In this analysis, no software for structuring or identifying categories has been used.

Content analysis was used to analyse the text from the interviews and the remaining data. Content analysis is a collection of techniques which enables interpretation of text (Weber 1996). Its objective is to provide interpretations which investigate some of the possible themes (Deese 1969). Furthermore, it is a process that can systematically analyse textual information from interviews (Kondracki et al. 2002). Hence, the text was classified into content categories in order to structure the data. More specifically, the data from the first case was structured into: first selection phase, collaboration with the first supplier, second selection phase and collaboration with the second supplier. The data from the second case was divided into three content categories: supplier assessment, supplier selection and supplier integration. This facilitated the analysis of the data. However, there are disadvantages to this method, as selection and classification limits data. Despite this, the advantages to this approach were considered to outweigh the disadvantages.

As Miles and Huberman (1984) stress, data analysis includes selecting and transforming data in an organized way in order to be able to draw conclusions. For example, conclusions from case 2 used in paper 2 were from those content categories in which it was possible to identify important elements in each category. These elements were used to illustrate what was considered to be of importance in the supplier selection process. To find categories, the data was first studied to identify differences and similarities in the material and then struc-
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tured. A part of the collected data was coded according to classifications, in order to facilitate the identification of different themes. This was done manually, by simply reading the case description and the transcriptions from the interviews and identifying the units. These were then transformed into code. Examples of codes can be found in table 3-7.

Table 3-7 Example of codes

<table>
<thead>
<tr>
<th>Code/Category</th>
<th>Identified unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection criteria</td>
<td>“We selected supplier A partly due to …”</td>
</tr>
<tr>
<td>Supplier change</td>
<td>“It was no longer possible to continue the collaboration with the current supplier”</td>
</tr>
<tr>
<td>Satisfaction with supplier</td>
<td>“The supplier was not capable of…”</td>
</tr>
<tr>
<td>Purchasing’s involvement in NPD</td>
<td>The supply manager was a team member on the NPD project</td>
</tr>
</tbody>
</table>

3.5.2 Within-case analysis

Eisenhardt (1989) recommends within-case analysis, which includes detailed case write-ups. A careful examination of the data collected was conducted, and it was thereafter classified into groups according to properties and similarities. In the analysis, the researcher’s prior knowledge was used, and all the data collected was included. Data can be organised according to a time perspective by which the researcher tries to create a story from the different occurrences that are presented in the data (Fejes and Thornberg 2009). In this study, time lines were created to facilitate the understanding of important milestones in the projects. In this mapping, core situations were identified and interpreted. Furthermore, detailed case descriptions were written in which the respondents’ views of important episodes are presented.

Yin (2009) suggests that case study analysis requires a case description and analysis by the researcher. In accordance with his suggestion, elaborated and detailed case descriptions, which included both data from the interviews and additional data, were written. Such data included for instance data collected from marketing material, internal documents and technical descriptions. The papers draw upon the information in the case descriptions. The process of writing the papers included studying the literature and analysing the case descriptions. According to Eisenhardt (1989), the researcher works systematically to compare theory with data in an iterative process. Therefore, throughout these studies, relevant literature has been searched for and read. The study started with general theory about NPD and supply management and then it evolved to incorpo-
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rate literature about supplier involvement in NPD, supplier selection and Purchasing. Thus, the theory started broad, became narrow and more specific, and finally developed into including relevant subjects for this research.

3.5.3 Cross case analysis

In cross case analysis, it is preferable for the researcher to be intimately familiar with each case, something which can be achieved through case write-ups (Eisenhardt 1989). In the research described here, two case descriptions were written and were often returned to and re-read. At times, it also seemed necessary to return to the raw material in order to ensure that the case description did not omit any valuable information. Eisenhardt (1989) describes three tactics for cross-case comparison:

1) Select categories or dimensions, and look for within-group similarities coupled with intergroup differences

2) Select pairs of cases and list similarities and differences between each pair

3) Divide data by data source

Following Eisenhardt’s suggestions, a specific dimension was selected; Purchasing’s involvement in the NPD project. Within this dimension, similarities and differences between the projects were searched for. Thereafter, the similarities discovered were listed in one matrix and the differences in another matrix. In this way, Eisenhardt’s first tactic was used and from the reduced data, her second tactic was applied. The third tactic for cross case analysis was partly used and the data was divided by source in form of the informant. For instance, the data obtained from the Purchasers were separated from the other informants in the comparison of the two roles. Other informants were similarly divided to facilitate comparison.

It is argued that in a comparative analysis the focus should be on the key variables (Lijphart 1971). This is due to the risk of the researcher becoming overwhelmed by a large number of variables. Thus, to facilitate the comparison, key events in the NPD projects were identified and the process was divided into different stages of the NPD project. For instance, the projects were divided into three rough timeframes: technology selection, supplier selection and supplier involvement in the project. This division is illustrated in figure 3-3.
Another method to collocate data from multiple cases is to present information in one chart, the unordered meta-matrix (Miles and Huberman 1984). This method is similar to the tactics described by Eisenhardt (1989). By managing to categorise the data, the comparison becomes clearer. Therefore, a matrix for the comparison and identification of similarities and differences in the NPD projects was made. Relevant descriptive data was assembled in this way and from there, it was possible to divide the data into categories. For instance, some of the categories for comparison were: uncertainty, Purchasing’s involvement and problems. The pair of cases, case 1 and case 2, had already been identified. Here, case 1 was divided into two distinct projects. Thereafter, similarities and differences found in the NPD projects were listed.

The key variables were similar to the categories; one example is technology selection, which investigated how involved Purchasing had been in the technology selection in the two cases. Other variables were, for example, supplier selection, supplier integration, uncertainty and success. This is demonstrated in table 3-8 where the pair of cases is presented. The dimension is as previously mentioned, Purchasing’s involvement. The key variables are connected to the dimension and searched for in the data in order to find similarities and differences. The complete matrix is not presented, but the table is given as an example to demonstrate the method used.
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Table 3.8 Example matrix for comparing the cases

<table>
<thead>
<tr>
<th>Purchasing’s involvement</th>
<th>Project ALPHA</th>
<th>Project BETA</th>
<th>Project GAMMA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Similarities (all 3 projects)</strong></td>
<td>Buying firm has a Purchasing department</td>
<td>Buying firm has a Purchasing department</td>
<td>Buying firm has a Purchasing department</td>
</tr>
<tr>
<td></td>
<td>No participation in the technology selection</td>
<td>No participation in the technology selection</td>
<td>No participation in the technology selection</td>
</tr>
<tr>
<td></td>
<td>Purchaser did not have prior knowledge of the supplier</td>
<td>Purchaser had prior knowledge of the supplier</td>
<td>Purchaser had prior knowledge of the supplier</td>
</tr>
<tr>
<td></td>
<td>No participation in the supplier selection</td>
<td>Participation in the supplier selection</td>
<td>Participation in the supplier selection</td>
</tr>
<tr>
<td></td>
<td>No member from the Purchasing department in the project team</td>
<td>No member from the Purchasing department in the project team</td>
<td>Supply manager on the project team</td>
</tr>
</tbody>
</table>

### 3.6 Validity and reliability

#### 3.6.1 Construct validity

To perform construct validity is to identify correct operational measurements for the case studied. To ensure construct validity during data collection, it is important to use multiple sources to gather data, to establish a chain of evidence and to have key informants review the draft. Yin (2009) identifies this as problematic due to the fact that researchers fail as researchers to develop sufficient operational sets of measures. Data triangulation, which is the use of multiple data sources, is recommended during the data collection (Eisenhardt 1989; Yin 2009). By using data triangulation, the same phenomenon can be viewed through multiple sources of evidence. Triangulation should at best support findings by revealing agreement among independent measures and the data collection, or should at least not contradict (Miles and Huberman 1984). In this thesis, the data triangulation consisted of interviews, observations at the facto-

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1 Text in *italic* displays similarities
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ries, internal and external documents, and technical information. The principle of a chain of evidence is to allow an external observer to follow the evidence from research question to conclusions (Yin 2009). At this point, I had the possibility to discuss the research with colleagues and my supervisor read my case study reports in which the collected data was presented. Key informants for both key studies were also offered the possibility to review the drafts. However, of these three key informants only one reviewed and commented. These comments included highlighting important occurrences during the project. It would have been better if all three reviewers had commented on the text, but at least they were given the opportunity.

3.6.2 Internal validity

Internal validity can be described as something that ascertains whether there is a match between the researcher's observations and the idea developed (Bryman and Bell 2007). Thus, the researcher must ensure that the conclusions are correctly drawn and that rival explanations and other possibilities have been addressed. According to Yin (2009), it is difficult to identify tactics to ensure internal validity. However, several tactics can be used in the data analysis: pattern matching, explanation building, addressing rival explanations and using logic models. In pattern matching, the empirical pattern is compared to a predicted pattern and coinciding patterns can strengthen the internal validity. For instance, according to the supplier literature, Purchasing is becoming more strategic (Cousins and Spekman 2003). Thus, it was predicted that Purchasing's involvement would have a positive influence on the NPD project. In the cases studied, it was believed that Purchasing had a positive effect on the NPD projects and thus, the pattern coincided. However, with regards to technical uncertainty, it is not obvious that Purchasing contributes to the NPD project but on the contrary, Purchasing can be perceived as interfering because of the tendency to raise commercial aspects during technical discussions.

Explanation building is an analysis of the case study data and develops an explanation about the case. This explanation can be based on propositions from the literature. During the data analysis, significant literature on the subject was reviewed, and thus it was possible to better understand the phenomenon studied. Examining rival explanations is to define and test rival explanations, e.g. a rival theory may explain the phenomenon better. A thorough search in the literature for different explanations was conducted, and explanations were not dismissed at an early stage. According to Eisenhardt (1989), examining conflicting literature is important for two reasons:

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1) If conflicting literature is ignored, then confidence in the findings is reduced

2) Conflicting literature forces the researcher into creative thinking

Consequently, conflicting literature was reviewed. For example, many studies demonstrate the benefits of supplier involvement in NPD. However, there are also studies that investigate this phenomenon and find no associated benefits. Furthermore, some studies show disadvantages from collaborating with suppliers. By being aware of this conflict in the literature, it was possible to address various possibilities, and I did not ‘make up my mind’ before I had the data. In my opinion, this conflict has made the phenomena more interesting to study.

It is argued that internal validity can be strengthened if the researcher ties the findings to existing literature (Eisenhardt 1989). In this research, results from the case studies have been connected to the literature. In the logic model, events are presented in cause-effect patterns and observed events can be matched with predicted events. Many cause-effect patterns have been used to describe and present the case study data and these have been compared with patterns from the literature.

3.6.3 External validity

External validity refers to whether or not a study is generalizable to other fields or research areas. Generalization from case studies can be problematic, although at the same time case studies can be valuable to understand or explain a phenomenon. Generalization is based on extrapolation, Yin (2009) argues that even if case studies are not generalizable to populations, they are generalizable to theoretical propositions. Such analytical generalization links theories to a case study, something that is possible with only a few cases (Firestone 1993). Normann (1976) claims that the possibility to generalize from one or a few cases depends on the possibility to reach an understanding of the phenomenon. Merriam (1994) however, reasons that generalization of a case study is pointless since the reason for selecting this method is to investigate a phenomenon in-depth in a certain situation and not to generalize to all possible units. The present study has a similar aim; to conduct in-depth investigation and not to make generalizations to populations. The findings from this study are related to previous empirical findings.

In a research design, theory can be used in single case studies and replication can be used in multiple cases to ensure external validity. The results from the
single case studies are used to generalize a broader theory and not to generalize statistically. Case studies can be used to understand a behaviour, if the argument is provided by the explanation and not by the case itself (Nightingale 2000). Cases may be selected to replicate a previous case or to provide examples of polar types (Eisenhardt 1989). Replication, in other words to conduct multiple experiments, is used in multiple case studies to predict similar results or predict contrasting results for expected causes. Validity is enhanced in the replication if the cases support the researcher’s suggestions. In this study, the sampling consisted of trying to find a second case that had similar conditions as the first case but were different in one aspect: the perceived problems in the NPD project.

3.6.4 Reliability
Reliability refers to the possibility for another researcher to follow the procedures and conduct the same case study again. This means that the study is completed and the second researcher makes the same findings. Each NPD project is unique and although repeating a study of one such project and reaching the same findings is an objective for the researcher, it may not be possible. However, to ensure that it is hypothetically possible, documents of the procedures are needed. Yin (2009) recommends researchers to use case study protocols and to develop a case study database during the data collection. The case study protocol is the researcher’s guide in data collection. A case study database contains the researcher’s raw data material and this enables other researchers to study the evidence directly. In the early stages of this research, a case study protocol, which included several phases in the data collection, was prepared. During the case studies, a case study database was created, which included the recorded interviews, transcriptions, the different documents that have been collected as well as the case write-ups.

Golafshani (2003) discusses the importance of validity and reliability in qualitative research. Tests for validity and reliability are presented in table 3-9 and include the tactics that the literature recommends and those that have been used in these case studies.
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Table 3-9 Tests for validity and reliability

<table>
<thead>
<tr>
<th>Test</th>
<th>Recommended tactic</th>
<th>My tactic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>Multiple sources of evidence</td>
<td>I used data triangulation and collected multiple data from interviews, internal and external documents, observation and technical information</td>
</tr>
<tr>
<td></td>
<td>Chain of evidence</td>
<td>My case study reports were read by my supervisor and I discussed my work with colleagues</td>
</tr>
<tr>
<td></td>
<td>Draft review</td>
<td>Key informants from the firms were offered the possibility to review the drafts</td>
</tr>
<tr>
<td>Internal validity</td>
<td>Pattern matching</td>
<td>Empirical patterns are compared with predicted patterns</td>
</tr>
<tr>
<td></td>
<td>Explanation building</td>
<td>I have studied significant literature and explanation propositions</td>
</tr>
<tr>
<td></td>
<td>Address rival explanations</td>
<td>I searched the literature to find different explanations to the phenomenon</td>
</tr>
<tr>
<td></td>
<td>Existing literature</td>
<td>My results were connected to the existing literature</td>
</tr>
<tr>
<td></td>
<td>Logic models</td>
<td>I have many cause-effect patterns in my case descriptions and I have compared these with theoretical predicted patterns</td>
</tr>
<tr>
<td>External validity</td>
<td>Use theory</td>
<td>In the single case studies, the generalization was aimed towards theory</td>
</tr>
<tr>
<td></td>
<td>Analytical generalization</td>
<td>My generalization was not aimed towards population but rather towards theory, where my explanation carries the argument and not the case itself</td>
</tr>
<tr>
<td></td>
<td>Use replication</td>
<td>The second case had similar conditions as the first case</td>
</tr>
<tr>
<td>Reliability</td>
<td>Study protocol</td>
<td>I have created a case study protocol</td>
</tr>
<tr>
<td></td>
<td>Case study database</td>
<td>The raw data was collected in a case study database. Furthermore, the case write-ups have been stored there as well</td>
</tr>
</tbody>
</table>

3.7 Presenting the material

To present a single case study can be challenging, but it can be facilitated by presenting a complete story of the case. According to Eisenhardt and Graebner (2007 pp. 29) “The story typically consists of narrative that is interspersed with quotations from key informants and other supporting evidence”. In those
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papers where the data is from the single cases, the empirical data, including quotations, is interwined with theories from the literature. Paper 1 and paper 2 are based on single case studies, whereas paper 3 is based on a comparative case study. It is a comparison of the single case studies in paper 1 and paper 2.

During the process of writing the papers, my supervisors Fredrik Tell and Nicolette Lakemond have read early drafts and given valuable feedback and comments on the work-in-progress. Some main issues have been regarding positioning and focusing the content of the papers. Additionally, the papers have been presented at MEKA, an internal research group at business administration at Linköping University. There, feedback and comments from senior and junior colleagues have been received.

An overview of the papers is given in table 3-10. Fredrik Tell co-authored paper 1 and participated at the beginning of the data collection for case 1. This paper was presented at the DRUID winter conference 2011 under the title “Balancing flexibility and integration?” Supplier selection under technological uncertainty in collaborative NPD projects. Valuable feedback from both senior and junior discussants was received. The paper was consequently modified and worked through and then submitted to a journal.

I wrote the second paper, and this was submitted to the NOFOMA conference 2011. In the submission process, comments from two anonymous reviewers helped to improve the paper before final submission. Thereafter, the paper was presented at the conference where questions and additional perspectives were raised. This paper is a working paper that will be further developed before it is submitted to a journal.

Paper 3 was accepted for the R&D Management conference 2011 where it was presented and commented by a discussant. Additional work was thereafter done. Additionally, a revised version of this paper was sent to the Continuous Innovation Network (CINet) conference 2011 where the extended abstract was double blind reviewed by two reviewers. Comments and recommendations on how to further develop the paper were received, especially concerned to the research question and chosen methodology. The full paper was thereafter accepted for presentation and for publication in the proceedings. The version of paper 3 in this thesis is developed after comments received at the conference presentations. Nicolette Lakemond is co-author in this paper.
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Table 3-10 Overview of the papers

<table>
<thead>
<tr>
<th></th>
<th>Paper 1</th>
<th>Paper 2</th>
<th>Paper 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empirical data</td>
<td>ABB (1)</td>
<td>ABB (2) and SKF</td>
<td>ABB (1), ABB (2) and SKF</td>
</tr>
<tr>
<td>Co-authors</td>
<td>Fredrik Tell</td>
<td>-</td>
<td>Nicolette Lakemond</td>
</tr>
<tr>
<td>Presented at</td>
<td>DRUID winter conference 2011</td>
<td>NOFOMA conference 2011</td>
<td>R&amp;D Management conference 2011(∗)</td>
</tr>
<tr>
<td>conference</td>
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<td></td>
<td>CINet conference 2011(∗)</td>
</tr>
<tr>
<td>Paper title at</td>
<td>“Balancing flexibility and integration?”</td>
<td>Supplier Involvement in New Product Development</td>
<td>Purchasing in NPD</td>
</tr>
<tr>
<td>conference</td>
<td>Supplier selection under technological uncertainty in collaborative NPD projects</td>
<td>A model of the supplier assessment-selection-integration process</td>
<td>Exploring the Degree of Involvement(∗)</td>
</tr>
<tr>
<td>Status</td>
<td>Under review</td>
<td>Working paper</td>
<td>Purchasing in NPD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Comparing the Degree of Involvement(∗)</td>
</tr>
</tbody>
</table>

In addition, a part of the compiled summary has been presented at a PhD workshop. Chapter 3, the methodology chapter, was presented at the R&D Management conference 2011. The chapter was reviewed by a junior and by a senior discussant who made valuable comments regarding the presentation of the methodology and how the choice of methodology could be strengthened.
4 Summary of the papers

This chapter summarizes the papers presented in the second part of the thesis. As previously mentioned, this thesis is based on three papers that are related in different ways to the aim of the study. Table 4-1 gives an overview of the papers and their link to the research questions. To repeat, the research questions in this study are:

1) What are the criteria that firms consider when assessing and selecting suppliers for collaborative NPD projects?
2) What is the role of Purchasing in collaborative NPD projects?

<table>
<thead>
<tr>
<th>Paper</th>
<th>Methodology</th>
<th>Focus</th>
<th>Link to research question (RQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single case study</td>
<td>Uncertainty in supplier collaboration</td>
<td>RQ1</td>
</tr>
<tr>
<td>2</td>
<td>Single case study</td>
<td>Criteria that influence the process of supplier assessment-selection-integration</td>
<td>RQ1</td>
</tr>
<tr>
<td>3</td>
<td>Comparative case study</td>
<td>Purchasing’s role in NPD</td>
<td>RQ2</td>
</tr>
</tbody>
</table>

4.1 Paper 1

The first paper focuses on the selection phase of the NPD project in cases of uncertainty, and on the selection of technology and supplier in the NPD projects. The paper is based on a single-case study of an NPD project, and a collaborative R&D project is described and analysed. In the case studied, the aim was to develop an energy storage unit for integration in advanced power grid applications. There was uncertainty in the project and this could be divided into technological and strategic uncertainty. In this case study, the selection phase was particularly interesting because the firm first chose a technology that was owned by one single supplier and therefore, there was no supplier selection. Several years later however, the firm had to change supplier and consequently
Summary

had to change technology. In the second selection process, there was both a technology selection and a supplier selection.

In this paper, it is demonstrated that uncertainty can be divided into technological and strategic uncertainties. Furthermore, the way in which a firm handles these different types of uncertainties in an NPD project is described. The findings suggest that buying firms may seek flexibility in supplier selection in circumstances with technological and strategic uncertainty. Technological uncertainty may cause the firm to seek flexibility to allow a rapid change of technology. Strategic uncertainty may also result in the firm seeking flexibility due to competition, spillovers and cost factors. The study also shows the importance of buyer-supplier compatibility and strategic fit.

4.2 Paper 2

Paper 2 investigates the supplier assessment-selection-integration process in NPD. This paper is based on a single case study in which both the buying and supplying firm participated. The aim of this NPD was to create a standardized assortment of hybrid bearings for a range of traction motors. Thus, the project involved both introducing a new technology and limiting the number of bearings. In the study, the views of the buying firm and of the supplying firm are taken into account.

The paper describes how the assessment-selection-integration process was conducted in this project. Furthermore, it investigates how different criteria and mechanisms are related to the process. While most studies focus on one part of this process, this one provides an overview of the entire process and shows how the different parts of the process are inter-related. From the case, a model is developed which demonstrates how the processes of supplier involvement are related and affect each other. Additionally, the model classifies a number of elements that are important in the different stages of the supplier assessment-selection-integration process.

4.3 Paper 3

The purpose of paper 3 is to explore purchasing's role in technology selection, supplier selection and regular participation in NPD projects involving technology suppliers. Three NPD projects at one large high-tech firm in collaboration with three different suppliers are studied. This paper shows that Purchasing had
Summary

limited influence on the firm’s technology selections. This is in contrast to some findings in the literature, which describe how Purchasing affects the firm’s technology selection in product development. In accordance with existing literature, this paper shows that Purchasing has an important role in the supplier selection, and contributes by evaluating the supplier and its products.

The main finding that this paper identifies is that Purchasing can have a role as a trouble-shooter in collaborative NPD projects. Other research has shown that Purchasing can solve operational problems and routing issues. However, in the role of trouble-shooter, Purchasing solves large problems that otherwise might have led to a project standstill. Examples of problems that a trouble-shooter can solve include problems related to the supplier’s strategy, the relationship with the supplier and commitment. A trouble-shooter is not necessarily a project member, but can be summoned to solve the problems that have emerged with the supplier.
Discussion and conclusions

5 Discussion and conclusions

In this chapter, responses to the research questions raised in chapter one are discussed and some concluding remarks including methodological reflections, theoretical and practical implications are provided. The chapter ends with a brief discussion about future research. Papers 1 and 2 relates to RQ1 while paper 3 primarily deals with RQ2. A systematic map of criteria to consider is presented in this chapter as well.

5.1 RQ1: What are the criteria that firms consider when assessing and selecting suppliers?

There have been a number of previous studies that identify criteria for supplier assessment (see Spekman 1988; Handfield et al. 1999; Petersen et al. 2003). However, this research contributes to the field by providing an additional study where supplier assessment is viewed from the perspective of both the buying firm and the supplying firm. Furthermore, supplier assessment criteria are divided into three areas. In paper two, basic criteria, product criteria and firm criteria are identified. These are presented in table 5-1. The basic criteria are what the firm considers to be the minimum number of criteria met for a firm to be considered as a future collaborator in NPD. The product criteria are those that evaluate the technology or product of that the supplying firm and these have been identified in several previous studies (see Handfield et al. 1999; Petersen et al. 2003; Zsidisin et al. 2004). The firm criterion includes a number of criteria that assess the supplier according to its management and organisation.

Some of the criteria in table 5-1 are well known and have been discussed previously in the literature. However, the classification of the criteria into basic, product and firm criteria is unique, and provides an overview of three areas in which firms should evaluate potential suppliers. This is the classification used in paper 2 and it supports the argument that firms should assess suppliers on a number of aspects. Firstly, the basic criteria ensure that the supplying firm fulfils the minimum criteria for collaboration partners. Secondly, the product criteria evaluate the product and the firms’ technical expertise within the chosen...
Discussion and conclusions

technology. Thirdly, the supplying firms’ characteristics are assessed. Hence, this framework ensures that the supplying firms are assessed within three areas; basic, product and firm. The criteria in table 5-1 have also been grouped into product and production factors, firm characteristics and relational criteria, which is the classification used in the framework in chapter two. These criteria are included in the developed process model in figure 5-1.

<table>
<thead>
<tr>
<th>Table 5-1 Criteria for supplier assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic criteria</strong></td>
</tr>
<tr>
<td>Product and Production factors</td>
</tr>
<tr>
<td>Firm characteristics</td>
</tr>
<tr>
<td>Relational criteria</td>
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<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

In this study, generally the assessment criteria are viewed as objective data that it is possible for the buying firm to gather and rate. This can be called “hard” data and is easier to quantify than “soft” data. In contrast, selection criteria are viewed as softer data that could be more difficult to quantify. These criteria are evaluated and judged by individuals at the buying firm. Soft data will also require more effort and knowledge from the individuals at the buying firm who compile the data to present to the firm. However, there are criteria that have characteristics that are both hard and soft. Hence, the assessment criteria are not pure hard data and the selection criteria not pure soft data.

In the literature, there are a number of studies that test which selection criteria firms use and which criteria are important (see Choi and Hartley 1996; Verma and Pullman 1998; Vonderembse and Tracey 1999; Kannan and Tan 2002). Ho et al. (2010) show that the most common criteria among firms in the literature are quality, delivery and cost. This research contributes by providing two additional studies that discuss supplier selection. In paper 1, uncertainties that firms need to consider when selecting a supplier with whom to collaborate is discussed. These uncertainties can be divided into technological and strategic uncertainty and are presented in table 5-2. The technological uncertainties are
Discussion and conclusions

present both within the selected technology and in the competing technologies. Thus, uncertainty concerns the development of the selected technology and whether there is a risk of a new technology becoming more suitable in the future. Hence, technological uncertainty is related to the development of technologies and not directly related to the supplier. Strategic uncertainty on the other hand, has some elements that are related to the supplier’s characteristics. The strategic uncertainties identified are: fit, support from management, future strategy, skills and competence, risks of spillover/leakage and possible future competition. These uncertainties can be viewed as criteria to be implemented in the supplier selection in order to evaluate aspects of uncertainty, regarding both the technology and the supplying firm. The criteria in table 5-2 are grouped into product and production factors, firm characteristics and relational criteria. This classification is used in in the developed process model in figure 5-1.

Table 5-2 Identified uncertainty criteria

<table>
<thead>
<tr>
<th>Product and production factors</th>
<th>Technological uncertainty</th>
<th>Strategic uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product performance</td>
<td>Necessary skills and technological competence</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>Spillover/leakage</td>
<td>Management support</td>
</tr>
<tr>
<td>Rate of change</td>
<td></td>
<td>Future strategy</td>
</tr>
<tr>
<td>Firm characteristics</td>
<td></td>
<td>Competition</td>
</tr>
<tr>
<td>Relational criteria</td>
<td></td>
<td>Company “fit”</td>
</tr>
</tbody>
</table>

In paper 2, criteria used by firms to select a supplier are identified and classified into technological, business and relation specific criteria. Additionally, criteria for the supplier to join the NPD project are discussed. Technological criteria relate to the supplying firm’s technology and technical knowledge. Similar criteria were identified by Zsidisin and Smith (2005) and called technological capabilities. The business criteria evaluate the potential of the business set-up and the fit of the two firms. Three of the four criteria, business potential, no exclusivity and market interest, can be seen as unique to the project studied and could be less important in other projects. In other projects, exclusivity could be instead a criterion for the firms to collaborate rather than a reason for not collaborating as it was here. Strategic fit, on the other hand, which has been discussed in the literature (see Ellram 1990; Bronder and Pritzl 1992) is relevant in most NPD projects and not specific to this studied project. Finally, relation-
specific criteria include organisational criteria and other soft criteria. Similar criteria have been identified previously in the literature (see Ellram 1990; Croom 2001; Zsidisin and Smith 2005).

The classification presented in table 5-3 illustrates an overview of criteria that are important to firms when they select suppliers with whom to collaborate in NPD. This classification into technological, business and relation-specific criteria can facilitate the supplier selection. By providing a framework of supplier selection criteria, firms can more easily ensure that criteria that are related to the technology, business and relation are taken into consideration. The criteria in table 5-3 are grouped into product and production factors, firm characteristics and relational criteria, which can be found in the developed process model in figure 5-1.

<table>
<thead>
<tr>
<th>Table 5-3 Supplier selection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technological criteria</strong></td>
</tr>
<tr>
<td>Product and production factors</td>
</tr>
<tr>
<td>Firm characteristics</td>
</tr>
<tr>
<td>Innovative reputation</td>
</tr>
<tr>
<td>No exclusivity</td>
</tr>
<tr>
<td>Good strategic fit</td>
</tr>
</tbody>
</table>

The criteria discussed in this section have been added to the process model presented in chapter two and are shown in figure 5-1. The model has been extended to include criteria that were identified in paper 1 and paper 2. The classification is made according to the product and production factors, firm characteristics and relational criteria that were presented in tables 5-1, 5-2 and 5-3. Criteria that were present in the previous model (figure 2-2) in chapter 2
Discussion and conclusions

and which were verified in this study are marked with a * (asterisk) while criteria that did not exist previously in the model but have been identified in this study are marked with a ** (two asterisks) in figure 5-1. Hence, the answer to RQ1 contributes by confirming criteria already identified in the literature and by adding further criteria to the model.

Several of the criteria used in supplier assessment and supplier selection are the same or very similar. This could be due to the fact that supplier assessment and supplier selection are closely related. As Spekman points out (1988), the assessment consists of evaluating current suppliers and new suppliers according to a set of criteria. From this assessment, a smaller number of potential suppliers are further analysed in order for the firm to select the most suitable. Some criteria are relevant in both phases, such as the cost, quality and performance of the product. These criteria are important both in the first assessment of potential suppliers and in the final selection of supplier.

In this study, several criteria from the literature were validated. Four types of criteria related to the product or to production were noticed. Surprisingly, only two of the three most common criteria from the review made by Ho et al. (2010) were found: quality and cost. However, the third criterion stated by Ho et al. (2010), namely delivery, was not found. This could be due to the fact that in the NPD projects studied, delivery was not an issue since the focus was on developing the products and not on producing them. The third type that was validated in the assessment was technical expertise (Petersen et al. 2003) and in the selection phase, technological capabilities (Zsidisin and Smith 2005). These two criteria are very similar in character and can be viewed as interchangeable. The final type, product performance (see Handfield et al. 1999; Vonderembse and Tracey 1999) was validated. However, criteria related to production and its possibilities to adapt to the buying firm’s needs were not found. This was probably due to the fact that the buying firm did not focus on how the product was to be produced but instead, on developing a good product at a suitable price.

In the second classification, firm characteristics, commitment from the supplier (see Spekman 1988; Petersen et al. 2003) was validated. The final classification, relational criteria, validates fit and trust (Ellram 1990). It is likely that other criteria in the groups firm characteristics and relational criteria were not validated either due to the character of the projects or to the design of the study. The focus of the projects was on the technology rather than on the supplying firm and hence the lack of criteria that evaluate the supplying firm and its character-
Discussion and conclusions

ics. With regard to the design of the study, it was the NPD projects and the actual selection process in those projects that were studied. Had a more general approach been taken at the buying firm that investigated the selection of suppliers for NPD in general instead, the result would probably include a larger amount of criteria that were used. The criteria in this study are specific for each NPD project and other projects could include more or fewer criteria, or different criteria.

In this study, criteria that were not found in the literature presented in the thesis were identified. In the assessment phase, four such criteria belonging to the classification firm characteristics were identified. The first is stability and profitability, and a similar criterion: economic performance and stability was identified in the selection phase by Ellram (1990). The second criterion is general competence, which includes organisational, development and market competence. Hence, this criterion can be viewed as one that includes several other individual criteria. These two criteria mentioned are thus not entirely new to the literature. However, the third criterion is. Genuine interest in the project assesses the suppliers’ interest in joining a collaborative NPD. The forth criterion is suitable organisation, which assesses the supplying firms’ organisation and tries to evaluate whether that organisation is suitable for the buying firm and its NPD project.

In the selection phase, criteria belonging to each classification were identified. In the product and production factors, three criteria were identified: rate of technological change, spillover/leakage and technical skills. It could be useful for firms to consider the rate of technological change and the supplier's technical skills. For example, if there are emerging new technologies that are more appropriate, the buying firm may want to change technology. With a technically skilled supplier, it could be possible to continue the collaboration and develop the product using the new technology. The issue of spillover or leakage takes into consideration the fact that the supplier could gain information or knowledge from the buying firm that the buying firm does not wish to share.

Seven criteria have been identified belonging to firm characteristics: management support, future strategy, likelihood of becoming a competitor, innovative reputation, business potential, no exclusivity and market interest. A similar criterion to management support can be found in the assessment of suppliers in the study by Petersen et al. (2003), namely supplier’s top management commitment. By evaluating the future strategy of the supplier, it is possible to see
Discussion and conclusions

what the supplier has planned for future investments for instance. The previous criterion is closely related to market interest, whether the supplier has an interest in the market and a willingness to explore the market. The anterior criterion is in turn related to the business potential. An additional criterion is the supplier’s reputation of being innovative, which evaluates the supplier’s previous NPD. In some projects, it may be relevant to evaluate the likelihood of the supplier becoming a competitor in the future; this could limit the possibilities for open communication and collaboration. In contrast, other projects may want no exclusivity and prefer the supplier to promote the technology or component developed to other firms in order to enable lower costs through economies of scale, or the firm could want the new technology to become accepted on the market and perhaps even become a new standard.

The final classification, relational criteria has three new criteria: believing in the project, learning possibilities and open to discussion. Collaborating with a supplier that believes in the project, could make it easier to access the supplier’s resources and gain their commitment. A firm could also consider the possibilities of learning from the supplier. A final criterion is to evaluate how open the supplier is to discussion; by being open, the supplier could be prepared to ask about the buying firm’s ideas and suggestions. A discussion could lead to a more suitable solution to possible problems that may arise.
### Supplier Assessment

**Product and Production factors**
- Cost *
- Quality *
- Product performance
- Timing
- Ramp-up possibilities
- Ability to hit targets
- Innovation, technical competence and expertise *

**Firm characteristics**
- Senior management’s support, culture, mind-set and strategic orientation
- Supplier commitment and its top management commitment *
- Supplier willingness and ability to share information
- Supplier growth potential
- Win-win attitude
- Future planning
- Business knowledge
- Training of personnel
- Technical support
- Stability and profitability **
- General competence **
- Genuine interest **
- Suitable organisation **

**Relational criteria**
- Supplier’s view of partnership
- Trust
- Openness

---

### Supplier Selection

**Product and Production factors**
- Quality
- Cost *
- Delivery and reliability
- Product performance *
- Production capabilities
- Design capabilities
- Technological capabilities *
- Speed in development
- Rate of technological change **
- Spillover/leakage **
- Technical skills **

**Firm characteristics**
- Desired goals/objectives
- Economic performance and stability
- Management attitude
- Top management compatibility
- Compatibility across levels and functions
- Organisational structure and personnel
- Safety record
- Business references and customer base
- Management support **
- Future strategy **
- Likelihood of becoming a competitor **
- Innovative reputation **
- Business potential **
- No exclusivity **
- Market interest **

**Relational criteria**
- Familiarity and past experience
- Empathy
- Ability to adapt
- Philosophies
- Fit *
- Trust *
- Believing in the project **
- Learning possibilities **
- Open to discussions **

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Figure 5.1 Developed process model (*validated criterion, ** identified criterion in this study)
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5.2 RQ 2: What is the role of Purchasing in collaborative NPD projects?

It is argued in the literature that it is beneficial for firms to include Purchasing in the NPD process (see McGinnis and Vallopra 1999; Tracey 2004). In fact, recent studies have shown that Purchasing has a dual role in NPD: supporting the innovation process and being responsible for cost and integration (Schiele 2010). However, for Purchasing to be able to manage these responsibilities, its organisation may have to evolve. In addition, the way Purchasing is organised has been identified as an enabling criteria to facilitate its involvement in NPD (Lakemond et al. 2001). In this study, the participation and role of Purchasing varied among the three NPD projects, and this is illustrated in table 5-4.

Table 5-4 Variation of Purchasing’s role in the NPD projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Technology selection</th>
<th>Supplier selection</th>
<th>Team member</th>
<th>Role in project</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHA</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Trouble-shooter</td>
</tr>
<tr>
<td>BETA</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Trouble-shooter</td>
</tr>
<tr>
<td>GAMMA</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Team member</td>
</tr>
</tbody>
</table>

In the three projects included in paper 3, the chronological order of the projects consisted of first a selection of the technology and thereafter the selection of a suitable supplier. The suppliers available depend on the technology that is selected. In the projects studied, which were of both a radical and an incremental nature, Purchasing was not involved in the technology selection. In one project, the firm was locked into one particular technology (Handfield et al. 1999) due to the technology selection and only one supplier provided the technology selected. Therefore, by selecting a technology, the firm automatically selected the supplier as well.

Similarly to what is reported in the literature (see McGinnis and Vallopra 1999; Schiele 2006), two of the projects studied included Purchasing in the supplier selection. However, one project did not involve Purchasing in the supplier selection, due to the fact that the selected technology only had one supplier. In the supplier selection, Purchasing provided information about the different suppliers’ products, as shown in other studies (see Wynstra et al. 2003), and the suppliers’ organisation and NPD experience. However, Purchasing was not the
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main source of information about the different suppliers’ technology. Instead, the technologies were mainly evaluated by the R&D department of the firm.

Purchasing can have a number of roles in NPD, one role discussed in the literature concerns supporting and facilitating the innovation process (Knight and Harland 2005; Schiele 2010). In the projects studied, part of the work of Purchasing was similar. Indeed, Purchasing did support the project by participating in the supplier selection and solving issues that emerged during the projects. In the project where Purchasing was a project member, they supported the NPD consistently. However, in two of the projects Purchasing was only supportive when the NPD team contacted them to solve a particular issue.

In addition, Purchasing’s role can also cover being active both within the firm and outside the firm as an innovation facilitator (Knight and Harland 2005). In the cases studied, Purchasing was active both within and outside the firm. However, Purchasing did not respond to requests from suppliers as is suggested by Knight and Harland (2005), but instead could only respond to problems when approached by the firm’s NPD team.

A problem-solving role has been identified in the literature, that of a facilitator (Wu et al. 2010 pp. 820) which “portrays the supply manager as being in the middle between the buyer and supplier” and solves problems that occur in the daily operations. Yet another, similar, role portrays Purchasing as an advisor (Knight and Harland 2005 pp. 287), where advisors can be viewed as being “called upon to provide formal and informal advice” and in some cases, working as a supply expert. These problem-solving roles discussed above describe Purchasing as facilitating, advising and solving minor problems that occur in daily operations in NPD projects. This thesis suggests that the role of Purchasing can be expanded to yet another role, the trouble-shooter. The role of a trouble-shooting Purchasing implies that Purchasing is an expert that solves larger problems.

This study suggests that in contrast to role as facilitator (Wu et al. 2010) and the role as advisor (Knight and Harland 2005) a trouble-shooter solves problems in the NPD that have a large impact on the project. In two of the projects, the trouble-shooter was contacted when the projects were at a standstill due to problems related to the supplier. The problems that the trouble-shooter solved evolved around the supplier’s strategy, the relationship with the supplier and commitment issues to the project. These problems affected the NPD projects to such a large extent that they could not continue before the issues were
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solved. However, to solve these problems, it was not necessary for Purchasing to be present during the entire NPD project. As a trouble-shooter, it can be advantageous to be an outsider to solve the problems that had surfaced. By not being a member of the project team, Purchasing could solve the problems without damaging personal relationships between individuals in the NPD project.

5.3 Contributions of the papers

The three research papers contribute to enhancing our understanding of supplier involvement in NPD. More specifically, paper 1 discusses uncertainties that are present in NPD projects involving suppliers. These uncertainties can be divided into technological and strategic uncertainties. Parts of the strategic uncertainties are related to the supplier and its organisation. Therefore, firms should consider strategic uncertainties in the supplier selection process. Paper 2 continues to investigate the supplier selection process, and this study is expanded to include both the buying firm and the supplying firm. The entire supplier selection process is investigated, and variables for supplier assessment, selection and integration are identified.

Paper 3 discusses the role of Purchasing in NPD by exploring the two cases from papers 1 and 2. It is shown that Purchasing did not contribute to the technology selection. However, Purchasing was involved in the supplier selection, evaluating potential suppliers and selecting suppliers. The main finding in paper 3 was that Purchasing could have a role as a trouble-shooter in NPD projects. A trouble-shooter does not necessarily have to be on the project team, but can be an expert that is brought into the project to solve large problems related to the supplier, the supplier’s strategy or commitment issues.

As demonstrated, all the papers are related and concern aspects of supplier involvement in NPD.

5.4 Methodological choices and reflections

In this study, several choices were made that changed the course of the research. Firstly, the choice to conduct qualitative research and not quantitative limited the study to only a few projects. Had instead a survey been conducted, the study would have included a large number of firms and projects. That would have made it possible to generalize results. Furthermore, a survey would
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have enabled a comparison of many projects, which could have been classified for instance into industry, technology and firm size. Instead however, two in-depth studies were conducted, which enabled an investigation into why and how things occurred (Yin 2009).

Reflecting on the methodological choices, the most appropriate method for this study was chosen. The aim was to identify variables and understand supplier involvement in NPD, and for this, case study is an appropriate method. However, there are drawbacks to the chosen method that a survey would not have. Most evident is the possibility to access results from a large number of firms, thus making it possible to generalize. Nevertheless, this research was focused on studying what was going on at firms and how they operated NPD projects. A survey would not have made it possible to gain the in-depth understanding that resulted from this study.

This thesis can be viewed as an example of how to conduct structured case studies. The methodological chapter gives examples of case selection, data collection and analysis. Moreover, the chapter is a map of the cases and explains clearly what has been done. The ambition is that chapter contributes to our understanding of how to conduct case studies to gain detailed knowledge of what is going on in NPD projects involving external suppliers.

5.5 Theoretical and practical implications

This study contributes theoretically to the field of supply management and NPD management research by adding a study of variables that firms need to consider in supplier selection to NPD projects. It contributes by providing a discussion about different uncertainties that were found at the project studied. Moreover, it focuses on identifying criteria that were important in the supplier selection process in that NPD project. It adds to our knowledge of criteria that firms use in their supplier selections, something which has been studied previously by using case studies (see Ellram 1990; Handfield et al. 1999; Zsidisin and Smith 2005). Additionally, reasons for the supplying firm to join the NPD project were identified. Furthermore, our understanding of how firms conduct supplier selection to NPD collaborations is enhanced. This thesis also adds support to the discussion that Purchasing has an important role in NPD (see McGinnis and Vallopra 1999; Rozemeijer et al. 2003; Tracey 2004). The discussion by Schiele (2010) that Purchasing has two roles in NPD projects is further developed here.
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Practical implications from this thesis include variables that firms need to consider when selecting a supplier for NPD. These variables evaluate suppliers according to the different parameters of product, management and organisation. This thesis provides in-depth studies of how firms assess and select suppliers. It demonstrates that Purchasing is becoming more relevant in NPD and it is considered a strategic asset in many firms. Hence, additional practical implications include recommendations that firms should realize that Purchasing could contribute in NPD. This study has identified that Purchasing can have the role as a trouble-shooter in NPD. This does not necessarily lead to that Purchasing has to be a project member. On the contrary, this study has shown that Purchasing can contribute to the NPD project even if it is not a project member.

5.6 Future Research

Further research in this field could include the investigation of additional criteria that firms need to consider when selecting suppliers for collaboration in NPD projects. Since a majority of the studies in this field have been conducted with a powerful buyer and a less powerful supplier (Johnsen 2009), further research could include a powerful buyer with an equally powerful supplier. This thesis has partly investigated collaboration between equally powerful firms, but there are more aspects that need attention. This research could focus on the supplier and its reasons for entering collaboration with the buying firm. Challenging questions could be which criteria that the suppliers use for joining a NPD project. In the next step, these criteria could be compared to the buying firms’ criteria. Differences and similarities could be investigated. Additionally, it would be interesting to study projects where the supplier has the potential to become a future competitor in order to understand firms’ strategic considerations in such collaborations.

The results from this study could be tested in the future by conducting a survey. In such a study, the criteria for supplier assessment, selection and integration could be tested to see if other firms also use these criteria. In a first step, the survey could be to gather descriptive data in which the firms say whether they use the criteria or not. This would provide an overview of how common these criteria are to firms. Another suggestion could be that the criteria presented in papers 1 and 2 could be used as alternatives in a survey question, such as “In supplier assessments do you consider...” or a similar question where the identified criteria would be alternative answers for the firm to answer yes or no.
Discussion and conclusions

In a second step, the results from the descriptive data could be used. For example, the criteria that are shown to be applied in firms could be tested by asking firms to consider on a scale of one to five how important they consider them to be. This would provide an importance ranking. In addition, from such a survey it could be possible to investigate whether there are differences in how small versus small firms reason with regards to criteria in supplier selection. In addition, differences or similarities between industry, turnover or kind of new technology that was implemented could be studied.

An additional idea for the survey is related to research question two. Firm could be asked whether they include Purchasing in their supplier selection in NPD. This would provide descriptive data of how many firms and which kinds of firms include Purchasing in the process. A second question could be the role of Purchasing in NPD where the alternatives could be related to the roles discussed in paper 3. This could provide information about of how common it is for Purchasing to actually have the role of trouble-shooter. Moreover, results from such a survey could provide information about the areas that need to be further investigated.

The discussion above should not be viewed as the plan for how my research will continue after this licentiate thesis but rather as a suggestion for future goals.

* A goal is not always meant to be reached, it often serves simply as something to aim at.  
  *(Bruce Lee)*
References


