

UNIVERSITY OF TWENTE.



Faculty of Behavioural, Management and Social Sciences
Department of Technology Management and Supply
University of Twente
LUT Business School
Business Administration
Lappeenranta–Lahti University of Technology LUT

Double degree Master Thesis

Master of Science (M.Sc.) Business Administration
Purchasing & Supply Management

The practices of purchasing involvement in radical innovation projects

Submitted by: Mats Tavenier
S1865617 / 000680352

1st Supervisor: Dr. Frederik Vos
2nd Supervisor: Prof. dr. Holger Schiele
3rd Supervisor (LUT): Prof. Katrina Lintukangas
Practical Supervisor: Jeroen Arentsen MSc (Supply Value)

Number of pages: 87
Number of words: 27.845

Utrecht, 16th October 2023

Acknowledgements

This thesis represents the final part of my Master's double degree in Business Administration with a specialization in Purchasing & Supply Management at the University of Twente and Lappeenranta University of Technology.

I would like to thank everybody who supported me during this process, but there are a few persons I would like to thank in particular. First of all, I would like to thank my first supervisor Frederik Vos for his pleasant and elaborate guidance throughout this process. Our meetings were very useful and it was always interesting to find out if you called in from Europe, Asia or the US. Secondly, I would like to thank my second supervisor Holger Schiele for his constructive feedback which brought this thesis to a higher level. Thirdly, I would like to thank my supervisor from LUT Katrina Lintukangas for her feedback and smooth communication, which made it possible for me to finish both Master's degrees with this one thesis.

Furthermore, I would like to thank my practical supervisor Jeroen Arentsen for the regular meetings, brainstorm sessions and overall guidance during this project. I hope this thesis will also help you further towards obtaining your PhD. Moreover, I would like to thank all colleagues at Supply Value that contributed to this thesis.

Additionally, I would like to thank all the respondents from the different organizations that were willing to spend time and energy in the interviews. I thoroughly enjoyed every interview, which taught me a lot and gave an unique insight into each one of your (purchasing) organizations. Without you I would have not been able to finish my thesis.

Lastly, I would like to thank my friends and family, especially my parents, for always supporting me and making this academic journey possible.

Mats Tavenier

Abstract

This research aims to explore the purchasing practices in radical innovation projects in the manufacturing industry. Since these practices are relatively unknown, the research calls for an explorative nature. Consequently, 15 semi-structured interviews with purchasers involved in innovation projects in 15 different Dutch and Swedish manufacturing companies were performed. They were asked about their role as purchasers in radical innovation projects with suppliers. The Resource Orchestration Theory (ROT) was used to explain the role of purchasing and a five-stage structure was applied to the innovation projects to give insights into the different purchasing practices per phase.

The findings indicate that purchasing involvement in radical innovation projects exists out of two different types of practices: innovation enhancing and traditional. Earlier found ROT purchasing practices like Resource Portfolio Updating, Market Scanning and Resource Integration were confirmed. New additional innovation enhancing practices like Partnerships and Good Fit With Supplier were found. Additionally, traditional practices like Cost Controlling, Supplier Choice and establishing Contracts were found. Furthermore, the purchasing practices performed during radical innovation projects change from innovation enhancing to traditional.

Additionally, the purchasing practices found in this research help purchasing professionals in understanding the complete role of purchasers in radical innovation projects with both innovation enhancing and traditional practices, which can be used for function descriptions of project buyer and examples of best practices. Future research could test the purchasing practices quantitatively over a bigger group of respondents and could investigate the barriers withholding other departments of involving purchasing in innovation projects.

Table of Contents

1	Introduction: Purchasing involvement is becoming more important, yet there is no clear overview of the purchasing practices in radical innovation projects	1
2	Theory: Radical product innovation, five-stage project structure and Resource Orchestration Theory	6
2.1	Radical product innovation has different characteristics than other innovation	6
2.2	Innovation projects can be divided into five stages	8
2.3	The changing role of purchasing and its involvement in innovation projects.....	10
2.3.1	The origin of Purchasing involvement.....	10
2.3.2	The evolution of purchasing involvement	12
2.3.3	Internal and external contingency factors of purchasing involvement	16
2.4	Adding a theoretical perspective by considering different theories and explain the Resource Orchestration Theory choice	20
2.4.1	Considering different theoretical perspective to explain purchasing involvement in radical innovation projects	20
2.4.2	The Resource Orchestration Theory explains the role of managers in orchestrating resources for competitive advantage	22
2.5	Resource Orchestration Theory in a purchasing innovation context.....	24
2.6	Research model: Building on the Resource Orchestration Theory by adding a project stage and radical innovation perspective	27
3	Methodology: Performing semi-structured interviews with purchasers involved in innovation projects	29
3.1	Research design: Qualitative, explorative semi-structured interviews.....	29
3.2	Data sampling: Interviews with purchasers involved in radical innovation projects in the manufacturing industry	31
3.3	Semi-structured interview guide: Divided into four sections.....	33
3.4	Data analysis: Analysing the data in a structured way	34
4	Results: Empirical data on the purchasing practices in radical innovation projects	37
4.1	Purchasing involvement activities can be grouped into innovation enhancing and traditional activities.....	37
4.2	Structuring, bundling and leveraging activities.....	38
4.2.1	Structuring: Resource portfolio Updating, Interface Development and Market Scanning.....	38
4.2.2	Bundling: Resource Integration and Resource Re-configuration, Internal Alignment and External Coordination	41
4.2.3	Leveraging: Customer Need Capturing	44
4.2.4	Additional innovation enhancing practices: Partnership and Good fit with supplier	45

4.3	Traditional activities: Cost controlling and Contracts	48
4.4	Insights per phase: from innovation enhancing to traditional practices	50
4.5	Additional insights: The diverse role of purchasers, purchasing can have the most impact in the early phases and purchasing needs to be close to engineering.....	53
4.6	Visual representation of the research model and the found themes	55
5	Discussion: The main findings, contributions, limitations and future research directions	57
5.1	Main results: the changing purchasing practices from innovation enhancing to traditional in radical innovation projects	57
5.2	Practical implications: The practices of purchasers in different project stages of innovation projects	58
5.3	Limitations and future research directions: Quantitatively testing results over a bigger group of respondents	59
	References	63
	Appendices	74
	Appendix A. The interview guide	74
	Appendix B. Table with all activities	77
	Appendix C. Table with examples of best practices	78

Index of figures

Figure 1 - Four typologies of innovation	7
Figure 2 - 5 stage radical innovation project structure based on Cooper (1994, p. 5)	8
Figure 3 - Purchasing integration framework (Wynstra et al., 2003, p. 80).....	13
Figure 4 - The three constructs of the Resource Orchestration Theory (Andersén & Ljungkvist, 2021, p. 151)	23
Figure 5 - Phases of Resource Orchestration (Kumar et al., 2022, p. 543).....	24
Figure 6 - Reserach model	28
Figure 7 - 5 stage radical innovation project structure based on Cooper (1994, p. 5)	34
Figure 8 – The updated research model based on the results.....	37
Figure 9 – Visual representation of the results.....	56

Index of tables

Table 1 - Number of published articles on purchasing and innovation over time (Johnsen et al., 2022, p. 3)	14
Table 2 - Internal contingency factors of purchasing involvement.....	17
Table 3 - External contingency factors of purchasing involvement.....	19
Table 4 - Resource Orchestration Practises in a purchasing innovation context	26
Table 5 - Research sample with participant and company characteristics	32
Table 6 - Cross-comparison between the structuring activities and respondents.....	38
Table 7 - Structuring activities per project phase.....	41
Table 8 - Cross-comparison between the bundling activities and respondents.....	42
Table 9 - Bundling activities per project phase	43
Table 10 - Cross-comparison between the leveraging activities and respondents	44
Table 11 - Leveraging activities per project phase.....	45
Table 12 - Cross-comparison between the additional innovation enhancing practices and respondents.....	45
Table 13 - Cross-comparison between the traditional activities and respondents	49
Table 14 - Innovation and traditional activities per project phase	51
Table 15 - All activities per phase	52

List of abbreviations

e.g.	For example
PSM	Purchasing & Supply Management
ROT	Resource Orchestration Theory
R&D	Research & Development
KBV	Knowledge Based View
RBV	Resource Based View
DC	Dynamic Capabilities
TCE	Transaction Cost Economics

1 Introduction: Purchasing involvement is becoming more important, yet there is no clear overview of the purchasing practices in radical innovation projects

The recognition of the criticality of purchasing and its strategic role in the growing importance of supply chain management has evolved the purchasing function from a plain buying function into a strategic one over the last few years (Brandon-Jones & Knoppen, 2018, p. 446; Chen et al., 2004, p. 505; Paulraj et al., 2006, p. 107). The interest in the issues of supplier involvement in product development and the role of purchasing in these projects has started to increase since the early 1990s (Wynstra et al., 1999, p. 130). Supplier involvement is established in the organisation of development projects for new Japanese automotives, where for example the concepts of Lean Management and supplier development were raised as well (Johnsen, 2009, p. 188; Martínez-Jurado & Moyano-Fuentes, 2014, p. 138). According to Schiele et al. (2021, p. 6), the involvement of purchasers is a precondition for enabling the involvement of suppliers in product development. The purchasing involvement in product development leads to activities focused on two categories: optimising costs and generating innovations. This dual role has been identified in the literature by multiple scholars (e.g. Constant et al., 2020; Schiele, 2006, 2010).

Purchasing has a key role in innovating with and from external partners since purchasing is the external interface and process owner with suppliers (Luzzini et al., 2015, p. 110; Turkulainen & Swink, 2017, p. 53). Only a few companies manage their innovation projects on their own, with up to 65% of innovations being sourced from external partners like suppliers (Johnsen et al., 2022, p. 1). Tapping from supplier innovations is particularly important in product development and suppliers are therefore critical external sources of innovation (Wagner, 2012, p. 39). Research into purchasing involvement in product development projects goes back decades (Wynstra et al., 2000; Wynstra et al., 1999), but “the need for purchasing to play an active role in innovation is more recent” (Johnsen et al., 2022, p. 2).

The competitiveness of firms is heavily influenced by innovation capabilities and the successful implementation of product development projects (Wagner, 2012, p. 37). Especially the shorter time-to-market demands and the vast technical knowledge required to develop new products make firms rely more on suppliers during product development

projects (Azadegan, 2011; Koufteros et al., 2010; Wagner, 2012, p. 37). Furthermore, the shorter lead times and an increasing amount of new product introductions are the results of the rising rate of technological change in the current volatile business environment (Burt & Soukup, 1985, p. 93). Manufacturers are increasingly more dependent on their suppliers for the development and innovation of their products because they have subcontracted large parts of their production (Wynstra et al., 1999, pp. 129-130). Firms with a focus on industry in the Netherlands are spending most on R&D since the products in the industry are more technical than in other sectors (Goedhart & van Roekel, 2022, p. 109). Combining these findings with the observation that purchasing has a key role in innovating makes the manufacturing industry an interesting context for research into purchasing involvement. Furthermore, Narasimhan and Das (2001, p. 593) state that the strategic importance of purchasing and purchasing integration have a clear impact on a manufacturing firm's performance. To summarise, the purchasing involvement in innovative product development projects in the manufacturing industry is an interesting topic, but the theoretical perspectives of product innovation project stages and Resource Orchestration Theory can further deepen and understand the subject.

Product innovation projects can be divided into five stages: idea generation, business/technical assessment, product/process concept development, testing and validation and lastly production and launching (Cooper, 1994, p. 5; Picaud-Bello et al., 2022, p. 153). Different stages require different knowledge, actions, activities and practices of the managers involved (Jespersen, 2012, p. 257), so the practices of the involved actors might change during the project as well.

To understand the complex issue of purchasing involvement in radical innovation projects, a theory is needed. The Resource Orchestration Theory (ROT) is chosen because of its potential to cover the holistic view of purchasing practices in innovation projects and how it covers the role of managers in orchestrating resources. The ROT was introduced by Sirmon et al. (2011) based on the two concepts of resource management and asset orchestration. These theories are based on the Resource Based View and Dynamic Capabilities, which are considered to be “grand theories” (Wynstra et al., 2019, p. 10). The ROT exists out of three constructs, which are structuring, bundling and leveraging, and explicitly addresses the role of managers' actions in orchestrating the resources of a firm. The theoretical view extends to the Resource Based View by stating that it is not only what

resources a company possesses, but also how it is used (orchestrated) to reach competitive advantages (Gong et al., 2018, p. 1064).

Several studies already explain the potential benefits of purchasing involvement in innovation projects (e.g. Calvi et al., 2018; Patrucco et al., 2017; Schiele et al., 2021, p. 28) and some studies describe activities that purchasers can undertake to enhance innovation (e.g. Mikkelsen & Johnsen, 2019; Schmelzle & Tate, 2022), but the research field of purchasing involvement in innovation projects is still underdeveloped (e.g. Johnsen et al., 2022, p. 4; Spina et al., 2016, p. 27). Especially the purchasing practices in radical innovation projects are not well described, let alone the shifting type of practices during different project stages. Therefore, the research goal of this study is to define the practices of purchasing in different stages of radical innovation projects with suppliers. The theoretical perspective of the Resource Orchestration Theory (Sirmon et al., 2011) has been used to describe the practices of purchasers before (Schmelzle & Tate, 2022), but this research is new because it focuses on radical innovation projects in the manufacturing industry and explores the changing purchasing role during different stages.

Central research question

What are the practices performed by purchasing in the manufacturing industry in different stages of radical product innovation projects with suppliers from a Resource Orchestration perspective?

To answer this research question, 15 purchasing professionals operating in manufacturing companies in the Netherlands and Sweden are interviewed in a semi-structured, explorative way. The data retrieved from the interviews were analysed and thematically coded inductively.

Three different theoretical contributions result from this research. The first contribution is the description of the purchasing practices in radical innovation projects. Where scholars in the 2000s focused more on purchasing involvement in projects with products or services based on existing technological capabilities (Constant et al., 2020, p. 3; Schiele, 2010; Van Echtelt et al., 2008; Wynstra et al., 2003), a more recent increasing focus has come on the effect of purchasing involvement in radical innovation (Johnsen et al., 2022, pp. 4-5). Furthermore, the research on ROT in a purchasing context focused solely on cases with incremental innovation (Schmelzle & Tate, 2022, p. 12). This research adds to the

understanding of the purchasing involvement in radical innovation projects by confirming practices found in earlier research, but also by providing suggestions for additional practices such as partnerships and good fit with suppliers.

The second theoretical contribution is the description of changing types of practices of purchasing in innovation projects with suppliers. The potential benefits of involving purchasers in innovation projects are well described (e.g. Calvi et al., 2018; Patrucco et al., 2017; Schiele et al., 2021, p. 28), just as the activities and practices that purchasers could perform in such projects (e.g. Mikkelsen & Johnsen, 2019; Schmelzle & Tate, 2022). However, the changing role that purchasers have in different stages of radical innovation projects is not well described. In recent years the focus on separate stages has emerged, such as the involvement of purchasing in the idea-generation stage (Servajean-Hilst & Calvi, 2018), the role as a sparring partner of R&D for technology selection (Mikkelsen & Johnsen, 2019) and the timing of purchasing involvement in NPD (Picaud-Bello et al., 2022) have all been studied before. This last study has researched the purchasing involvement in the first stages of the NPD process (idea generation and business/technical assessment), but no purchasing involvement research considers all the different stages of product development projects and the changing practices of purchasing in the project. This complete overview of the changing role of purchasing helps in understanding the different aspects of purchasing involvement and how they are connected. The results of this research show that the type of purchasing practices evolve from innovation enhancing to traditional during an innovation project.

The final theoretical contribution is the application of the Resource Orchestration Theory (ROT) in the context of purchasing involvement in innovation projects. One research has studied the practices of purchasing from an ROT perspective (Schmelzle & Tate, 2022), but failed to include radical innovation projects and the changing purchasing practices during innovation projects in their research. The ROT is a theory receiving much attention in different research fields (Gong et al., 2018, p. 1064), but this research further explored the potential of the ROT theory in a purchasing context. A theory like the ROT helps in explaining complex issues and gives structure to the results and how they relate to previous research. The theory is validated on a new data set and it resulted in a confirmation of most practices found in earlier ROT research (Schmelzle & Tate, 2022, p. 4). Next to this validation, there are also several innovation enhancing and traditional activities found that could be added to the 'ROT in purchasing' framework.

The practical contribution of this research is a better understanding of the practices of purchasers in different stages of innovation projects with suppliers. Having this insight has multiple advantages. First of all, purchasers can use the results to understand the innovation enhancing practices needed at the beginning of the project and how they evolve into more traditional practices. They can better understand how to contribute to these types of product development projects in a manufacturing or production firm. Purchasers can use the outcomes of this research to reflect on themselves and learn how to improve their role in innovation projects. Furthermore, this research also gives insight in the type of purchaser an organisation needs to effectively make use of purchasing involvement, which is a purchaser that is able to shift from innovation enhancing practices to a traditional role during the course of a project. Lastly, a better understanding of purchasing roles in innovation projects can also help top management in deploying their purchasers in the best way possible to achieve successful innovation projects with external partners like suppliers.

The paper is structured as follows. Chapter 2 is dedicated to a literature review in which a radical innovation project structure, purchasing involvement and the Resource Orchestration Theory are introduced, resulting in a research model. Chapter 3 describes how the method of semi-structured interviews will help answer the research question from a theoretical perspective. In chapter 4 the findings of the interviews are presented about the practices of purchasing in radical innovation projects. Finally, chapter 5 discusses the theoretical contributions, managerial implications, research limitations and areas for future research.

2 Theory: Radical product innovation, five-stage project structure and Resource Orchestration Theory

2.1 Radical product innovation has different characteristics than other innovation

Innovation is a broad concept, with many different typologies. In chapter 2.1, a few of these differentiations are considered, such as radical/incremental innovation and product/process innovation. The focus of this research will be on radical product innovation.

Innovation can be separated into different variations, of which the typology of incremental and radical is often made (e.g. Kobarg et al., 2019; Lennerts et al., 2020; Sumo et al., 2016). Radical innovation can be defined as “a new product that incorporates a substantially different core technology and provides substantially higher customer benefits relative to previous products in the industry” (Chandy & Tellis, 2000, p. 2). Kobarg et al. (2019) states that “Radical innovation is primarily characterized by the newness of the knowledge component” (Kobarg et al., 2019, p. 3). In contrast to radical innovation, “Incremental innovations involve relatively minor changes in technology and provide relatively low incremental customer benefits per dollar” (Chandy & Tellis, 1998, p. 476). Radical innovation is also known as a high degree of technological change (Johnsen et al., 2022, p. 5), technological uncertainty (Melander & Lakemond, 2015; Mikkelsen & Johnsen, 2019), discontinuous (Picaud-Bello et al., 2019) or breakthrough (Cousins et al., 2011). In this paper, the term radical is used.

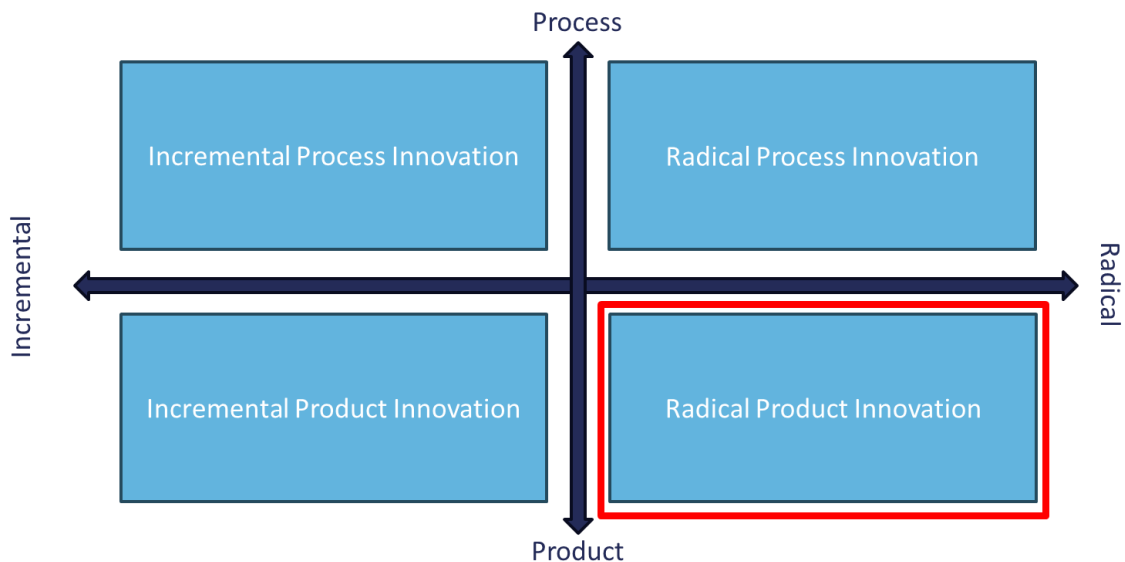
There are several dimensions in which radical innovation differs from incremental innovation. These are the newness and complexity of the embodied knowledge (Dewar & Dutton, 1986; Hill & Rothaermel, 2003, p. 258), the ease of learning (Cohen & Levinthal, 1990; Lane et al., 2006, p. 850) and the different types, size and complementarity of required resources (King et al., 2003, p. 591; Kobarg et al., 2019, p. 3; Rothaermel, 2001, p. 1242; Stieglitz & Heine, 2007). The characteristics of radical innovations have an effect on the needed skills, understanding and processes of the innovation or innovation project (Kobarg et al., 2019, p. 3). These differences between radical and incremental innovations can also have an impact on the different roles taken by actors in innovation projects.

The knowledge needed for radical innovation is more diverse and heterogenic, which means that a lot of this knowledge is found outside firm boundaries (Kobarg et al., 2019, p. 3; Rothaermel et al., 2006; Song & Thieme, 2009, p. 44). The dependence for radical

innovation lies more on external sources like suppliers, which means that the role of purchasing in radical innovation projects can be more critical than in incremental innovation projects. The absorptive capacity of purchasing is needed to integrate these external resources and has been discussed in literature by Picaud-Bello et al. (2022). de Visser et al. (2010) also discusses the differences in radical NPD projects compared to incremental projects by naming examples of radical innovation project activities like “fundamental research, experimenting and prototyping” (de Visser et al., 2010, p. 292).

Another typology that is often made in differentiating between different types of innovation is product and process innovation. Edquist et al. (2001, p. 15) define product innovations as “new – or better – products (or product varieties) being produced and sold; it is a question of what is produced”. On the other hand, “technological process innovations are new goods that are used in the process of production. These goods are what most people think of as investment goods, although they can also be intermediate goods” (Edquist et al., 2001, p. 15). The two typologies of radical/incremental and product/process are shown in Figure 1 with the four different types of innovation that are considered.

Figure 1 - Four typologies of innovation



Note. The focus of this research will be on radical product innovation.

The focus of this research will be on the radical product innovation. The reason is that older research into purchasing involvement focused more on incremental innovation (Constant et al., 2020, p. 3; Schiele, 2010; Van Echtelt et al., 2008; Wynstra et al., 2003), but the purchasing practices in radical innovation is still underexplored. The choice for

product innovation is made since the product innovation projects more clearly influence the successful development of new products (Bauer & Leker, 2013, p. 199; Brown & Eisenhardt, 1995; Montoya-Weiss & Calantone, 1994). The practices of purchasing in these product innovation projects can therefore be more easily linked to improved performance of the firm, especially in the manufacturing industry, which is the focus of this research.

In chapter 2.1, different typologies of innovation are considered. The focus will deepen into radical product innovation projects by adding a stage structure to the concept in chapter 2.2.

2.2 Innovation projects can be divided into five stages

Radical product innovation projects can typically be divided into five stages: idea generation, business/technical assessment, product/process concept development, testing and validation and lastly production and launching (Cooper, 1990, p. 52; Cooper, 1994, p. 5; Picaud-Bello et al., 2022, p. 153). The stages can be found in Figure 2. Other literature found slightly different phases in innovation projects (Kumar et al., 2022, p. 543; Schiele, 2010, p. 147), with for example Schiele (2010, p. 147) finding similar phases in the product development process with a concept, design, piloting (including testing) and transition to operations phase, where purchasing was involved from the first phase. When comparing the different phase structures in literature, the structures showed a lot of overlap and a choice was made for Cooper's stage process model. Cooper's model has been around for a long time (Cooper, 1990, p. 52), is improved over time (Cooper, 1994, p. 5; Picaud-Bello et al., 2022, p. 153) and the model is "used in a typical manufacturing firm" (Cooper, 1990, p. 51). That are the reasons that the structure as found in Figure 2 will be used as the structure for a typical radical product innovation project in this research.

Figure 2 - 5 stage radical innovation project structure based on Cooper (1994, p. 5)



Stage 1 is the ideation stage, also known as the scoping stage. A first 'gentle' screen is performed, in which a handful of key criteria are subjected to the project. The goal of the first stage is to determine the project's technical and marketplace benefits, with for example a preliminary technical assessment, but financial criteria are not part of this stage in order to

stimulate innovation. To determine the manufacturing feasibility, purchasing and suppliers might even be involved in this stage already. Stage 2 is the business case stage, in which financial criteria are considered to determine if the project is an attractive business case. This is the last stage before heavy spending on a concept or prototype and a detailed financial analysis is performed to minimise the financial risks of the project. The manufacturing feasibility is continuously assessed with every change to the idea, but there is also a customer acceptance test. This stage ends with a clear product definition in which the specifications are finetuned. Stage 3 is the development stage, in which the plans made in stage 2 are performed. The project team will develop a first concept and design, which often results in one or multiple prototypes. There is often an iterative process between stage 3 development and stage 4 testing. The concept, design or prototype is tested and validated, after which the results of the tests are used to improve the concept and test it again. Stage 4 testing & validation exists out of tests on different levels, such as testing the production process, customer acceptance and commercial feasibility of the project. In the final stage 5 production & launch, the operations plans are finalised and implemented. These plans contain the production numbers, stock levels and way of distributing. These plans are often already made during stage 3 and 4, but in stage 5 it is finalised and implemented (Cooper, 1990, pp. 52-53).

The activities performed in the different stages show that a cross-functional team is needed to have input from all different perspectives, like R&D, production, sales, suppliers and purchasing (Picaud-Bello et al., 2022, p. 153). Cooper (1994, p. 5) described this by stating that no stage is owned by one function, but all functions should be involved in every stage. The involvement of purchasing can occur by contributing knowledge, performing managerial tasks and contributing to decision-making (Wynstra et al., 2000, p. 65). Other contributions of purchasing in the early stages of the project are providing supply market data like availability, quality and reliability of components (Burt & Soukup, 1985) or participating in commercial feasibility analysis and integrating technical ideas from suppliers in the product development project (Schiele, 2010, p. 147). Different stages require different knowledge, actions, activities and practices of the managers involved (Jespersen, 2012, p. 257), so the roles of the involved actors might change during the project as well.

The different types of innovation are discussed and the focus on radical product innovation is explained in chapter 2.1. Chapter 2.2 then added a five-stage model to structure

radical innovation projects in different phases. Next, chapter 2.3 will discuss the involvement of purchasers in innovation projects and how this has changed over time.

2.3 The changing role of purchasing and its involvement in innovation projects

2.3.1 The origin of Purchasing involvement

The concept of purchasing involvement comes from the concept of (early) supplier involvement in product development (Wynstra et al., 1999, p. 130). “Supplier involvement in New Product Development (NPD) implies the combination of the buyer's and supplier's R&D resources and the exploitation of joint capabilities through strategic integration of the buyer-supplier relationship” (Wagner & Hoegl, 2006, p. 937). Supplier involvement has been identified in the Japanese automotive industry in the 1980s for the first time, side-to-side to concepts like Lean Management and supplier development (Johnsen, 2009, p. 188; Martínez-Jurado & Moyano-Fuentes, 2014, p. 138). The literature on supplier involvement in product development is extensive and argues that “early and close collaboration with key suppliers are important factors in achieving reduced development cost, reduced time to market, and improved product quality” (Mikkelsen & Johnsen, 2019, p. 1).

Purchasing involvement encompasses the role of purchasers in product development with suppliers, with various activities like for example selecting suppliers, measuring availability, supplier market knowledge and integrating resources (Servajean-Hilst & Calvi, 2018, p. 3). The involvement of purchasing differs per company, project and situation (Picaud-Bello et al., 2022, p. 153; Wynstra et al., 2003, p. 82). However, according to Schiele et al. (2021, p. 6), the involvement of purchasers is a precondition for enabling the involvement of suppliers in product development. Purchasing has a key role in innovating with and from external partners since purchasing is the external interface and process owner with suppliers (Luzzini et al., 2015, p. 110).

One of the first papers about purchasing involvement originates from Burt and Soukup (1985), who describe the role of purchasing in new product development. If purchasing is not evolved in product development, the authors describe problems like suppliers not having enough capacity, sole sourcing and inefficient purchase/design specifications. The benefits of involving purchasing are, next to preventing the named problems, cost savings up to 20% and time savings up to 60%. The recommendations for integrating purchasing earlier and better in product development were for example senior

management recognition, co-location, project teams and procurement engineers (Burt & Soukup, 1985, p. 97).

In the early 90s, the research into supplier and purchasing involvement had an impulse from studies into the organisation of development projects in Japanese, US and European automobiles (Wynstra et al., 1999, p. 130). The Japanese manufacturers were able to produce with a shorter time to market, have more innovative features and needed less time and resources than their US and European competitors. Research showed that the main reason for their success was the embedded skills and knowledge of suppliers. The concept of supplier involvement was risen at this time and scholars wondered if this concept also worked for other manufacturers (Kamath & Liker, 1994, p. 154; Wynstra et al., 1999, p. 130).

With a growing interest in supplier involvement in the early 90s, the literature written about purchasing involvement also increased during the 90s (Dowlatshahi, 1992; Mendez & Pearson, 1994; O'Neal, 1993; Ragatz et al., 1997; Williams & Smith, 1990). The new focus on purchasing involvement came for two reasons. The first reason is the increasing realization that purchasing might have a strategic position in the firm. The second reason is “the growing importance of innovation and product development in creating competitive advantage” (Wynstra et al., 1999, p. 129). These two reasons, combined with the trend of outsourcing large parts of production to suppliers, created an increased focus on cooperating with suppliers and the role of purchasing.

Despite the new focus, the literature written about purchasing involvement in the 90s was still limited (Wynstra et al., 1999, pp. 130-131). The focus of the papers was limited to three aspects. The aspects were considering purchasing involvement as only managing supplier involvement, not having a clear definition of what purchasing involvement is and limiting studies to only large-scale assembly industries. These limitations were overcome by Wynstra et al. in four different articles in the early 00s (Wynstra et al., 2000; Wynstra et al., 1999; Wynstra et al., 2001; Wynstra et al., 2003). These articles can be seen as the first articles that introduced frameworks, definitions and factors influencing the subject of purchasing involvement.

2.3.2 The evolution of purchasing involvement

Purchasing involvement originates from the 1980s (Burt & Soukup, 1985), and developed during the 1990s into the frameworks of Wynstra et al. in the early 2000s (Wynstra et al., 2000; Wynstra et al., 1999; Wynstra et al., 2001; Wynstra et al., 2003).

The first paper of Wynstra et al. (1999) introduces a framework with four different management areas of purchasing involvement: Development Management, Supplier Interface Management, Project Management and Product Management. The second paper (Wynstra et al., 2000) discusses the different contingency factors driving and enabling the four different management areas of purchasing involvement. The discussed factors were for example company size, dependence on suppliers and the quality of purchasing personnel. Wynstra et al. (2001) examine three issues concerning supplier and purchasing involvement: identifying specific processes and tasks for purchasing integration, forming an organisation that supports such tasks and staffing the organisation with people with the right skills. In 2003, Wynstra et al. (2003) took a broader perspective than just product development projects and revised the framework introduced in 1999. The authors added specific activities and key processes to the framework, which can be seen in Figure 3. These discussed papers and frameworks can be considered fundamental for the research field of purchasing involvement.

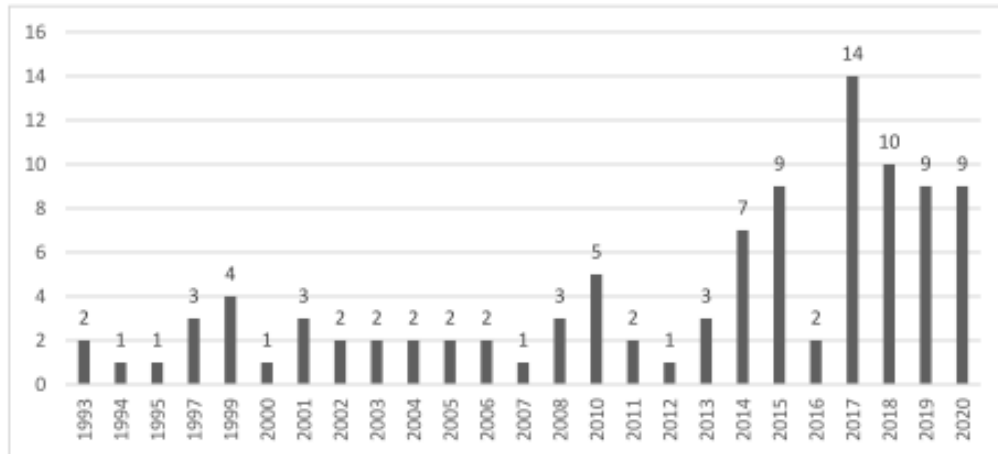
Figure 3 - Purchasing integration framework (Wynstra et al., 2003, p. 80)

Revised framework		
Levels	Activity	Embodied key processes
Development management	<ul style="list-style-type: none"> determining which technologies to keep/develop in-house and which ones to outsource to suppliers formulating policies for the involvement of suppliers formulating policies for purchasing-related activities of internal departments 	<p>prioritizing</p> <p>coordinating, timing</p>
Supplier interface management	<ul style="list-style-type: none"> communicating policies and procedures internally and externally monitoring supplier markets for technical developments preselecting suppliers for product development collaboration motivating suppliers to build up/maintain specific knowledge or develop certain products leveraging the technical capabilities of suppliers evaluating suppliers' development performance 	<p>informing</p> <p>prioritizing</p> <p>mobilizing, coordinating</p>
Project management	<p>planning:</p> <ul style="list-style-type: none"> determining specific develop-or-buy solutions selecting suppliers for involvement in the development project <p>determining the extent ('workload') of supplier involvement</p> <p>determining the moment of supplier involvement</p> <p>execution:</p> <ul style="list-style-type: none"> integrating development activities between suppliers and manufacturer integrating development activities between different first tier suppliers integrating development activities between first tier suppliers and second tier suppliers 	<p>coordinating, timing</p> <p>informing</p> <p>prioritizing</p> <p>prioritizing, mobilizing, coordinating, timing</p> <p>prioritizing, coordinating</p> <p>prioritizing, timing</p> <p>coordinating, timing, informing</p> <p>coordinating, timing, informing</p> <p>coordinating, timing, informing</p>
Product management	<p>extending activities:</p> <ul style="list-style-type: none"> providing information on new products and technologies being developed or already available in supplier markets suggesting alternative suppliers, products, and technologies than can result in a higher quality of the final product <p>restrictive activities:</p> <ul style="list-style-type: none"> evaluating product designs in terms of part availability, makeability, lead time, quality, and costs promoting standardization and simplification of designs and parts 	<p>informing</p> <p>prioritizing, mobilizing, informing</p> <p>informing</p> <p>prioritizing, mobilizing, informing</p>

During the 00s, the focus of the research field of purchasing involvement turned towards the more strategic position of purchasing in contributing to innovation (Chen et al., 2004, p. 505; Paulraj et al., 2006, p. 107; Schiele, 2006, p. 925). This changed position led to a new definition and understanding of the role of purchasing in companies. Based on the research of (Atuahene-Gima, 1995), (Nijssen et al., 2002) and (Schiele, 2006) the role of purchasing is described as a dual role in 2010 by Schiele (2010, p. 138). Purchasing involvement in product development leads to activities focused on two categories: optimising costs and generating innovations. Balancing these two type of activities are considered to be the new challenge for purchasing and determines a large part of the research on purchasing involvement in the 2010s.

Johnsen et al. (2022, p. 3) show the spark in articles about purchasing and innovation from 2014 onwards, see Table 1. Together with is trend, the research field of purchasing involvement has started to evolve as well, where the issue is widened and researched in depth.

Table 1 - Number of published articles on purchasing and innovation over time (Johnsen et al., 2022, p. 3)



The research into purchasing involvement until 2017 can be categorised into three main topics (Patrucco et al., 2017, p. 1272). The first topic is organizational design, which researches how the purchasing organisation can be designed to support innovation and supplier involvement in the best way (e.g. Lakemond et al., 2006; Luzzini & Ronchi, 2011; Schiele, 2010). The second topic is the enabling factors of effective purchasing involvement, in which contextual factors of the environment and organisation are considered (e.g. Toon et al., 2016; van Echtelt et al., 2007; Wynstra et al., 2000). The final topic is process design, where the scholars describe the role of purchasing professionals in supplier involvement (e.g. Knight & Harland, 2005; Oh & Rhee, 2008; Schiele, 2012; Wynstra et al., 2000). The last topic of process design is interesting for this research since it goes further into the role of purchasing in supplier involvement and product development.

The role of purchasing in product development has been described by Schiele (2010, p. 138) as a dual role consisting of optimising costs and generating innovations. However, the purchasing role can be considered more diverse than these two aspects, by making a distinction between ‘traditional’ and innovation enhancing activities (Melander & Lakemond, 2015, p. 118; Servajean-Hilst & Calvi, 2018, p. 4). Traditional activities are activities that deal with cost, quality and time issues. The innovation side is more diverse, with purchasing measuring availability and relevance of external resources (Schiele, 2006; Servajean-Hilst & Calvi, 2018, p. 3; Wynstra et al., 1999), having market competition knowledge (Servajean-Hilst & Calvi, 2018, p. 3; Trent & Monczka, 1998), linking innovation strategies to external resource management (Gonzalez-Zapatero et al., 2016; Melander & Lakemond, 2014; Servajean-Hilst & Calvi, 2018, p. 3; Van Echtelt et al., 2008), integrating different internal functions (Eslami & Lakemond, 2016; Olausson et al., 2009;

Servajean-Hilst & Calvi, 2018, p. 3) and performing relationship management activities with suppliers (Servajean-Hilst & Calvi, 2018, p. 3).

The definition of the dual role of purchasing as described by Schiele (2010) is developed into a more elaborate concept. With this development, the term purchasing ambidexterity was introduced by Gualandris et al. (2018, p. 667). Purchasing ambidexterity has been defined by Gualandris et al. (2018, p. 667) as “a balance dimension and a combined dimension between exploration and exploitation activities”. Explorative activities are activities focused on bringing radical new capabilities, opportunities and innovations to the company. Exploitative activities focus more on the firm’s existing resources and capabilities and how to exploit these (Constant et al., 2020, p. 2). “The purchasing function can be considered as ambidextrous if it is able to equally contribute to exploration and exploitation mechanisms of the firm and at the same time achieve and maintain a high level of performance in exploratory and exploitative activities” (Constant et al., 2020, p. 3).

Recent research is confirming this focus on a new role, with research finding that purchasing needs to mature, create new capabilities and new supplier relationship strategies (Johnsen et al., 2022, p. 5; Legenvre & Gualandris, 2018; Mikkelsen & Johnsen, 2019; Picaud-Bello et al., 2019). The balance between traditional cost-saving and new innovation-focused activities is also a recent popular topic (Andersen et al., 2021; Constant et al., 2020; Gualandris et al., 2018; Johnsen et al., 2022, p. 5). As can be seen in Table 1, the research into purchasing and innovation is more extensive and constant than ever. With these developments in research, the understanding of purchasing involvement becomes better. Therefore can (early) purchasing involvement be described as “the moment, or sourcing stage, at which the purchasing department has become involved in the sourcing process” and it relates to the role of purchasing and involvement within the organisation (Van Poucke et al., 2016, p. 302). However, the research field of purchasing in general is still underdeveloped, mainly on this new role in innovation (Ellram et al., 2020, p. 7; Johnsen et al., 2022, p. 6; Spina et al., 2016, p. 27). The papers written often lack a theoretical perspective, which would be the next step in progressing further as research a field (Johnsen et al., 2022, p. 6).

Next to the lack of theories on purchasing and innovation, another trend is found by Johnsen et al. (2022). Where scholars in the 2000s focused more on purchasing involvement in projects with products or services based on existing technological

capabilities (Constant et al., 2020, p. 3; Schiele, 2010; Van Echtelt et al., 2008; Wynstra et al., 2003), a more recent increasing focus has come on the effect of technological uncertainty on purchasing involvement (Johnsen et al., 2022, pp. 4-5). Other recent research also focused on NPD projects with a high degree of technological change, where they named it *radical* (Åberg & Bengtson, 2015; Goldberg & Schiele, 2018; Johnsen et al., 2022, p. 6) or *discontinuous* (Picaud-Bello et al., 2019).

The research on purchasing involvement in NPD projects goes back to Burt and Soukup (1985) with a focus on the key role of purchasing in the earlier stages by providing information about the supply market availability, quality and reliability (Picaud-Bello et al., 2022, p. 153). More recent research focuses on the role of purchasing in separate stages of the NPD project. For example, the involvement of purchasing in the idea-generation stage (Servajean-Hilst & Calvi, 2018), the role as a sparring partner of R&D for technology selection (Mikkelsen & Johnsen, 2019) and the timing of purchasing involvement in NPD (Picaud-Bello et al., 2022) have all been studied before. This last study has researched the purchasing involvement in the first stages of the NPD process (idea generation and business/technical assessment), but no purchasing involvement research considers all the different stages of product development projects.

To summarise the theoretical concept of purchasing involvement, the origin and how the concept developed has been considered in chapter 2.3.1 and 2.3.2. Research into purchasing involvement in product development projects goes back decades (Burt & Soukup, 1985; Wynstra et al., 2000; Wynstra et al., 1999), but “the need for purchasing to play an active role in innovation is more recent” (Johnsen et al., 2022, p. 2). More recently the research has evolved to a better and more complete understanding of purchasing involvement, but an overview of the changing practices of purchasing in radical innovation projects is missing. The research field of purchasing also needs to progress by implementing more established theories (Johnsen et al., 2022, p. 4; Spina et al., 2016, p. 27). To understand the contextual factors influencing purchasing involvement, the contingency factors influencing the purchasing practices in innovation projects are considered in the next chapter.

2.3.3 Internal and external contingency factors of purchasing involvement

Purchasing involvement is dependent on many factors, with the role of purchasing varying from company to company and from situation to situation (Picaud-Bello et al., 2022, p. 153;

Wynstra et al., 2003). The literature on purchasing involvement and related topics like supplier involvement found multiple contingency factors over the last two decades influencing the involvement of purchasers. Being aware of these contingency factors is important because they might influence the results of this research. An overview can be made of the different contingency factors which can be divided into internal and external factors influencing purchasing involvement.

Internal

The internal contingency factors influencing the purchasing involvement found in the literature can be separated into the state of the purchasing department, company and internal organisation. See Table 2 for a complete overview of all the internal contingency factors influencing purchasing involvement.

Table 2 - Internal contingency factors of purchasing involvement

Internal		
	State of purchasing as a function	
		Maturity of purchasing function
		Purchasing's internal attractiveness
		The perceived importance of the PSM function
		The degree of participation in strategic purchasing activities
		Level of purchasing coherence
	State of company	
		Company size
		Firms life-cycle
		Firm reliance on R&D
		Innovativeness of company
	State of internal organisation	
		The quality of intra-organisational relations
		Cross-functional/intra-organisational alignment
		Buyer's organizational integration
		Other capabilities such as manufacturing, assembly and logistics should be sufficient

The first main internal factor is the state of purchasing as a function. The maturity of the purchasing function (Bals et al., 2018, p. 43; D'Antone & Santos, 2016, p. 175; Luzzini et al., 2015, p. 117; Schiele, 2007, p. 278) and the degree of participation in strategic purchasing activities (Bals et al., 2018, p. 43; Zsidisin & Ellram, 2001, p. 639) influence the

degree of purchasing involvement. Also, the perceived importance of Purchasing & Supply Management (Zsidisin & Ellram, 2001, p. 639) and the internal attractiveness of purchasing as perceived by other departments (Viale, 2019, p. 104) are influential on purchasing involvement. Lastly, the level of purchasing coherence is important, which concerns the internal communication and alignment between different purchasing divisions (Bals et al., 2018, p. 43).

The second main internal factor is the state of the company. The company size (Bals et al., 2018, p. 43; Nijssen et al., 2002, p. 283; Spina et al., 2002, p. 1357; van Echtelt et al., 2007, p. 646; Wynstra et al., 2000, p. 131), innovativeness (Carnes et al., 2022, p. 162) and reliance on R&D (van Echtelt et al., 2007, p. 646) are important contingency factors. The firm's life cycle also influences the purchasing involvement (Carnes et al., 2017, p. 472), which means what kind of development stage the firm is at.

The final main internal factor is the state of the internal organisation. The quality of the intra-organisational relations is part of this factor (Viale, 2019, p. 104), just as the cross-functional alignment between departments (Bals et al., 2018, p. 43; Viale, 2019, p. 104). The buyer's organization integration also influences the degree of purchasing involvement (D'Antone & Santos, 2016, p. 175; Spina et al., 2002, p. 1357). Lastly, the state of other departments like manufacturing, assembly and logistics (Wagner & Hoegl, 2006, p. 938) influences the purchasing practices in product development.

External

The external contingency factors influencing the purchasing involvement found in the literature can be separated into supplier and industry related. The different external contingency factors can be found in Table 3.

Table 3 - External contingency factors of purchasing involvement

External		
	Suppliers related	
		Environmental complexity (e.g. number of supply sources, entry barriers)
		Environmental dynamism (change in supply market demands, market growth/decline)
		The overall dependence/reliance on suppliers
		Quality of buyer-supplier relationship
	Industry related	
		Companies tend to benchmark with industry leaders
		Production type or technology
		The importance of product development

Supplier-related factors are for example environmental complexity and dynamism, which concerns the number of supply sources, entry barriers and changes in supply market demands (Bals et al., 2018, p. 43). But also the overall dependence on suppliers (Spina et al., 2002, p. 1357; van Echtelt et al., 2007, p. 646; Wynstra et al., 2000, p. 131) and the quality of the buyer-supplier relationship (Parker et al., 2008, p. 79) influences the level of purchasing involvement.

One of the industry-related factors is the tendency to benchmark with industry leaders (Bidault et al., 1998, p. 55). If companies benchmark with industry leaders and these industry leaders involve their purchasers actively in product development, the other companies in the industry will involve purchasing as well. The production technology (Parker et al., 2008, p. 79; van Echtelt et al., 2007, p. 646; Wynstra et al., 2000, p. 131) and the importance of product development in the specific industry (Parker et al., 2008, p. 79; Wynstra et al., 2000, p. 131) influence the purchasing involvement as well.

The radical product innovation projects and how these projects can be structured into five general stages were discussed in chapter 2.1 and 2.2. In chapter 2.3 the focus was on the introduction and development of research on purchasing involvement, including an overview of the internal and external contingency factors. Adding the innovation variations and project stages to the subject of purchasing involvement results in a complex issue, which may be explained by introducing a theoretical framework. In chapter 2.4 different theories are considered and the Resource Orchestration Theory (ROT) will be introduced and explained.

2.4 Adding a theoretical perspective by considering different theories and explain the Resource Orchestration Theory choice

2.4.1 Considering different theoretical perspective to explain purchasing involvement in radical innovation projects

As discussed in chapter 2.3.2, research into the purchasing practices performed in all stages of radical innovation projects has not been performed before, with former purchasing involvement research focusing on incremental innovation (Constant et al., 2020, p. 3; Schiele, 2010; Van Echtelt et al., 2008; Wynstra et al., 2003) or on a particular stage in radical innovation project (Mikkelsen & Johnsen, 2019; Picaud-Bello et al., 2022; Servajean-Hilst & Calvi, 2018). However, it would be interesting to focus research on a complete view of purchasing practices in innovation projects, how they might change during a project and have an overview of all the different types of practices performed. For this holistic view on the practices of purchasers in radical innovation projects, a theoretical perspective helps to explain and structure the complex issue. In this chapter, a few possible interesting theories are discussed, after which the choice for the Resource Orchestration Theory is explained.

The first consideration in choosing the most suitable theoretical perspective is determining the scope of the research. In purchasing innovation research, a distinction can be made between advanced and life-cycling sourcing (Schiele, 2010, p. 138). Advanced sourcing is focused on (NPD) projects and life-cycling sourcing is focused on the phases after the project introduction and the further life-cycle of the product (production and post-production). Earlier research into the purchasing innovation context found a dual role, with innovation activities in the advanced sourcing stage and cost-focused activities in the life-cycle sourcing (Schiele, 2010, pp. 146-147). Constant et al. (2020, p. 11) found that in the one company where they did a case study, the purchasing innovation-focused activities were performed by one specific department. These researchers took a life-cycling sourcing perspective and considered the whole purchasing department in their research. Research that did take an advanced sourcing scope and focused on radical innovation projects would only consider certain stages (Mikkelsen & Johnsen, 2019; Picaud-Bello et al., 2022; Servajean-Hilst & Calvi, 2018). To conclude, a holistic view from a project perspective on radical innovation is missing and could provide new insights into purchasing practices performed in innovation projects. That is why not the life-cycle sourcing, but the advanced sourcing perspective is taken by focusing on innovation projects. To find the most suitable theory for this perspective, a few theories will be considered next.

The first theory to consider is the Knowledge Based View (KBV). The view sees knowledge as the ‘most strategically-significant resource of the firm’ (Grant, 1996, p. 375). KBV could be a good fit for the research question because the view can be used to describe supplier knowledge integration (Schoenherr, 2022, pp. 133-134). However, knowledge is just one of the potential resources that purchasers could be involved in integrating. Other resources like employee skills or tangible resources like land, materials or equipment might also affect the practices performed by purchasers. Since this research is investigating an overview of all the practices, the KBV would be too limited.

The second theory to consider is the supply chain network theory. “The supply chain network is a complicated network model, and its specific context depends on the relationships among the network members” (Chang et al., 2012, p. 1114). The theory focuses on the relationships between companies and the different network types that exist (Hearnshaw & Wilson, 2013, p. 444). However, the theory lacks an innovation perspective. It can therefore be concluded that the supply chain network theory is not the right theory for this purchasing innovation focused research.

Other theories to consider are the Transaction Cost Economics (TCE), the Agency Theory and the Relational View. The TCE describes the transaction costs that may occur during a particular transaction and can be explained by asset specificity and uncertainty (Geyskens et al., 2006, p. 520), but the theory is focused only on costs which is too specific and restricted for this research. The Agency Theory focuses on explaining relationship dynamics, for example between buyer and supplier, but it is not the right theory to investigate the practices performed by purchasers in innovation projects (Fayezi et al., 2012, pp. 565-566). The Relation View is similar to the Agency theory, with a focus on the relationships between supply chain partners, but it is not specific enough to explain the purchasing practices in innovation projects (Huang et al., 2022, p. 283).

A theory is needed that could cover the holistic view of purchasers in radical innovation projects. The Resource Based View (RBV) could be interesting since it describes how companies need resources that are valuable, rare, inimitable and non-substitutable to gain a competitive advantage (Hitt et al., 2016, p. 78; Sirmon et al., 2007). However, the RBV is criticised because of its static view by Teece et al. (1997), who introduced the concept of Dynamic Capabilities (DC). The theory describes the ability of firms to reach new and innovative forms of competitive advantage, but it focuses only on the adaptive and dynamic

ability of companies (Teece et al., 1997, p. 516). The Resource Orchestration Theory (ROT) (Sirmon et al., 2011, p. 1394) combines the concepts of RBV and DC. The theory is used to explain the role of managers in orchestrating resources, which could be a good explanation for the purchasing practices in radical innovation projects as well. Furthermore, the ROT could be a good theory to cover the holistic view of the purchasing practices in innovation projects, since its focus is broad enough to capture all the practices of purchasers. Lastly, Johnsen et al. (2022, p. 7) mention the possible interesting framework of ROT to explore the role of purchasing in enhancing innovation in future research. As a result, the chosen theoretical perspective in this research is the ROT, which will be elaborated on in the remainder of this chapter.

2.4.2 The Resource Orchestration Theory explains the role of managers in orchestrating resources for competitive advantage

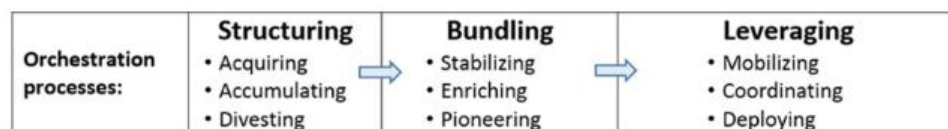
The main theory this research will build on is the Resource Orchestration Theory (ROT) introduced by Sirmon et al. (2011, p. 1394). The theory is built by combining the two frameworks of resource management and asset orchestration, which were introduced almost concurrently in 2007 and 2009 (Helfat et al., 2009; Sirmon et al., 2007). Resource management finds its origin in the Resource Based View (RBV), where asset orchestration is derived from the research on Dynamic Capabilities (DC). Both these theories are considered to be “grand theories” (Wynstra et al., 2019, p. 10). The RBV states that firms need to have valuable, rare, inimitable and non-substitutable resources to gain a competitive advantage (Hitt et al., 2016, p. 78; Sirmon et al., 2007). DC is introduced by Teece et al. (1997) by criticizing the static view of the RBV and the neglect of intangible resources in this view. “DC reflects an organization’s ability to achieve new and innovative forms of competitive advantage” and exists out of three main strategies: learning, new assets and transformation of existing assets (Teece et al., 1997, p. 516).

The theoretical view of the ROT extends to the Resource Based View by stating that it is not only what resources a company possesses, but also how it is used (orchestrated) to reach competitive advantages (Gong et al., 2018, p. 1064). This idea is based on the concept that “what a firm does with its resources is at least as important as which resources it possesses” (Hansen et al., 2004, p. 1280). Hitt et al. (2016, p. 85) explain that the ROT of Sirmon et al. (2011) is able to differentiate between resources and knowledge and how these properties can be developed into capabilities. ROT is “the combination of resources, capabilities, and managerial acumen that ultimately results in superior firm performance”

(Chadwick et al., 2015, p. 360; Gong et al., 2018, p. 1064). The ROT states that a particular actor plays the leading role in orchestrating resources (Gong et al., 2018, p. 1064) and these managers' actions can be structured into the constructs of structuring, bundling and leveraging

The three constructs of the ROT with the different subprocesses per construct can be found in Figure 4 (Andersén & Ljungkvist, 2021, p. 151). The first construct structuring refers to the subprocesses of acquiring, accumulating and divesting resources in the portfolio resources. However, as stated in the previous paragraph, just holding valuable and rare resources is not enough to achieve a competitive advantage. The second construct bundling refers to building capabilities by stabilising, enriching and pioneering the resources in the established resource portfolio. The last construct of leveraging capabilities in the marketplace can be divided into the subprocesses of mobilising, coordinating and deploying resources to create value from these capabilities (Hitt, 2011, p. 9; Sirmon et al., 2011, p. 1395). Synchronization between the three different constructs is critical for the effectiveness of the ROT processes (Carnes et al., 2022, p. 171). The ROT helps researchers to better understand how to manage a firm's resource portfolio to develop competitive advantages.

Figure 4 - The three constructs of the Resource Orchestration Theory (Andersén & Ljungkvist, 2021, p. 151)



Resources from suppliers are essential to firms and the orchestration of these external resources has been an interest in literature from a ROT perspective (Hitt, 2011, p. 10). Ketchen et al. (2014) discuss the role of resources in supply chain management and Liu et al. (2016) propose that the ROT is interesting for understanding the orchestration of resources in supply chain integration (Gong et al., 2018, pp. 1064-1065). Nemeh and Yami (2019, p. 65) also used the ROT and RBV to find that “firms that structured their resources early to make them available for bundling during cooperation were able to introduce products more rapidly than those that structured their resources during cooperation”. This finding suggests that firms implementing ROT structuring processes earlier were able to have a shorter time to market. Later the link to innovation performance was made, with Kumar et al. (2022, p. 527) using the ROT to describe the role of hub firms in enhancing innovation capabilities with suppliers, governments and research centres. Lastly, Schmelzle and Tate

(2022) applied the ROT to a specific purchasing perspective by studying the role of purchasing in enhancing the innovation performance of a firm. The authors introduce a purchasing-innovation framework with ROT practices, which will be elaborated on in chapter 2.5.

2.5 Resource Orchestration Theory in a purchasing innovation context

This research will further explore the application of the ROT in the purchasing innovation context. Multiple papers describing orchestrator roles in innovation networks were found, but only a few papers took a specific ROT perspective (e.g. Dessaigne & Pardo, 2020; Hurmelinna-Laukkanen & Nätti, 2018). One paper that did, is written by Kumar et al. (2022) about the role of the hub firm in developing innovation capabilities. In this paper, the ROT is used to find how resources are orchestrated to enhance the innovation capabilities of firms part of the hub. Particularly interesting was the exploration of how the orchestrating role changed as the innovation project developed. The context of the paper is a regional industrial cluster hub in the French wine industry, but because of the application of the ROT and the defined roles in orchestrating resources of mainly suppliers, this article is a valuable addition to the theoretical framework. Especially the framework in which they consider the different resource orchestration phases, roles and activities can be an important inspiration for this research (Kumar et al., 2022, p. 543), see Figure 5.

Figure 5 - Phases of Resource Orchestration (Kumar et al., 2022, p. 543)



Another interesting paper is about the purchasing involvement in the early stages of new product development (NPD) by Picaud-Bello et al. (2022). In this paper, the absorptive capacity perspective from the Dynamic Capability (DC) theory is taken to study the different effects on the absorption of supplier knowledge in the NPD process. Even though the research subject and the theoretical background of the paper are slightly different from this research, there are also similarities. The DC theory is connected to the ROT (Adner & Helfat, 2003; Sirmon et al., 2011, p. 1391) and shows overlap, but the focus on the different stages of the product development process serves as inspiration for this research as well. Furthermore, the coding process used by the authors is extensively described, with a clear

explanation of how they coded the data into three central categories, which is similar to the data processing in this research (Picaud-Bello et al., 2022, p. 156).

During the literature review, one paper was found that specifically applied the ROT to a purchasing innovation context. In this research by Schmelzle and Tate (2022), the authors apply the ROT in a purchasing innovation context for the first time. They investigate the role of purchasing in enhancing an organization's innovation performance and introduce practices that enable innovation. Table 4 is showing the practices found in the literature by Schmelzle and Tate (2022, p. 4), including the sources where they found the practices and additional sources found by the author of this paper. The researchers performed qualitative interviews with purchasing managers to empirically test the purchasing activities that can be placed under one of the three resource orchestration constructs. Their focus was on introducing a purchasing-innovation framework and finding specific practices for this framework in incremental innovation projects. Besides, they focused on open-mindedness and technological uncertainty and how these two factors influence purchasing practices and innovation performance.

Table 4 - Resource Orchestration Practises in a purchasing innovation context

ROT in Purchasing Constructs	Sample Practices	Sources
Structuring: Acquiring resources from the supply chain to establish an updated resource portfolio	Market Scanning	Picaud-Bello et al. (2019, 2022), Tracey & Neuhaus (2013), Wynstra et al. (2000), Van Echtelt et al. (2008), Kilpi et al. (2018), Schiele (2010)
	Interface Development	Picaud-Bello et al. (2019, 2022), Tracey & Neuhaus (2013), Wynstra et al. (2000), Van Echtelt (2008), Handfield et al. (2015), Andersen & Gadde (2019), Kristal et al. (2010), Gualandris et al. (2018)
	Trust Building	Picaud-Bello et al. (2019), Tracey & Neuhaus (2013), van Echtelt (2008), Wynstra et al. (2000), Luzzini et al. (2015), Tchokogué & Merminod (2021), Wynstra et al. (2019), Mikkelsen & Johnsen (2019)
	Resource Portfolio Updating	Picaud-Bello et al. (2019, 2022), Tracey & Neuhaus (2013), Wynstra et al. (2000), Tchokogué & Merminod (2021)
Bundling: Integrating external resources and blending them with inhouse resources to create new, competitive capabilities for the organization	External Coordination	Picaud-Bello et al. (2019), Tracey & Neuhaus (2013), Wynstra et al. (2003), Luzzini et al. (2015), Van Echtelt et al. (2008), Suurmond et al. (2020)
	Supplier Co-Location	Krause et al. (2007), Schmelzle & Tate (2022)
	Internal alignment	Picaud-Bello et al. (2019, 2022), Tracey & Neuhaus (2013), Wynstra et al. (2003), Horn et al. (2014), Mikkelsen & Johnsen (2019)
	Resource Integration and Resource Re-configuration	Picaud-Bello et al. (2019, 2022), Van Echtelt et al. (2008), Wynstra et al. (2003)
Leveraging Support: Purchasing practices supporting the commercialization processes to create customer value	Customer Need Capturing	Picaud-Bello et al. (2019), Tracey & Neuhaus (2013), Handfield et al. (2015)
	Customer Interface Management	Schmelzle & Tate (2022), Sundgren (1999)

Note. The practises are based on the research of Schmelzle and Tate (2022, p. 4) with the sources coming from their paper or own literature review.

The constructs are the same as in the ROT found in chapter 2.4, but the definitions are applied to a purchasing context. The different sample practices were found in the literature and were all supported by data from practice. These constructs with practices are used in this research because the framework gives a structure to different innovation enhancing activities performed by purchasers. However, the Schmelzle and Tate (2022) article is the first and so far only paper using the ROT in a purchasing context, so this research is still underdeveloped. Their research disregards the potential changing purchasing

practices during innovation projects and focuses solely on cases with incremental innovation (Schmelzle & Tate, 2022, p. 12).

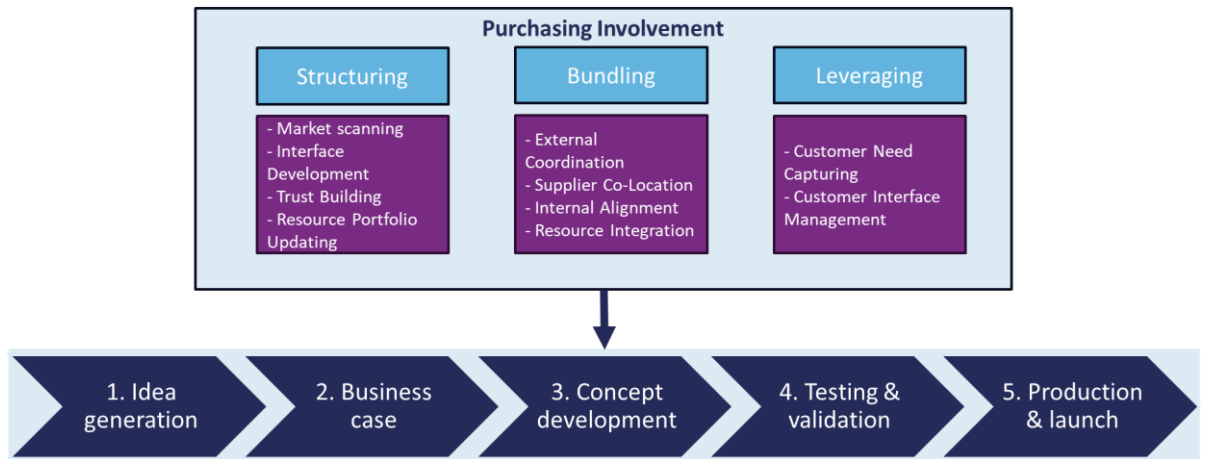
The ROT in purchasing context practices seem interesting, but the research into the concept is still underdeveloped. Kumar et al. (2022) focus on the changing role of member firms in a network from a ROT perspective and Picaud-Bello et al. (2022) consider the role of purchasing in the early stages of radical innovation projects. By considering the changing purchasing practices during a project and focusing on radical innovation projects, the research of Schmelzle and Tate (2022) can be extended.

2.6 Research model: Building on the Resource Orchestration Theory by adding a project stage and radical innovation perspective

In chapter 2, the theoretical framework for this research is discussed. First, in chapter 2.1, the different types of innovation were discussed and is explained that the focus of this research is radical product innovation projects. In chapter 2.2, a stage structure was introduced to divide radical innovation projects into different phases (Cooper, 1994, p. 5). Afterwards, purchasing involvement and the purchasing practices in innovation projects are discussed and what is known about this role until now. In chapter 2.4 the theoretical perspective of the Resource Orchestration Theory (ROT) (Sirmon et al., 2011) was introduced to explain the role of purchasers in orchestrating resources for competitive advantage. The ROT can be applied in a purchasing context to explain the involvement of purchasers in innovation projects. The research about the ROT in a purchasing context is discussed in chapter 2.5, but it was found that the research is still limited. Only one paper is written about ROT in purchasing (Schmelzle & Tate, 2022), but these authors disregard the changing practices of purchasing in radical innovation projects. By adding the stage structure used in radical innovation projects to the concept of purchasing involvement from a ROT perspective, the changing practices can be explored in this research from a holistic view. The performed theoretical review leads to the research model in Figure 6, which includes the ROT constructs with practises found in earlier research to explain purchasing involvement and shows how this research will investigate how these practices fall into the different phases of the stage structure. Since the concept of ROT in a purchasing context is relatively unexplored and the changing practices of purchasing during an innovation project have not

been considered before, the nature of this research will be explorative to learn more about the concepts and how they are connected.

Figure 6 - Reserach model



Note. In this research model, purchasing involvement is divided into the three ROT constructs Structuring, Bundling and Leveraging. The practices found in literature about ROT in a purchasing context are placed below each construct. Finally, the five stages for radical innovation projects are shown to relate the involvement of purchasers to different project phases.

3 Methodology: Performing semi-structured interviews with purchasers involved in innovation projects

3.1 Research design: Qualitative, explorative semi-structured interviews

The design of research can be differentiated into quantitative and qualitative. “Quantitative research examines relationships between variables, which are measured numerically and analysed using a range of statistical techniques” (Saunders et al., 2012, p. 162). It is often used to verify certain phenomena and confirm relationships from a theory (Gelo et al., 2008, pp. 271-272). Qualitative research is more interpretive since the researchers “need to make sense of the subjective and socially constructed meanings expressed about the phenomenon being studied” (Saunders et al., 2012, p. 163). With this approach researchers tend to understand the personal side of the individuals and the research is usually “inductive and data-driven” (Gelo et al., 2008, p. 272). In qualitative research, the theories are built from observations of phenomena (Gelo et al., 2008, p. 272). Since the research into ROT in a purchasing context is still in its infancy with only one paper written about the concept (Schmelzle & Tate, 2022), the concept is not yet in a phase where the theory can be tested in quantitatively. This research will therefore follow a qualitative research design.

The second differentiation that is often made in a research design, is the difference between explanatory, descriptive and explorative research. Explanatory studies are “studies that establish causal relationships between variables” and this type of research is often combined with quantitative research (Saunders et al., 2012, p. 172). The goal of descriptive research is “to gain an accurate profile of events, persons, or situations”, but this research type is often combined with an explanatory study because merely describing phenomena without drawing certain conclusions is often not sufficient for a research project (Saunders et al., 2012, p. 171). The last research design is explorative, which is useful for understanding the exact nature of a problem and “is a valuable means to ask open questions to gain insights about a topic of interest” (Saunders et al., 2012, p. 172). This last research design is most suitable for this research, in combination with the qualitative research approach (Gelo et al., 2008, p. 272), because the focus is on further exploring the concept of ROT in purchasing. However, it should be noted that the research design can be a combination of the three discussed approaches (Saunders et al., 2012, p. 170) and that therefore the research also has a descriptive nature. This means that the focus of the interviews will lay on how the role of purchasing is currently organised and not how it should be.

The research design is becoming more clear with an explorative, qualitative approach. A research strategy and method should be considered next. In qualitative research, there are four research strategies: case studies, ethnographic studies, action research and grounded theory (Saunders et al., 2012, p. 173; Schiele et al., 2022, p. 287). Case studies are focused on the description of a research topic within its context or a few contexts (Saunders et al., 2012, p. 179). In ethnographic studies, the researcher will be embedded in the study object, for example, a specific group of people (Schiele et al., 2022, p. 287). Action research is an emergent and iterative process in which practical problems are being tried to solve (Saunders et al., 2012, p. 183; Schiele et al., 2022, p. 287). Grounded theory is a research strategy in which a theory is developed inductively from a dataset, without proposing a theory upfront (Saunders et al., 2012, p. 185; Schiele et al., 2022, p. 287). Since this research is exploring the relatively new framework of ROT in a purchasing context, no well-established theory is tested. The research strategy is therefore close to the ground theory strategy since the found data will be analysed from the ground up without having a specific theory upfront.

Next to consider are the different research methods. Saunders et al. (2012, p. 400) describe for example group interviews and focus groups. Both methods can generate data in a short amount of time, but the opinions or answers can be influenced by the presence of the other participants. This research project benefits most from one-on-one interviews with purchasing professionals involved in innovation projects so that their expert opinions on the subject will be unfiltered. By interviewing respondents from different companies, the researcher will also be able to analyse and compare the different situations with each other to find interesting results. Lastly, one-on-one interviews enables respondents to participate anonymously in the research, which will likely improve their willingness to participate and share information. Saunders et al. (2012, pp. 374-375) describe three types of interviews: structured, semi-structured and unstructured. In a structured interview, the questions are predetermined and standardised for each respondent, whereas unstructured interviews are informal and without a predetermined set of questions. Semi-structured interviews are structured to some level by having a list of themes or questions ready, but the researcher can add and remove questions during the interview. If certain answers are particularly interesting, this semi-structured format allows the researcher to ask follow-up questions to further deepen the understanding. However, the data is still rich and generalizable since most questions will be asked to all respondents. Since this research has an explorative nature to

refine theoretical knowledge, the method used in this research will be semi-structured interviews (Saunders et al., 2012, p. 378; Schiele et al., 2022, p. 288).

3.2 Data sampling: Interviews with purchasers involved in radical innovation projects in the manufacturing industry

The interviewees were not randomly selected, since specific manufacturing companies were targeted. Purchasers involved in innovation projects with their suppliers were reached out to, since they could provide the best input about the purchasing practices in innovation projects. The interviewed companies were working in different industries, such as high tech, machine building and automotive, as can be seen in Table 5. However, each company was active in producing, manufacturing and/or building some sort of product or component. The interviewees had an average work experience in purchasing functions of seventeen years. The respondents were found in several ways: about one-third were found via the network of consultancy firm Supply Value, one-third via the researchers' network and one-third via cold networking. This last group of people were found by searching relevant Dutch manufacturing firms and sending messages to purchasers that seem to be involved with innovation projects based on their function. After reaching out to the respondents, a screening took place to find out if they could actually help in answering the research question. This was done via email with an explanation of purchasing involvement and radical innovation projects and in a few cases even with phone calls to further explain the nature of the research and find out if the potential respondents were a good fit.

Table 5 - Research sample with participant and company characteristics

Respondent number	Job title	Purchasing experience (in years)	Industry	Number of Employees	Company Revenue	Purchasing spend
R1	Procurement Manager Program Manager	26	High Tech	600	€200M	€140M
R2	Purchasing Innovation	24	Pharmaceutical	51.950	€22.4B	€17.3B
R3	Project Buyer	4	Automotive	650	-€65M	-
R4	Project Buyer	3	Machinery	555	€143M	€72M
R5	Senior Strategic Buyer	23	Machinery	800	€174M	€70M
R6	Strategic Buyer	35	Shipyard	500	€157M	-
R7	Global Sourcing Buyer	28	Machinery	1.000	€399M	€145M
R8	Project Buyer	23	High Tech	900	€25M	€18M
R9	Director Sourcing & Supply Chain	15	High Tech	37.000	€21B	€10.7B
R10	Supervisor Purchasing Department	17	Manufacturing	250	€70M	€27M
R11	Supply Chain Manager	10	Manufacturing	150	€40M	-
R12	NPI project buyer	9	High Tech	1.750	€702M	€526,5M
R13	Purchasing Manager	12	Automotive	5.500	€906M	€600M
R14	Project Buyer	5	High Tech	600	€145M	€110M
R15	Global Sourcing Director	17	Automotive	500	€230M	€110M

18 interviews were performed with manufacturing companies from the Netherlands and Sweden and took between 45 and 90 minutes. 15 interviews were processed for this research, but the last three interviews did confirm the results and did not hold any data that differed from the other interviews. After 6 interviews, a first indication of the results was discussed with the practical and first supervisor. This first indication of results was confirmed by interviews 7 to 12. After interview 12, the researcher heard barely any new insights and therefore was theoretical saturation (Saunders et al., 2012, p. 186) reached after 15 processed interviews. Each respondent was involved in innovation projects with suppliers or a purchasing manager of the department where purchasing involvement was initiated from. In 11 interviews the interviewee talked about a specific innovation project in which it was involved, but in 4 interviews the role of purchasing was described in a more general way, often because the interviewee was a purchasing manager and not directly involved in projects

themselves. The data was still useful because these 4 interviewees were all from mature companies with a clear internal structure and process definition of purchasing involvement. The interviewees were not directly involved in the projects but were well-informed about the role, tasks and practices performed by their purchasers in innovation projects. Lastly, all cases discussed innovation projects concerning a product or component which was new or different from what they had done before and could be considered a radical innovation.

3.3 Semi-structured interview guide: Divided into four sections

The research design and method are discussed in chapter 3.1. In chapter 3.2 the selected interviewees are discussed and in chapter 3.3 the focus is on the interview guide used to perform the interviews.

The interview guide was structured in four sections. The first section was the introduction section, in which the research(er), purchasing professional and company were introduced. This section was about making the intentions of the interview clear and included a privacy statement. The goal was to make the interviewee feel at ease with a few simple questions. The introduction of the company often led to a natural transition into section two, which was about finding the characteristics and context of the company and purchasing department. These questions were based on the most important contingency factors, as discussed in chapter 2.3.3, and included questions about the company size (employees and revenue), purchasing maturity, purchasing department structure and amount of R&D employees. These characteristics can later be used to find similarities and differences between the companies and give more depth to the results. The final questions of this section were about the involvement of purchasers in innovation projects, which made the transfer to the next section of the interview more fluent.

The third section of the interview was about trying to answer the research question of the changing practices of purchasing during an innovation project. At this point, a choice was made on whether or not the interviewee wanted to talk about a specific project in which it was involved or that they wanted to talk in a more general way. If the interviewee chose a specific project, the characteristics of the project such as the focus, complexity, newness of suppliers and duration were identified. The third section was structured according to the stages structure discussed in chapter 2.2 (Cooper, 1994, p. 5). The structure can be found in Figure 7 and in the earlier discussed research model as well. The researcher would explain the structure to the interviewee and give a definition of the first stage and what it generally

entails. The research would then ask the interviewee about the role, activities, tasks and responsibilities of a purchaser in that stage of the project. This process was repeated for each stage.

Figure 7 - 5 stage radical innovation project structure based on Cooper (1994, p. 5)



Finally, the last section of the interview consisted of a few closing questions to get the opinions of the respondents on the research topic. This included questions about activities outside the scope of the 5 stages structure, which stage purchasing had the most impact and which qualities purchasers added to innovation projects. Lastly, a question about which factors made it possible for purchasing to be involved was included.

Before the first interview was conducted, two test interviews with senior procurement consultants were done, also known as ‘pilot interviews’ (Castillo-Montoya, 2016, p. 827). These were performed to practise the guide in real life, but also to finetune the questions. After the first two actual interviews with purchasing professionals, the interview guide was discussed with the university supervisors to evaluate the results and if they were as expected. The interview guide gave the expected results and there was only one question added about the ambidexterity role (Constant et al., 2020) of purchasers and how the interviewees dealt with that role. Each interviewee was also informed a few days before the interview about the themes and structure of the interview, including the structure of the 5 stages of an innovation project (Saunders et al., 2012, p. 385). The complete interview guide can be found in Appendix A.

3.4 Data analysis: Analysing the data in a structured way

The data can be analysed in two ways: deductive and inductive. In the deductive approach, the research will use existing literature to shape the analysis of the data. This approach is criticised because the perspective on the reality of the data is limited only to the used theory, by which the research disregards potentially interesting results falling outside the scope of the theoretical framework (Saunders et al., 2012, p. 548). The inductive approach is data-driven and explores which categories or themes come up from the data itself. However, this approach does not mean that the researcher can disregard its theoretical framework since the research still needs “a competent level of knowledge about that area” (Saunders et al., 2012,

p. 567). Saunders et al. (2012, p. 549) also mention that often elements of both approaches are used in analysing the data.

This research will follow an inductive approach. As discussed in chapter 3.1, the nature of this research is explorative, which fits well with an inductive analysis approach (Saunders et al., 2012, p. 567). Besides, an inductive research approach will give the opportunity to fully capture the views of the respondents, without being constricted to a theoretical framework. The theory that will emerge from the data will be 'grounded' in the reality of the respondents (Saunders et al., 2012, p. 567).

In the inductive approach, there are two main analysis procedures: grounded theory and thematic analysis (Robson & McCartan, 2016, p. 461). In the purely inductive grounded theory, the task is to find a central core category that grounded in the data. This is done by three types of coding: open coding, axial coding and selective coding (Robson & McCartan, 2016, p. 481). In thematic analysis, the data is also coded first, but then the codes will be combined into multiple themes, categories or labels. The thematic analysis allows for more flexibility in predetermining the themes based on the theoretical framework and research model (Robson & McCartan, 2016, p. 475; Saunders et al., 2012, p. 572). Since this research is partially testing the earlier found ROT activities, thematic analysis fits this research best because it combines an inductive approach with a deductive approach.

Thematic coding analysis is done in 5 phases: familiarizing with the data, generating initial codes, identifying themes, constructing thematic networks and making comparisons and lastly, integration and interpretation (Robson & McCartan, 2016, pp. 468-476). Familiarizing with the data is an ongoing process in which the researcher searches for meanings and patterns in the interviews. In the initial coding, the data is coded with codes that describe what is in the data. This is also known as open coding and has the goal of covering all the information that is present in the interviews. In the next phase identifying themes, the codes are grouped into meaningful themes and sub-themes. These themes can emerge from the data by comparing multiple interviews, but can also be inspired by the theoretical framework. The ROT practices in a purchasing context as described in the research model in chapter 2.6 are examples of the practices that were looked for in the data. Examples are Market Scanning, Resource Portfolio Updating and Internal Alignment. The process of identifying themes is iterative, where the codes are analysed multiple times to

examine if the themes still cover the data correctly (Robson & McCartan, 2016, pp. 468-476).

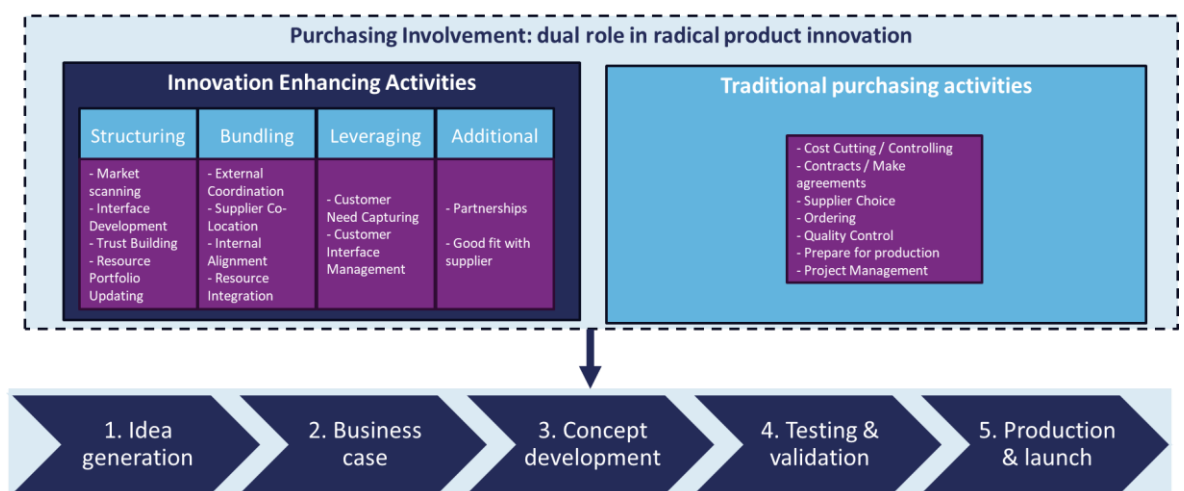
All interviews were recorded and transcribed in Amberscript. Atlas.ti was used for the coding process. The described coding process resulted in 591 quotations, 634 codes, 46 sub-themes and 2 main themes, partially based on the research model. Chapter 4 is dedicated to the results of the described research design and method in chapter 3.

4 Results: Empirical data on the purchasing practices in radical innovation projects

4.1 Purchasing involvement activities can be grouped into innovation enhancing and traditional activities

Two main themes were found when coding the activities: innovation enhancing and traditional activities. The innovation enhancing activities have four subthemes, of which three are from the research model as described in chapter 2.6. These are the three constructs found in the ROT known as structuring, bundling and leveraging. These activities can be seen as the results relating to the theoretical framework, with the subtheme of ‘Additional innovation enhancing activities’ and the second main theme of traditional activities relating to the results falling outside the scope of the established theoretical framework in chapter 2.6. The two main themes occurred from the data, but can also be related to the dual or ambidexterity role of purchasing as discussed in chapter 2.3.2. The results lead to an updated version of the research model presented in chapter 2.6 and can be found in Figure 8, where the ‘Additional innovation enhancing activities’ and ‘Traditional purchasing activities’ are added to the concept of purchasing involvement. In the purple blocks below structuring, bundling and leveraging the practices from the research model are found. In the purple blocks below the additional and traditional results, the practices mentioned most often are placed.

Figure 8 – The updated research model based on the results



In chapter 4.2, the themes concerning the ROT constructs of structuring, bundling and leveraging are further explored with first-order codes and representative quotes of the different themes. Chapter 4.2.4 discusses the additional innovation enhancing themes falling

outside the research model. Chapter 4.3 is dedicated to the traditional activities and all the sub-themes found in that main theme. In chapter 4.4, the five-stage structure of the research model is re-introduced to deepen the understanding of the changing practices of purchasing in innovation projects. Afterwards, chapter 4.5 is dedicated to a few additional results and insights. At last, in chapter 4.6 a visual representation of the results is made.

4.2 Structuring, bundling and leveraging activities

4.2.1 Structuring: Resource portfolio Updating, Interface Development and Market Scanning

The interviews in which a structuring activity is mentioned can be found in Table 6. The first sub-theme of the structuring construct of ROT activities is ‘Market Scanning’ and is mentioned in 11 interviews. This theme is mainly about scouting new suppliers and technologies and monitoring the current supplier market. R15 mentions how purchasing has to be aware of the trends in the market to provide valuable input in innovation projects: *“The added value from purchasing comes from [...] that you also have to understand very well what is happening in the market? What are the trends in the market and linked to this, that you have a good understanding of what your suppliers are doing and that you can provide that as input within the idea generation phase.”* Furthermore, R5 describes that purchasing should constantly be looking in the market: *“You always have to look: what is happening in the market? Are new parties emerging, other parties, smarter new developments?”*

Table 6 - Cross-comparison between the structuring activities and respondents

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Totals
Structuring																
Market Scanning	X				X	X	X		X	X	X	X	X	X	X	11
Interface Development	X	X	X	X		X	X	X	X	X	X	X	X			12
Trust Building	X	X	X	X					X	X					X	7
Resource Portfolio Updating	X	X		X	X	X		X	X	X	X	X	X	X	X	13

Note. X means that the code is mentioned at least once by that respondent.

The second structuring activity is ‘Interface Development’ and is mentioned in 12 different interviews. Interface Development is concerned with the task of establishing the communication between the supplier and R&D or engineering department, but also being the point of contact for the suppliers because as purchasing, you are responsible for the suppliers. R10 for example describes the process of contacting ten key suppliers: *“So last*

week I emailed ten suppliers, giving some context with the knowledge I gained from those meetings I attended. [...] 'We give more priority to R&D, we have more projects that we are starting up. You are key suppliers for us, how can we take care of this together, so that we have a fixed schedule? [...] What is possible? What do you need from us?' A piece of evaluation, I want to include, must cover a piece of NDA and that engineers can also contact them directly." R3 described the role of purchasing as one of a mediator: *"We are a kind of mediator for both parties (internal and supplier), so we have to keep our engineers and our internal and external customers happy. But also the supplier, we should keep it satisfied by not going back every time and saying adjust this, adjust that? There will be another update here, another revision here. So yes, we try to find a certain middle ground in that and that is actually always the case."* Furthermore, R7 discusses the fact that purchasing often has to make the connection to the supplier market for supplier resource integration, but this does not happen in all cases: *"So you see that with some product groups we are involved quite quickly, so to speak, and we are asked to make that connection on the supplier market. Others still hold back a bit, but it is clear from management that this integration must take place more quickly."*

The third structuring activity is 'Trust Building' which is mentioned in 7 interviews. Examples of Trust Building are Supplier Relationship Management, trying to become a preferred customer by creating a connection with the supplier and offering a certain assurance to the supplier. R4 mentioned the following regarding supplier assurance: *"And the suppliers do have, I think, a certain luxury. Of course, once we choose a supplier in a machine, it will stay on that machine forever unless it really messes up. So of course we choose based on specs and price, for example we choose a certain set of engines or hydraulic supplier. [...] They have a certain luxury, that if we say we expect to do 10 pieces and then 20 pieces a year consistently. That is a piece of revenue security."* Other respondents also mention the importance of Supplier Relationship Management, like R2: *"A piece of discovery, where we get ideas for new applications [...] from suppliers. So that's a discovery phase and [...] that is also the background of our SRM program, Supplier Relationship Management Program, to ensure that those ideas reach us first."* R9 also confirms the importance of relationship management and trust building: *"Yes, if I ask my manager what is the most important thing to do: she will say, you have to make sure the relationship between the supplier and us is well managed."*

The fourth structuring activity is ‘Resource Portfolio Updating’ and was mentioned in 13 interviews., which made it the innovation sub-theme most mentioned. Examples of found activities were assessing the supplier performance, comparing different suppliers and being aware of the issues the suppliers are dealing with. R1 for example mentioned the audit of suppliers: *“Which suppliers are suitable? Are those suppliers, if they are already in the portfolio, have they been audited, are they performing well. If they are not yet in the portfolio, then you are going to explore: do they fit into our portfolio?”* R12 discusses the importance of knowing the development of your supplier: *“And well, then it is useful that you also know [...] where the most critical suppliers are in their development.”* Some firms even follow the market trend closely and prepare a supplier portfolio for potential future projects, like R1: *“Yes, that's starting to take off now, so we've been looking for two, two and a half years from purchasing, which companies are developing well on that (that = a new, complex product) now, so that we're preparing for the first customer to come [...] That we already have several parties ready. [...] but the preparatory process is already underway there. Not that we will get a project like this in six months' time and then we will have: ooh that's interesting, which suppliers should we have for that.”* R15 also mentions the importance of constantly scouting the (suppliers) market: *“You always have to look: what is happening in the market? Are new parties emerging, other parties, smarter new developments?”*

Next to finding the structuring activities, the activities can also be related to the 5 phases structure of innovation projects. As can be seen in Table 7, the codes that could be related to the phases, are mostly related to the first three phases. It is important to notice that of the 90 structuring codes, only 42 could be related to one of the phases and that the others are in the category of ‘not contributed to a phase’. These codes were too general to relate to any phase, took place continuously or happened before the first phase of the defined structure. An example is given by R8, which discusses the ongoing process of maintaining a preferred supplier list, which is a quote coded to the Resource Portfolio Updating theme: *“Suppliers are chosen [...] and you choose those suppliers on the basis of a preferred supplier list. And maintaining a preferred supplier list [...] that goes beyond the projects. Now we do that as project buyers, we do that together, so we have a list and we also run vendor ratings on that. So we do see to what extent our suppliers perform well or less well. So that is definitely still running in the background.”*

Table 7 - Structuring activities per project phase

	Interface Development (28)	Market Scanning (18)	Resource Portfolio Updating (34)	Trust Building (10)
Phase 1 - Idea generation/scoping	3	5	3	1
Phase 2 - Business case	5	1	5	0
Phase 3 - Development	8	1	4	1
Phase 4 - Testing & validation	3	0	0	0
Phase 5 - Launch	0	0	0	0
Not contributed to a phase	11	11	26	8

Note. Cross-comparison for codes related to which phase the activity is performed. The last category is the codes that could not be contributed to one of the phases.

The key takeaways for the structuring activities are that the activities of Market Scanning, Interface Development and Resource Portfolio Updating are mentioned in many interviews. Furthermore, the structuring activities are concentrated in the first 3 phases of the innovation project.

4.2.2 Bundling: Resource Integration and Resource Re-configuration, Internal Alignment and External Coordination

Each interview in which a bundling activity was mentioned at least once can be found in Table 8. The first bundling sub-theme is ‘External Coordination’ and is mentioned in 7 interviews. The sub-theme involves activities like strategically managing suppliers, communicating with suppliers about the progress and forecasts of the innovation project and managing the growth opportunities of suppliers. R2 explains managing suppliers strategically as follows: *“It’s also about the expectations you create, there are things that are very strategic for a supplier, but are actually quite small in terms of money for us. These are very strategic for the supplier. Then you just have to manage it well, jointly.”* Furthermore, R8 explains the importance of supplier management and coordination for innovation projects: *“Supplier management, well, the better we manage our suppliers, the better we can run our projects, right, so you also need the one for the other.”* R9 gives an extensive example of how they coordinate and communicate their future plans with their suppliers: *“We share [...] a plan of the mix of machines that we are going to make in the next two to five years, where we think we are going to grow and we share that with those suppliers. Of course we also want feedback on that, that suppliers indicate: ‘yes, we can grow with you’ or ‘pay attention, we are now at the max of our current location, we have to add a location, but are you sure that you will grow that much?’ We spend a lot of time discussing those kinds of things with the supply chain.”*

Table 8 - Cross-comparison between the bundling activities and respondents

Bundling	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Totals
External Coordination	X	X						X	X	X		X			X	7
Supplier Co-location					X											1
Internal Alignment	X	X		X	X			X	X	X	X				X	9
Resource Integration and Resource Re-configuration		X	X	X	X		X	X			X		X	X	X	10

Note. X means that the code is mentioned at least once by that respondent.

The second sub-theme of the bundling construct of the ROT activities is ‘supplier co-location’ and is only mentioned in one interview. R5 describes the process of how it was not just a supplier visit, but more elaborate: *“This can also be due to innovation. So what we were already doing there was dual sourcing in China. Not just ordering in China, no, we had a team in China, we had quality engineers, purchasing, we audited the supplier there, built prototypes, tested the machine on our production lines with a trial batch.”*

The third sub-theme of bundling is ‘Internal Alignment’ and is mentioned in 9 interviews. Internal alignment concerns the communication with other departments and the managing and structuring of internal stakeholders. For example, R4 describes the importance of cross-functional teamwork and how purchasing is involved: *“It is a teamwork, so to say, engineering, purchasing, supplier and I think that is also a point that we are already working on, which is also pressed by our manager, that we are really actively involved in this. So that engineering also respects our opinion in this and that we also have a choice and that we are not already being pushed in a certain direction.”* R10 describes what happens when the internal alignment is not functioning well: *“Engineers who will make requests to suppliers themselves, for example with drawings, without involving purchasing. That has happened and is happening and I find that very worrying, so I looked for that in myself and asked the engineers: ‘Is it clear to you how the lines run?’”*

The final sub-theme of the bundling construct is ‘Resource Integration and Resource Re-configuration’ and is mentioned in 10 interviews. The sub-theme consists out of activities like transferring knowledge, feedback or technologies from the suppliers to the R&D or engineering department. R13 describes how the early integration of supplier knowledge can progress their innovation project: *“You involve the supplier at some point [...] and that can be early absolutely, it can be very early, to get their input and to get their knowledge about*

the product for you to be able to progress in your project.” R11 confirms the integration of developments of suppliers: “adopt the developments from suppliers in our company.” Lastly, R13 explains why purchasing should be involved in an early stage of development: “Purchasing should also be involved in an early stage in a development, because purchasing may have comments or an insight of what different suppliers do.”

Next to finding the bundling activities, the activities can also be related to the 5 phases structure of innovation projects. As can be seen in Table 9, the codes that could be related to the phases, are mostly related to the first four phases. It is important to notice that of the 52 bundling codes, only 22 could be related to one of the phases and one code can be assigned to multiple phases. The other codes were too general to relate to any phase or took place continuously. Supplier coordination and management is an ongoing process, just like setting up the internal structure for information and knowledge sharing. R4 gives an example of improving their cooperation with R&D continuously for internal alignment: *“Just general improvement projects in the purchasing department of which you are of course also a part, for example the process in collaboration with R&D. That is not specific to 1 project, but once a month we meet with our department anyway to improve that process with R&D. Those are things that do not specifically affect a project or a product, but of course that also ensures that things run smoothly.”*

Table 9 - Bundling activities per project phase

	External Coordination (15)	Internal Alignment (13)	Resource Integration and Resource Re-configuration (23)	Supplier Co-location (1)
Phase 1 - Idea generation/scoping	1	0	5	0
Phase 2 - Business case	0	1	3	0
Phase 3 - Development	1	1	6	0
Phase 4 - Testing & validation	1	3	0	0
Phase 5 - Launch	0	0	0	0
Not contributed to a phase	12	8	9	1

The key takeaways for the bundling activities are that the activities of Internal Alignment and Resource Integration and Resource Re-configuration are mentioned in many interviews. Furthermore, the bundling activities are concentrated in the first 4 phases of the innovation project, but External Coordination and Internal Alignment are often not contributed to a specific phase.

4.2.3 Leveraging: Customer Need Capturing

Each interview in which a leveraging activity was mentioned, can be found in Table 10. The last ROT construct is leveraging and the first sub-theme is ‘Customer Need Capturing’, which was mentioned in 8 interviews. The activities found were mainly about involving customers, sales or marketing in the innovation project. R14 states that they have a weekly meeting with the customer in their current innovation project: *“Purchasing is very closely connected with the team, also with the customer. So we have weekly meetings with the customer, so basically any problems that arise, we address them immediately.”* R6 also mentions market testing: *“So we will find x number of suitable alternatives. For each different type, you will make a plan together with sales: Okay, what's the market acceptance of those types?”*

Table 10 - Cross-comparison between the leveraging activities and respondents

Leveraging	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Totals
Customer Need Capturing	X		X		X	X	X			X	X			X		8
Customer Interface Management	X													X		2

Note. X means that the code is mentioned at least once by that respondent.

The second and last Leveraging sub-theme is ‘Customer Interface Management’ which was mentioned in 2 interviews. The found activities concerned having an account manager being involved who was responsible for the customer. R1 describes it as follows: *“Each project has an account engineer and that account engineer is also directly linked to the customer. So that account engineer really does the straight communication with the customer, all questions. So with that we actually safeguard the customer's interests and the salesman who joins in to see what the progress of the project is, of course also reports this to his purchasing colleagues on the customer side.”* R14 mentions a similar customer interface structure: *“A program manager who is account manager for everything a customer does with us. So that goes from design to production. And in principle, the project leader is subordinate to the program manager, who is actually also the direct point of contact for the customer.”*

The two sub-themes of leveraging were also linked to stages, where only Customer Need Capturing has any links to the stages. The results can be found in Table 11 and show that Customer Need Capturing was found 2 times in all first three stages. R10 for example

explains that in the idea generation/scoping phase, the idea of the customer was important: “marketing and sales have been very involved in this phase. [...] This was initiated from the wishes of the customer.”

Table 11 - Leveraging activities per project phase

	Customer Interface Management (3)	Customer Need Capturing (8)
Phase 1 - Idea generation/scoping	-	2
Phase 2 - Business case	-	2
Phase 3 - Development	-	2
Phase 4 - Testing & validation	-	-
Phase 5 - Launch	-	-
Not contributed to a phase	3	2

The key takeaways for the leveraging activities are that both activities were not mentioned often in the interviews. When the activity of Customer Need Capturing, was mentioned, it was often performed in one of the first 3 phases of the innovation project.

4.2.4 Additional innovation enhancing practices: Partnership and Good fit with supplier

During the analysis, other additional innovation enhancing practices next to the ROT activities from the research model came up. Six sub-themes emerged from the data which could not be (directly) linked to the research model. In this chapter 4.2.4, the 6 additional sub-themes are discussed with a short explanation and examples. An overview of which respondents mentioned which activity can be found in Table 12.

Table 12 - Cross-comparison between the additional innovation enhancing practices and respondents

Additional innovation	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Totals
Partnership	X		X	X	X		X		X			X				7
Good fit with supplier	X		X				X		X	X		X			X	7
Supplier visits	X											X		X	X	4
Roadmapping with suppliers					X		X		X			X				4
Functional specifications, have a frame but use supplier knowledge	X			X				X			X					4
Divesting suppliers/resources		X								X			X			3

Note. X means that the code is mentioned at least once by that respondent.

The first sub-theme is ‘Partnership’ which is mentioned in 7 interviews. The interviewees often discussed the importance of having supplier partners and how they as purchasers were key in setting up a partnership. The term was used interchangeably with co-development, preferred vendors and having suppliers that want to think along with the buying company. The sub-theme is connected to the structuring activity of Trust Building discussed in chapter 4.2.1, but the term ‘partner’ was explicitly mentioned in such a regular fashion that it is considered a separate sub-theme. For example, R12 mentions having strategic supplier partners: *“But we also have a few strategic partners in terms of suppliers that we do things with, that we're so open with, about what they're developing.”* R3 mentions the advantage of having short lines with partners: *“Yes, at an early stage we do try to enter into a partnership with some suppliers for certain important components in the car, because then we can respond much more flexibly, but also more quickly, more responsively, towards the market. The lines are shorter. So we prefer to continue from the partnerships we already have.”* R4 adds to the advantages of familiarity and price benefits: *“We do have a lot of permanent partners, for several reasons. One of the biggest reasons is of course: engineers are often a bit afraid of new things or new contacts. So they prefer, if they know their way around the engines at a certain supplier, to go there again. Of course, that also has the advantage for us that you don't have ten different engine suppliers. This way you can centralize somewhat and of course also build up a price advantage.”* R1 also mentions that the most successful innovation projects were from an open partnership relationship: *“The best results I've had in these kinds of projects is when from your supply chain really does everything from the partnership relationship and then it goes so far that you are actually completely open, you share your business case with your supplier, you just look in all openness like: hey, how can we do that? What are the challenges we're going to face? If you really work from an open partnership relationship, you get the greatest successes.”*

The second additional innovation enhancing sub-theme is having a ‘Good fit with supplier’ which is mentioned in 7 different interviews. There is an important role for purchasers in selecting suppliers to co-operate with and part of this selection is whether the supplier is a good fit with the buying company. This good fit is determined based on criteria like *“the power relationship, experience with supplier, sustainability and having the same mission and vision”* [R3], but also *“the capability and capacity of the supplier”* [R9] and *“the match on soft aspects”* [R1] were important factors in selecting suppliers for closer

cooperation. The role of purchasing in selecting a supplier with the right fit with the buying firm was particularly important when selecting unknown suppliers for supplier involvement.

‘Supplier visits’ is the third additional innovation enhancing sub-theme which is mentioned in 4 interviews. This sub-theme describes the activity of the purchasers visiting (potential) suppliers with their engineers. R12 described it as follows: *“The first step of purchasing was to take engineering to potential suppliers, based on the concept that was on paper at the time, to find out who could help to develop the concept.”* But also R14 mentions the importance of checking the producibility of a design with the supplier: *“Only now the question was: can it be produced at all? So then I went to different suppliers together with those design engineers to look at: hey, can you make this, do you have any comments about this? And how can you possibly help us with this? So that is actually what I did on the front part, to actually support our design department with the question: is this even feasible and what does the supplier say that will later have to build it?”* This sub-theme can be related to the Supplier Co-Location of the bundling construct since it has the same goal of integrating external resources to create new capabilities.

The fourth additional innovation enhancing sub-theme is ‘Roadmapping with Suppliers’ which is mentioned in 4 interviews. This sub-theme entails the technology or cost road maps that some firms share or make together with their suppliers. R9 describes roadmaps as follows: *“So for example we have the idea of a roadmap, so that's actually the idea of what the landscape of our system could look like seven years from now, in 2030.”* R7 also explains how the roadmap might relate to the supplier’s roadmap: *“We do a bit of roadmapping, [...] the supplier of course also has its own portfolio and development program.”*

The fifth sub-theme is ‘functional specifications’ which is mentioned in 4 different interviews. This sub-theme is about making sure that the concept is specified in a functional matter so that the purchasers prevent a lock-in with one supplier and leave room for suppliers to add their knowledge to the concept and innovation project. The purchasers play an important role in preventing early over-specifying, as described by R1: *“We make sure [...] that we don't already have a complete, clear cut idea [...] but that we allow the supplier to add his value and say: ‘hey, it can also be done like this and it can be done like that’. [...] So that you get the optimal solution.”*

The last additional innovation enhancing sub-theme is ‘Divesting Supplier/Resources’ which is mentioned in 3 interviews. This sub-theme is particularly interesting because it is a sub-theme mentioned by Schmelzle and Tate (2022, p. 6) as a bundling activity that they did not find in their data because the ‘purchasers focused more on getting resources than divesting them’. However, in this data set, R2, R10 and R13 mentioned the role of purchasing in terminating contracts and cooperations with suppliers. R10 mentions: *“In fact, suppliers who don't want to cooperate, I tend to look if we can say goodbye to them. It really just has to do with our future, our development and does a supplier think it is important enough to think along with us. Or does it only want to deliver the standard products as it can deliver now. So I think it's a weighing moment.”*

To summarise, 6 additional innovation enhancing activities were found next to the research model, in which especially Partnership and Good fit with supplier were mentioned in many interviews.

4.3 Traditional activities: Cost controlling and Contracts

In chapter 4.2, the first main theme of innovation enhancing activities is presented, which largely incorporates the research model with the three ROT constructs that resulted from the theoretical framework. The activities in this second main theme occurred when inductively coding the data from the interviews. However, these activities could not be related to the research model and became a separate main theme. Chapter 4.3 presents the results of this second main theme ‘Traditional activities’ and shortly depicts the most interesting or hard-to-understand sub-themes.

Table 13 - Cross-comparison between the traditional activities and respondents

Traditional activities	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Totals
Cost cutting / controlling	X	X	X	X	X	X	X	X	X	X	X	X	X		X	14
Contracts / make agreements	X	X	X	X	X	X	X	X				X	X	X	X	12
Supplier choice	X		X	X	X			X	X	X		X		X		9
Ordering	X			X				X		X	X	X	X	X	X	9
Quality control			X	X		X	X		X	X		X	X		X	9
Prepare for production	X		X	X				X	X	X		X		X		8
Project management		X		X	X	X		X	X		X		X			8
Make business case from cost perspective	X					X		X	X		X	X				6
Leadtime, time management, project planning	X		X			X			X					X		5
Identify risk items, critical part list				X					X			X		X		4
Escalations after finishing project		X	X			X			X							4
Availability products						X						X			X	3
Negotiate		X											X			2

Note. X means that the code is mentioned at least once by that respondent.

The 13 traditional activities distinguished from the data and which respondent mentioned which activity, can be found in Table 13. The most mentioned sub-theme was ‘Cost cutting/controlling’, which are all the different activities that purchasers perform in an innovation project related to controlling, calculating or reducing costs. Often the purchasers have a commercial role in which they see the bigger picture and look at the total cost of ownership. R13 describes it as follows: “So we come in [...] with a commercial perspective on different things and have a good input of what is commercially effective when you develop a product.” The second most mentioned sub-theme, that occurred in 12 different interviews, is ‘Contracts / make agreements’. This sub-theme refers to setting up supply contracts, non-disclosure agreements and contracts around co-development, which is often handled by the purchasers involved in the innovation project. R2 states the following: “Purchasing’s role is [...] to guarantee the volumes and to set the prices and contracts.” The third sub-theme is ‘Supplier choice’ and concerns the selection of the supplier based on for example “technology, quality process, capacity and cost down targets” [R9]. R1 also discussed the role of purchasing in preventing a supplier lock-in early in the innovation project: “When

you choose components, fine, but let multiple parties make quotes, so we don't get a lock-in" [R1]. The fourth sub-theme is the actual 'Ordering' of products and components for the prototypes, test design and actual production. The fifth sub-theme is 'Quality Control', where purchasing has an important role in assuring that the quality of the purchased products is sufficient for the prototypes and test series. For example, R12 discusses the purchasing responsibility for the quality audit: *"But the project buyer makes sure that we are going to do that quality audit and that we have removed the risk from the product and that we know that when we start, it will be good."* The next sub-theme is 'Prepare for production', which is often performed during the last two phases of the project stage structure. Examples of this sub-theme are *"creating a transfer document for operational purchasers"* [R8], *"set up systems"* [R1] and *"assuring supply of products"* [R14]. The seventh sub-theme is called 'Project Management' and concerns *"coordinating the project"* [R11], *"managing commercial procedure and expectations"* and *"report to management."*

The 6 least mentioned traditional sub-themes will not be discussed in detail, since these sub-themes are self-explanatory. Only 'Escalations after finishing project' needs some explaining. This sub-theme regards the involvement of purchasers when after launching the project, unexpected problems occur with regards to the supplier. R3 explains it as follows: *"And yes, if there are escalations, something is not up to standard or material is not available. [...] then we are called again as a project buyer, then we step in, solve the problems and then we step out again."*

To summarise, a second main theme next to the main theme of innovation enhancing activities that could mostly be related to the research model was found in the data. The most mentioned sub-themes of these traditional activities were 'Cost cutting / controlling' and 'Contracts / make agreements'. An overview of the amount of respondents mentioning each innovation enhancing and traditional activity can be found in Appendix B.

4.4 Insights per phase: from innovation enhancing to traditional practices

The research model discussed in chapter 2.6 included the five-stage project structure for innovation projects from Cooper (1994, p. 5). Chapter 3.3 showed that this structure is used in the interviews to understand the practices of purchasing in a particular project stage. This chapter 4.4 goes into results regarding the activities found in different phases.

First of all, the stages cannot be seen as completely separate, since they often show some overlap. R2 also explains the iterative process that often occurs in innovation projects: “*You don't know the exact working of the concept in advance, not even after testing, that's really in that development phase, and then you go through that business case iteratively.*” Secondly, as discussed in 4.2.1 structuring and 4.2.2 bundling, it is often hard to allocate certain innovation enhancing activities to phases since they are more general or continuously ongoing.

The results of the different activities of the two main themes in comparison to the 5 phases can be found in Table 14. Of the 197 innovation activities only 83 could be related to any of the phases and of the 185 traditional activities from the data, only 116 activities could be related to any of the phases. The activities were coded to one of the phases if they were an explicit answer to questions about the purchasing practices in a particular stage. Only if the interviewee explained or talked about an activity in another part of the interview that could be clearly linked to one of the phases, it would also be assigned to the phases. Table 14 shows that the innovation activities were mostly performed in the first three phases, where the traditional activities increased in phase 2 and became dominant over the innovation activities from phase 3 onwards.

Table 14 - Innovation and traditional activities per project phase

	Innovation activities (197)	Traditional activities (185)
Phase 1 - Idea generation/scoping	28	8
Phase 2 - Business case	23	22
Phase 3 - Development	25	32
Phase 4 - Testing & validation	6	27
Phase 5 - Launch	0	27

Note. The innovation or traditional codes that could be contributed to one of the phases.

The results shown in Table 14 give an overview of the changing purchasing practices during an innovation project. The activities change from the first main theme of innovation enhancing activities to the second main theme of traditional activities during an innovation project. To further explore the different types of sub-themes and activities that are actually performed in the phases, Table 15 is made to show for each sub-theme in which phase it is performed.

Table 15 - All activities per phase

	Phase 1 - Idea generation/ scoping	Phase 2 - Business case	Phase 3 - Development	Phase 4 - Testing & validation	Phase 5 - Launch	Not contributed to a phase
Innovation						
Structuring						
Market Scanning (18)	5	1	1	0	0	11
Interface Development (28)	3	4	7	1	0	13
Trust Building (10)	1	0	1	0	0	8
Resource Portfolio Updating (34)	3	5	3	0	0	23
Bundling						
External Coordination (15)	1	0	1	1	0	12
Supplier Co-location (1)	0	0	0	0	0	1
Internal Alignment (13)	0	1	1	1	0	10
Resource Integration and Resource Re-configuration (23)	5	3	6	0	0	9
Leveraging						
Customer Need Capturing (8)	2	2	2	0	0	2
Customer Interface Management (3)	0	0	0	0	0	3
Additional innovation enhancing						
Divesting suppliers/resources (3)	0	0	0	0	0	3
Functional specifications, have a frame but use supplier knowledge (4)	2	0	0	0	0	2
Supplier visits (6)	2	3	0	0	0	1
Partnership (16)	1	2	0	0	0	13
Good fit with supplier (10)	3	1	1	0	0	5
Roadmapping with suppliers (5)	0	0	0	0	0	5
Traditional activities						
Cost cutting / controlling (35)	4	6	8	2	0	15
Contracts / make agreements (40)	2	3	6	2	6	21
Supplier selection (15)	2	3	4	2	0	4
Ordering (18)	0	0	3	6	3	6
Quality control (14)	0	0	1	3	2	8
Prepare for production (29)	0	1	2	10	14	2
Project management (9)	0	0	1	0	0	8
Make business case from cost perspective (7)	0	6	0	0	0	1
Leadtime, time management, project planning (9)	0	1	1	0	0	7
Identify risk items, critical part list (7)	0	2	3	0	0	2
Escalations after finishing project (4)	0	0	0	0	0	4
Availability products (4)	0	0	2	0	2	0
Negotiate (2)	0	0	0	0	0	2

Note. Amount of interviews in which the code or activity was mentioned at least once. Certain quotes could not be placed under one of the five phases and are therefore placed in the last column 'Not contributed to a phase'.

Table 15 confirms the changing practices from innovation enhancing to traditional as projected by Table 14. By projecting each sub-theme and how it relates to the five phases, a few results can be noticed. First, the innovation enhancing activities of Interface Development, Resource Portfolio Updating and Resource Integration and Resource Re-configuration are often allocated to one of the first three phases and are responsible for a big part of the innovation enhancing activities in the first three phases as projected by Table 14. External Coordination and Internal Alignment stand out for having a relatively high amount of codes, but only a small amount is connected to a phase. As discussed in chapter 4.2., these activities seem to be more of a constantly ongoing process instead of being specific to one

phase of an innovation project. Secondly, the traditional activities are performed in the last three 3 phases of the project. However, there are two exceptions with the codes of ‘Cost cutting / controlling’ and ‘Make business case from cost perspective’ being mentioned often in the early phases of the project. The focus for traditional activities seems to shift from cost-oriented activities in the early phases to ‘Contracts / make agreements’, ‘Ordering’ and ‘Prepare for production’ in the last phases.

The results have been separated into the two main themes of innovation enhancing and traditional activities. In chapter 4.4 the results connected to the five-stage structure are presented, where it seems like the purchasing practices change from innovation enhancing activities to traditional activities during an innovation project. Chapter 4.5 is dedicated to additional insights resulting from the semi-structured interviews.

4.5 Additional insights: The diverse role of purchasers, purchasing can have the most impact in the early phases and purchasing needs to be close to engineering

The semi-structured interviews with purchasing professionals provide interesting insides into the views on purchasing and purchasing involvement. Next to the questions about the changing practices of purchasing in innovation projects and contextual factors, the interview guide left room for more general questions about related topics. Chapter 4.6 goes into the views of interviewees on the general role of purchasing in innovation projects, qualities that purchasers add to projects, the phase where purchasing can make the most impact and factors enabling purchasing to be involved. Furthermore, the trade-off between innovation and costs is discussed.

Each interviewee was asked how they would describe the general role of purchasers in innovation projects. The answers were divergent but could be brought together in the following descriptions. R15 explained the diverse role of purchasing by understanding what support the project needs in every phase: *“What things are going on at that moment and how can we ensure that it is supported in the right way?”*. R4 described the role of purchasing in three words: *“Facilitating, coordinating and operational.”* The diverse and generalist role was confirmed by other respondents in calling purchasers the *“linking-pin”* [R1] or the *“Spider in the web”* [R13].

The interviewees were also asked about the qualities that they thought purchasers added to innovation projects. Just like the general role of purchasing, the qualities of

purchasers vary and are diverse. R12 described the project buyer as a generalist able to bring different disciplines together: *“I think that a buyer by nature should be able to work well with different disciplines [...] work together with the factory, with your planners, with the engineers, with your supplier. And that is the crucial factor in an NPD process, that these different disciplines come together. So you often add that skill as a buyer to such a project team.”* R13 talked about the commercial skills that purchasers add, with R10 stressing the more realistic and pragmatic perspective of purchasers. However the most mentioned skills are being able to see the bigger picture, keeping the overview and project management [e.g. R8, R9 and R12].

After the questions about the role of purchasing in the different phases of an innovation project, the researcher would ask the interviewee in which phase they think purchasing can have the most impact on the project. Almost all the respondents indicated that the most impact could be made at the beginning of the project in the first three phases. Since there is often overlap between the phases or companies had a slightly different phase structure, it is hard to pinpoint one phase. R15 described the phase as follows: *“The ideation phase and then I think it continues until you reach that development phase.”* The explanation for this phase being most impactful was that *“the choices were made”* [R1, R15] or *“parameters could still be tweaked”* [R2] in this part of the project. Phase 1 [R1, R3, R6], phase 2 [R9], phase 3 [R4, R7, R8, R10, R14] and a combination of the first three phases [R2, R12, R15] were all named as the phase in which purchasing had the most impact.

The interviewees were also asked about the factors enabling purchasing to be involved in the best way possible. Several factors were mentioned by multiple interviewees. One of these was that engineering should have a positive and competent perception of purchasing [R4, R8]. R12 and R14 also mention the factor of being close to engineering, so that they are able to find you easily: *“You have to make sure that you are very close to engineering. [...] I spent three days a week in engineering in the office and two days I spent in the factory doing the rest of my work”* [R12]. Furthermore, having an external and internal network with good relationships is a key factor in successful purchasing involvement [R2, R3 R15].

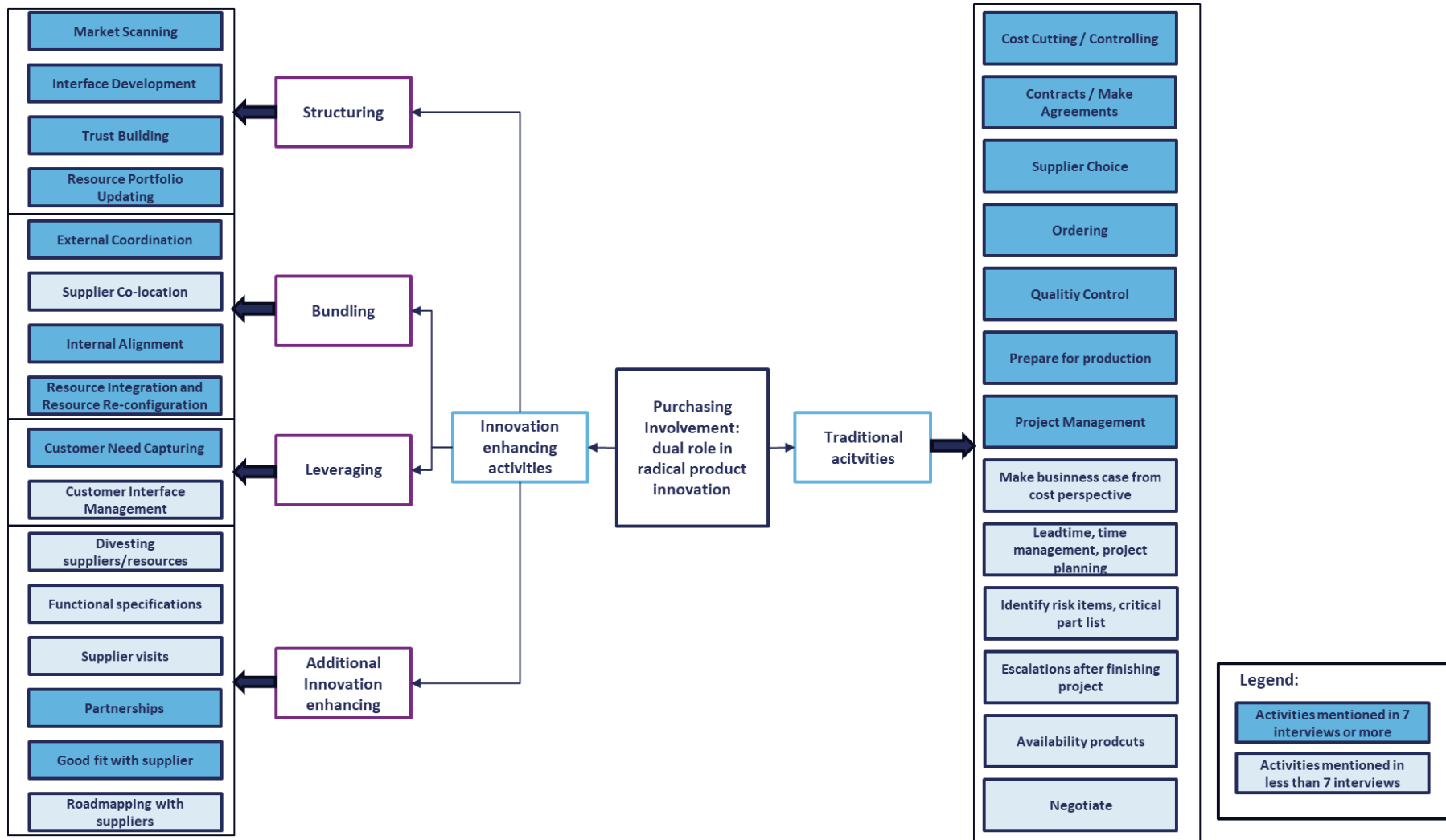
In innovation projects, purchasing often has to balance the trade-off between innovating and cost aspects. The interviewees were asked how they dealt with this trade-off. Clear communication and cooperation between the different departments is key to dealing

with this trade-off according to R9 and R10. A few respondents said that it all depends on the company strategy and accompanying purchasing strategy on how to deal with this trade-off [R5, R7, R12]. However, for most organisations were quality, availability and innovation more important factors than price and that is also what they acted upon, so the innovation versus cost trade-off was less of an issue for them [R6, R8, R15].

4.6 Visual representation of the research model and the found themes

An overview of all the different themes found in the research is presented in Figure 9 on the next page. In the middle, the main subject of purchasing involvement is shown, with the two aspects of the dual role of purchasing on the left and right of it. The innovation enhancing activities are divided into four sub-themes Structuring, Bundling, Leveraging and Additional Innovation Enhancing activities. For each sub-theme, the activities or codes belonging to that sub-theme are marked in dark or light blue. The dark blue activities are activities which are mentioned in 7 or more interviews, whereas the light blue activities are activities mentioned less than 7 times. The same distinction is made for the traditional activities, which can be found on the right side of the figure.

Figure 9 – Visual representation of the results



5 Discussion: The main findings, contributions, limitations and future research directions

5.1 Main results: the changing purchasing practices from innovation enhancing to traditional in radical innovation projects

This research aimed to find the purchasing practices in radical innovation projects with suppliers. To achieve this, a Resource Orchestration Theory (ROT) (Sirmon et al) perspective was taken to explain the innovation enhancing activities of purchasers. Furthermore, the five-stage project structure of innovation projects as described by Cooper (1994) was added to the research model to find out more about the changing practices of purchasing during the different phases. In this chapter, the main results and their theoretical contributions are discussed, after which the practical implications of the research are considered. Lastly, the limitations of the research and future research directions are debated.

The first main finding is the innovation enhancing and traditional purchasing practices in radical innovation projects with suppliers from an ROT perspective. The first group are the innovation enhancing activities, which are activities that purchasers perform to stimulate innovation. This group of activities was also found in the literature review and was included in the original research model. The second group are traditional activities, which are activities focused on the traditional role of purchasing in dealing with cost, quality and time issues. This group of activities were additional findings besides the originally intended research model, which was based on authors disregarding the traditional role of purchasing (Schmelzle & Tate, 2022, p. 2). The combination of innovation enhancing and traditional practices for purchasers are described in research before, with Schiele (2010, p. 138) calling it a dual role and Gualandris et al. (2018, p. 667) calling it ambidexterity. However, the insight into this purchasing dual role in radical innovation projects from an ROT perspective is new to the research field of purchasing.

The second contribution is the finding that the purchasing practices in radical innovation projects change from innovation enhancing to traditional. As far as known to the author, no research has been done into the changing practices of purchasing in radical innovation projects. The role in particular stages has been discussed (Mikkelsen & Johnsen, 2019; Picaud-Bello et al., 2022; Servajean-Hilst & Calvi, 2018), but the holistic view looking at how the involvement of purchasing changes from start to finish in a project is new. Based on the results in chapter 4.4, the practices of purchasers in the first three phases of the project

are mostly focused on orchestrating, facilitating and stimulating innovation. The practices change to traditional activities from phase three onwards. Towards the end of the project, purchasers involved in innovation projects seem mostly occupied with assuring that the right prices, quality and contracts are in place to transfer the product from an innovation project to regular production. So, the second theoretical contribution of this research is the insight into the changing type of purchasing practices from innovation enhancing to traditional in radical innovation projects.

The third theoretical contribution is the development of the ROT in a purchasing context. Earlier research has found different practices (e.g. Picaud-Bello et al., 2019; Schmelzle & Tate, 2022; Wynstra et al., 2000) which were allocated to one of the three ROT constructs (Sirmon et al., 2011), as can be seen in the research model in chapter 2.6. These practices are tested and validated on this dataset, with most practices being found in more than half of the interviews. Only the practices of ‘Supplier Co-location’ and ‘Customer Interface Management’ were an exception and were not found regularly in this study. On the other hand, the research also identifies several practices that can be considered to be added to the research model. For the innovation enhancing activities, ‘Partnerships’ and having a ‘Good fit with suppliers’ were important themes mentioned in multiple interviews. If the ROT framework wants to be used to explain the involvement of purchasing in innovation projects, the traditional part of the dual role of purchasing should be added as well. This explorative research found out that to understand the role of purchasing innovation projects, just having an innovation enhancing practices perspective is not enough.

5.2 Practical implications: The practices of purchasers in different project stages of innovation projects

Next to the main findings and their theoretical contribution, there are also a few practical implications from this research.

The results give an indication of the practices and activities performed by purchasers in innovation projects in the manufacturing industry and could therefore serve as inspiration for companies on how to involve their purchasers. For example, function descriptions of project buyers can be made based on the practices found in this research. The five-stage structure used in the research provides companies and purchasing managers with a process description of the tasks performed by purchasers in radical innovation projects. A stage-gate is quite common in R&D departments and projects already, but this research could serve as an inspiration for a specific purchasing stage-gate for radical innovation projects.

The second practical contribution is the structure that the ROT offers to different best practices found in the interviews. For example, if practitioners want to focus on structuring, the research found a best practice like performing audits with suppliers to create preferred suppliers with vendor ratings based on KPIs (e.g. performance dashboards). An example of a best practice of bundling is notifying engineers about potential interesting developments at suppliers (e.g. technology, knowledge, innovations). Furthermore, an example of a best practice of leveraging is having an account engineer/program manager present in the NPD project team to secure customer needs. A complete overview of multiple best practices per innovation enhancing activity can be found in appendix C.

A third practical contribution is the finding that the purchasing practices change from innovation enhancing to traditional during a project. At the moment, purchasers involved in radical innovation projects are often one person involved as a project buyer. The results of this research show that this one project buyer has to have a diverse skillset to fulfil all the requirements asked of an involved purchaser. Companies could rethink their approach to purchasing involvement, with potentially multiple purchasers with different skill sets and responsibilities involved in an innovation project to cover the different types of practices. These practical implications could be combined with the results of Stek and Schiele (2021) about the different purchasing skills leading to success.

5.3 Limitations and future research directions: Quantitatively testing results over a bigger group of respondents

The research has a few theoretical and practical contributions, but besides the contributions, there are also a few limitations. However, these limitations often also open opportunities for future research. The limitations and future research are discussed in this section.

The first limitation is the initial focus of this research and the accompanying theoretical framework. The basis taken was from an innovation enhancing perspective on the concept of purchasing involvement and this is also reflected in the original research model and interview guide. The results show that there was a dual role with a combination of innovation enhancing and traditional activities. If this dual role perspective had been taken into account from the beginning of the research, the interviews and results might have been different. It could therefore be interesting to conduct a similar type of research into the practices of purchasing in radical innovation projects from an ambidexterity perspective to further deepen the understanding of this purchasing dual role.

The second limitation is the explorative, qualitative nature of the research. The studied subject was in need of explorative research to understand the concept, but it is difficult to make strong conclusions based on this type of research because of the lack of hypothesis or relations being tested. Future research could therefore focus on studying the same subject with a quantitative approach and test for example the changing of practices over a bigger group of people or companies. The contingency factors used in this research did not seem to have any impact on the results, but they can also be considered in quantitative research over a bigger group. Furthermore, the new research model including the dual role and the newly found practices could be tested over a broad range of companies. Lastly, this research had a descriptive nature, in which the current state of purchasing involvement was the focus. Future research could consider a prescriptive approach in which they could investigate how purchasers would like to see their involvement in innovation projects.

The third limitation is that the research only focused solely on companies in the manufacturing industry and mainly in the Netherlands. Companies in other industries or countries might give different results on the topic of purchasing involvement. It should also be noted that all purchasers participating in this research were from companies where there was at least some sort of purchasing involvement. Potential respondents indicating that purchasers were not involved in innovation projects at all at their company were filtered out and were not interviewed. This was quite a common response and it should therefore be noted that the results of this research are only from manufacturing companies with at least some sort of purchasing involvement.

The fourth limitation is that only eleven out of fifteen interviewees talked about a specific project in their interviews, whereas the others were purchasing managers and often not directly involved in the projects. It should also be noted that if one project was chosen and focused on, this might not always be a good representation of all the innovation projects at that company. Future research could therefore be a case study by focusing on multiple projects at one company. This could provide interesting insights or unveil contingency factors influencing purchasing involvement that were missed in this research.

The fifth limitation lies in the fact that the data is only coded by one researcher and there is not been any data triangulation. Allocating practices to certain phases is somewhat open to interpretation and to validate the results of this study, it should be analysed by at least a second researcher.

The sixth limitation is the fact that the research focused solely on the perspective of purchasers. Some interviewees had difficulties looking at their own role from a helicopter view and had a hard time describing the way that purchasing was involved. For future research, it could be interesting to also take the perspective of other departments like Research & Development, Engineering or suppliers to see what their view is on the role of purchasing. This type of research could for example be combined with case studies at one company.

Additionally, this research is limited to purchasing practices in innovation projects and does not consider the entire product life cycle after the innovation project. This more specific focus on projects also resulted in new insights, with future research possibly further investigating the dual role of purchasers in radical innovation projects. Earlier research into the dual role of purchasing found that in innovation projects the practices of purchasing were innovation-oriented and the practices further in the product life cycle were cost-oriented (Schiele, 2010, pp. 146-147), but the results of this research suggest that the purchasing dual role is already active in the innovation projects itself. Constant et al. (2020, p. 9) do mention the ambidexterity role of purchasers in innovation projects already but focus more on the entire purchasing department and the differences between different types of purchasers. This research is more specific to innovation projects and project buyers, but also considers fifteen different cases and companies, whereas Constant et al. (2020, p. 5) only regard one company. Constant et al. (2020, p. 11) mention how one purchasing sub-department is responsible for the explorative (innovation enhancing) part of the project and the tactical/operational side is responsible for the exploitive (traditional) part of the project. The companies interviewed for this research often had designated project buyers performing both innovation enhancing and traditional tasks. Having one project buyer for one project makes sense to prevent knowledge transfer loss, but it does require the project buyer to have diverse skills: explorative and exploitative. Discussion and further research into the most effective way to organise purchasing involvement and its dual role in radical innovation could be interesting.

Lastly, future research could go into the barriers to purchasing involvement. Purchasing involvement is a topic described for decades (Atuahene-Gima, 1995; Burt & Soukop, 1985), but the issue is still present and ongoing. Tracey and Neuhaus (2013, p. 99) already mentioned that there have been more than decades of research into the benefits of purchasing involvement, but somehow the involvement of purchasers is often still lacking in practice. Research into what companies hold from involving purchasers in innovation

projects could be interesting. Research into the success factors of purchasing involvement has been done by Viale et al. (2022, p. 253), Luzzini et al. (2015) and Castaldi et al. (2011), but future research could focus on barriers and how to overcome them. Furthermore, the named authors only had a purchasing perspective, but this type of research can be combined with the above-mentioned different perspectives on the topic of purchasing involvement, e.g. focus on an Engineering department and what withholds them from involving purchasers.

References

- Åberg, S., & Bengtson, A. (2015). Does CERN procurement result in innovation? [Article]. *Innovation: The European Journal of Social Science Research*, 28(3), 360-383. <https://doi.org/10.1080/13511610.2015.1043244>
- Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities [Article]. *Strategic Management Journal*, 24(10 SPEC ISS.), 1011-1025. <https://doi.org/10.1002/smj.331>
- Andersén, J., & Ljungkvist, T. (2021). Resource orchestration for team-based innovation: a case study of the interplay between teams, customers, and top management. *R&D Management*, 51(1), 147-160.
- Andersen, P. H., Ellegaard, C., & Kragh, H. (2021). How purchasing departments facilitate organizational ambidexterity [Article]. *Production Planning and Control*, 32(16), 1384-1399. <https://doi.org/10.1080/09537287.2020.1818326>
- Atuahene-Gima, K. (1995). Involving organizational buyers in new product development [Article]. *Industrial Marketing Management*, 24(3), 215-226. [https://doi.org/10.1016/0019-8501\(94\)00083-9](https://doi.org/10.1016/0019-8501(94)00083-9)
- Azadegan, A. (2011). Benefiting from supplier operational innovativeness: The influence of supplier evaluations and absorptive capacity [Article]. *Journal of Supply Chain Management*, 47(2), 49-64. <https://doi.org/10.1111/j.1745-493X.2011.03226.x>
- Bals, L., Laine, J., & Mugurusi, G. (2018). Evolving Purchasing and Supply Organizations: A contingency model for structural alternatives [Article]. *Journal of Purchasing and Supply Management*, 24(1), 41-58. <https://doi.org/10.1016/j.pursup.2017.10.001>
- Bauer, M., & Leker, J. (2013). Exploration and exploitation in product and process innovation in the chemical industry [Article]. *R and D Management*, 43(3), 196-212. <https://doi.org/10.1111/radm.12012>
- Bidault, F., Despres, C., & Butler, C. (1998). New product development and early supplier involvement (ESI): The drivers of ESI adoption [Article]. *International Journal of Technology Management*, 15(1-2), 49-69. <https://doi.org/10.1504/ijtm.1998.002593>
- Brandon-Jones, A., & Knoppen, D. (2018). The role of strategic purchasing in dynamic capability development and deployment: A contingency perspective [Article]. *International Journal of Operations and Production Management*, 38(2), 446-473. <https://doi.org/10.1108/IJOPM-10-2015-0656>
- Brown, S. L., & Eisenhardt, K. M. (1995). Product development: Past research, present findings, and future directions. *Academy of Management Review*, 20(2), 343-378.
- Burt, D. N., & Soukup, W. R. (1985). Purchasing's role in new product development. *Harvard Business Review*, 63(5), 90-97.

- Calvi, R., Johnsen, T., & Picaud Bello, K. (2018). Purchasing involvement in discontinuous innovation: An emerging research agenda. In *Contributions to Management Science* (pp. 165-185). https://doi.org/10.1007/978-3-319-74304-2_8
- Carnes, C. M., Chirico, F., Hitt, M. A., Huh, D. W., & Pisano, V. (2017). Resource Orchestration for Innovation: Structuring and Bundling Resources in Growth- and Maturity-Stage Firms [Article]. *Long Range Planning*, 50(4), 472-486. <https://doi.org/10.1016/j.lrp.2016.07.003>
- Carnes, C. M., Hitt, M. A., Sirmon, D. G., Chirico, F., & Huh, D. W. (2022). Leveraging resources for innovation: The role of synchronization. *Journal of Product Innovation Management*, 39(2), 160-176.
- Castaldi, C., Ten Kate, C., & Den Braber, R. (2011). Strategic purchasing and innovation: a relational view. *Technology Analysis & Strategic Management*, 23(9), 983-1000.
- Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol refinement framework. *Qualitative report*, 21(5).
- Chadwick, C., Super, J. F., & Kwon, K. (2015). Resource orchestration in practice: CEO emphasis on SHRM, commitment-based HR systems, and firm performance. *Strategic Management Journal*, 36(3), 360-376.
- Chandy, R. K., & Tellis, G. J. (1998). Organizing for radical product innovation: The overlooked role of willingness to cannibalize [Article]. *Journal of Marketing Research*, 35(4), 474-487. <https://doi.org/10.2307/3152166>
- Chandy, R. K., & Tellis, G. J. (2000). The incumbent's curse? Incumbency, size, and radical product innovation [Article]. *Journal of Marketing*, 64(3), 1-17. <https://doi.org/10.1509/jmkg.64.3.1.18033>
- Chang, C.-W., Chiang, D. M., & Pai, F.-Y. (2012). Cooperative strategy in supply chain networks. *Industrial Marketing Management*, 41(7), 1114-1124.
- Chen, I. J., Paulraj, A., & Lado, A. A. (2004). Strategic purchasing, supply management, and firm performance [Article]. *Journal of Operations Management*, 22(5), 505-523. <https://doi.org/10.1016/j.jom.2004.06.002>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.
- Constant, F., Calvi, R., & Johnsen, T. E. (2020). Managing tensions between exploitative and exploratory innovation through purchasing function ambidexterity [Article]. *Journal of Purchasing and Supply Management*, 26(4), Article 100645. <https://doi.org/10.1016/j.pursup.2020.100645>
- Cooper, R. G. (1990). Stage-gate systems: a new tool for managing new products. *Business Horizons*, 33(3), 44-54.

- Cooper, R. G. (1994). Perspective third-generation new product processes [Article]. *The Journal of Product Innovation Management*, 11(1), 3-14. [https://doi.org/10.1016/0737-6782\(94\)90115-5](https://doi.org/10.1016/0737-6782(94)90115-5)
- Cousins, P. D., Lawson, B., Petersen, K. J., & Handfield, R. B. (2011). Breakthrough scanning, supplier knowledge exchange, and new product development performance [Article]. *Journal of Product Innovation Management*, 28(6), 930-942. <https://doi.org/10.1111/j.1540-5885.2011.00854.x>
- D'Antone, S., & Santos, J. B. (2016). When purchasing professional services supports innovation [Article]. *Industrial Marketing Management*, 58, 172-186. <https://doi.org/10.1016/j.indmarman.2016.05.024>
- de Visser, M., de Weerd-Nederhof, P., Faems, D., Song, M., van Looy, B., & Visscher, K. (2010). Structural ambidexterity in NPD processes: A firm-level assessment of the impact of differentiated structures on innovation performance [Article]. *Technovation*, 30(5-6), 291-299. <https://doi.org/10.1016/j.technovation.2009.09.008>
- Dessaigne, E., & Pardo, C. (2020). The network orchestrator as steward: Strengthening norms as an orchestration practice [Article]. *Industrial Marketing Management*, 91, 223-233. <https://doi.org/10.1016/j.indmarman.2020.09.007>
- Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management science*, 32(11), 1422-1433.
- Dowlatshahi, S. (1992). Purchasing's role in a concurrent engineering environment. *International Journal of Purchasing and Materials Management*, 28(1), 21-25.
- Edquist, C., Hommen, L., & McKelvey, M. D. (2001). *Innovation and employment: Process versus product innovation*. Edward Elgar Publishing.
- Ellram, L. M., Harland, C. M., van Weele, A., Essig, M., Johnsen, T., Nassimbeni, G., Pagell, M., van Raaij, E., Rozemeijer, F., Tate, W. L., & Wynstra, F. (2020). Purchasing and supply management's identity: Crisis? What crisis? [Article]. *Journal of Purchasing and Supply Management*, 26(1), Article 100583. <https://doi.org/10.1016/j.pursup.2019.100583>
- Eslami, M. H., & Lakemond, N. (2016). Internal integration in complex collaborative product development projects [Article]. *International Journal of Innovation Management*, 20(1), Article 1650008. <https://doi.org/10.1142/S1363919616500080>
- Fayezi, S., O'Loughlin, A., & Zutshi, A. (2012). Agency theory and supply chain management: a structured literature review. *Supply Chain Management: An International Journal*, 17(5), 556-570.
- Gelo, O., Braakmann, D., & Benetka, G. (2008). Quantitative and qualitative research: Beyond the debate. *Integrative psychological and behavioral science*, 42, 266-290.
- Geyskens, I., Steenkamp, J.-B. E., & Kumar, N. (2006). Make, buy, or ally: A transaction cost theory meta-analysis. *Academy of management journal*, 49(3), 519-543.

- Goedhart, R., & van Roekel, R. (2022). *ICT, kennis en economie*. CBS.
- Goldberg, J., & Schiele, H. (2018). Early Supplier Integration: Assessing Supplier Innovation Ideas [Review]. *IEEE Engineering Management Review*, 46(3), 94-102, Article 8486844. <https://doi.org/10.1109/EMR.2018.2866379>
- Gong, Y., Jia, F., Brown, S., & Koh, L. (2018). Supply chain learning of sustainability in multi-tier supply chains: A resource orchestration perspective [Article]. *International Journal of Operations and Production Management*, 38(4), 1061-1090. <https://doi.org/10.1108/IJOPM-05-2017-0306>
- Gonzalez-Zapatero, C., Gonzalez-Benito, J., & Lannelongue, G. (2016). Antecedents of functional integration during new product development: The purchasing-marketing link [Article]. *Industrial Marketing Management*, 52, 47-59. <https://doi.org/10.1016/j.indmarman.2015.07.015>
- Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization science*, 7(4), 375-387.
- Gualandris, J., Legenvre, H., & Kalchschmidt, M. (2018). Exploration and exploitation within supply networks: Examining purchasing ambidexterity and its multiple performance implications [Article]. *International Journal of Operations and Production Management*, 38(3), 667-689. <https://doi.org/10.1108/IJOPM-03-2017-0162>
- Hansen, M. H., Perry, L. T., & Reese, C. S. (2004). A Bayesian operationalization of the resource-based view. *Strategic Management Journal*, 25(13), 1279-1295.
- Hearnshaw, E. J., & Wilson, M. M. (2013). A complex network approach to supply chain network theory. *International Journal of Operations & Production Management*, 33(4), 442-469.
- Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2009). *Dynamic capabilities: Understanding strategic change in organizations*. John Wiley & Sons.
- Hill, C. W. L., & Rothaermel, F. T. (2003). The performance of incumbent firms in the face of radical technological innovation [Article]. *Academy of Management Review*, 28(2), 257-274. <https://doi.org/10.5465/AMR.2003.9416161>
- Hitt, M. A. (2011). Relevance of strategic management theory and research for supply chain management. *Journal of Supply Chain Management*, 47(1), 9-13.
- Hitt, M. A., Xu, K., & Carnes, C. M. (2016). Resource based theory in operations management research. *Journal of Operations Management*, 41, 77-94.
- Huang, F. K., Rosca, E., Bals, L., & Tate, W. L. (2022). 18. The relational view. *Handbook of theories for purchasing, supply chain and management research*, 283.

- Hurmelinna-Laukkanen, P., & Nätti, S. (2018). Orchestrator types, roles and capabilities – A framework for innovation networks [Article]. *Industrial Marketing Management*, 74, 65-78. <https://doi.org/10.1016/j.indmarman.2017.09.020>
- Jespersen, K. R. (2012). Stage-to-stage information dependency in the NPD process: Effective learning or a potential entrapment of NPD gates? [Article]. *Journal of Product Innovation Management*, 29(2), 257-274. <https://doi.org/10.1111/j.1540-5885.2011.00894.x>
- Johnsen, T., Le Dain, M. A., Kiratli, N., & Schiele, H. (2022). Editorial: Purchasing and innovation: Past, present and future of the field of research [Article]. *Journal of Purchasing and Supply Management*, 28(2), Article 100768. <https://doi.org/10.1016/j.pursup.2022.100768>
- Johnsen, T. E. (2009). Supplier involvement in new product development and innovation: Taking stock and looking to the future [Article]. *Journal of Purchasing and Supply Management*, 15(3), 187-197. <https://doi.org/10.1016/j.pursup.2009.03.008>
- Kamath, R. R., & Liker, J. K. (1994). A second look at Japanese product development. *Harvard Business Review*, 72(6), 154-165.
- Ketchen, D. J., Wowak, K. D., & Craighead, C. W. (2014). Resource gaps and resource orchestration shortfalls in supply chain management: The case of product recalls. *Journal of Supply Chain Management*, 50(3), 6-15.
- King, D. R., Covin, J. G., & Hegarty, W. H. (2003). Complementary resources and the exploitation of technological innovations [Article]. *Journal of Management*, 29(4), 589-606. [https://doi.org/10.1016/S0149-2063\(03\)00026-6](https://doi.org/10.1016/S0149-2063(03)00026-6)
- Knight, L., & Harland, C. (2005). Managing Supply Networks: Organizational roles in network management [Article]. *European Management Journal*, 23(3), 281-292. <https://doi.org/10.1016/j.emj.2005.04.006>
- Kobarg, S., Stumpf-Wollersheim, J., & Welp, I. M. (2019). More is not always better: Effects of collaboration breadth and depth on radical and incremental innovation performance at the project level [Article]. *Research Policy*, 48(1), 1-10. <https://doi.org/10.1016/j.respol.2018.07.014>
- Koufteros, X. A., Rawski, G. E., & Rupak, R. (2010). Organizational integration for product development: The effects on glitches, on-time execution of engineering change orders, and market success [Article]. *Decision Sciences*, 41(1), 49-80. <https://doi.org/10.1111/j.1540-5915.2009.00259.x>
- Kumar, M., Pullman, M., Bouzdine-Chameeva, T., & Sanchez Rodrigues, V. (2022). The role of the hub-firm in developing innovation capabilities: considering the French wine industry cluster from a resource orchestration lens [Article]. *International Journal of Operations and Production Management*, 42(4), 526-551. <https://doi.org/10.1108/IJOPM-08-2021-0519>

- Lakemond, N., Berggren, C., & Van Weele, A. (2006). Coordinating supplier involvement in product development projects: A differentiated coordination typology [Article]. *R and D Management*, 36(1), 55-66. <https://doi.org/10.1111/j.1467-9310.2005.00415.x>
- Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct [Article]. *Academy of Management Review*, 31(4), 833-863. <https://doi.org/10.5465/AMR.2006.22527456>
- Legenvre, H., & Gualandris, J. (2018). Innovation sourcing excellence: Three purchasing capabilities for success [Article]. *Business Horizons*, 61(1), 95-106. <https://doi.org/10.1016/j.bushor.2017.09.009>
- Lennerts, S., Schulze, A., & Tomczak, T. (2020). The asymmetric effects of exploitation and exploration on radical and incremental innovation performance: An uneven affair [Article]. *European Management Journal*, 38(1), 121-134. <https://doi.org/10.1016/j.emj.2019.06.002>
- Liu, H., Wei, S., Ke, W., Wei, K. K., & Hua, Z. (2016). The configuration between supply chain integration and information technology competency: A resource orchestration perspective. *Journal of Operations Management*, 44, 13-29.
- Luzzini, D., Amann, M., Caniato, F., Essig, M., & Ronchi, S. (2015). The path of innovation: Purchasing and supplier involvement into new product development [Article]. *Industrial Marketing Management*, 47, 109-120. <https://doi.org/10.1016/j.indmarman.2015.02.034>
- Luzzini, D., & Ronchi, S. (2011). Organizing the purchasing department for innovation [Article]. *Operations Management Research*, 4(1-2), 14-27. <https://doi.org/10.1007/s12063-010-0042-2>
- Martínez-Jurado, P. J., & Moyano-Fuentes, J. (2014). Lean management, supply chain management and sustainability: A literature review [Article]. *Journal of Cleaner Production*, 85, 134-150. <https://doi.org/10.1016/j.jclepro.2013.09.042>
- Melander, L., & Lakemond, N. (2014). Variation of purchasing's involvement: Case studies of supplier collaborations in new product development [Article]. *International Journal of Procurement Management*, 7(1), 103-118. <https://doi.org/10.1504/IJPM.2014.057877>
- Melander, L., & Lakemond, N. (2015). Governance of supplier collaboration in technologically uncertain NPD projects [Article]. *Industrial Marketing Management*, 49, 116-127. <https://doi.org/10.1016/j.indmarman.2015.04.006>
- Mendez, E. G., & Pearson, J. N. (1994). Purchasing's Role in Product Development: The Case for Time-Based Strategies [Article]. *International Journal of Purchasing and Materials Management*, 30(4), 2-12. <https://doi.org/10.1111/j.1745-493X.1994.tb00261.x>
- Mikkelsen, O. S., & Johnsen, T. E. (2019). Purchasing involvement in technologically uncertain new product development projects: Challenges and implications [Article].

- Journal of Purchasing and Supply Management*, 25(3), Article 100496. <https://doi.org/10.1016/j.pursup.2018.03.003>
- Montoya-Weiss, M. M., & Calantone, R. (1994). Determinants of new product performance: A review and meta-analysis [Article]. *The Journal of Product Innovation Management*, 11(5), 397-417. [https://doi.org/10.1016/0737-6782\(94\)90029-9](https://doi.org/10.1016/0737-6782(94)90029-9)
- Narasimhan, R., & Das, A. (2001). The impact of purchasing integration and practices on manufacturing performance [Article]. *Journal of Operations Management*, 19(5), 593-609. [https://doi.org/10.1016/S0272-6963\(01\)00055-9](https://doi.org/10.1016/S0272-6963(01)00055-9)
- Nemeh, A., & Yami, S. (2019). Orchestrating resources for FMA in cooperative NPD. *R&D Management*, 49(1), 64-85.
- Nijssen, E. J., Biemans, W. G., & De Kort, J. F. (2002). Involving purchasing in new product development [Article]. *R and D Management*, 32(4), 281-289. <https://doi.org/10.1111/1467-9310.00260>
- O'Neal, C. (1993). Concurrent Engineering with Early Supplier Involvement: A CrossFunctional Challenge [Article]. *International Journal of Purchasing and Materials Management*, 29(1), 2-9. <https://doi.org/10.1111/j.1745-493X.1993.tb00001.x>
- Oh, J., & Rhee, S. K. (2008). The influence of supplier capabilities and technology uncertainty on manufacturer-supplier collaboration: A study of the Korean automotive industry [Article]. *International Journal of Operations and Production Management*, 28(6), 490-517. <https://doi.org/10.1108/01443570810875331>
- Olausson, D., Magnusson, T., & Lakemond, N. (2009). Preserving the link between R&D and manufacturing: Exploring challenges related to vertical integration and product/process newness [Article]. *Journal of Purchasing and Supply Management*, 15(2), 79-88. <https://doi.org/10.1016/j.pursup.2008.12.004>
- Parker, D. B., Zsidisin, G. A., & Ragatz, G. L. (2008). Timing and extent of supplier integration in new product development: A contingency approach [Article]. *Journal of Supply Chain Management*, 44(1), 71-83. <https://doi.org/10.1111/j.1745-493X.2008.00046.x>
- Patrucco, A. S., Luzzini, D., & Ronchi, S. (2017). Achieving innovation through supplier collaboration: the role of the purchasing interface [Article]. *Business Process Management Journal*, 23(6), 1270-1289. <https://doi.org/10.1108/BPMJ-10-2016-0202>
- Paulraj, A., Chen, I. J., & Flynn, J. (2006). Levels of strategic purchasing: Impact on supply integration and performance [Article]. *Journal of Purchasing and Supply Management*, 12(3), 107-122. <https://doi.org/10.1016/j.pursup.2006.08.002>
- Picaud-Bello, K., Johnsen, T., & Calvi, R. (2022). Purchasing involvement in new product development: An absorptive capacity perspective [Article]. *Industrial Marketing Management*, 104, 150-166. <https://doi.org/10.1016/j.indmarman.2022.04.011>

- Picaud-Bello, K., Johnsen, T., Calvi, R., & Giannakis, M. (2019). Exploring early purchasing involvement in discontinuous innovation: A dynamic capability perspective [Article]. *Journal of Purchasing and Supply Management*, 25(4), Article 100555. <https://doi.org/10.1016/j.pursup.2019.100555>
- Ragatz, G. L., Handfield, R. B., & Scannell, T. V. (1997). Success factors for integrating suppliers into new product development [Article]. *Journal of Product Innovation Management*, 14(3), 190-202. [https://doi.org/10.1016/S0737-6782\(97\)00007-6](https://doi.org/10.1016/S0737-6782(97)00007-6)
- Robson, C., & McCartan, K. (2016). Real world research: A resource for users of social research methods in applied settings.
- Rothaermel, F. T. (2001). Complementary assets, strategic alliances, and the incumbent's advantage: An empirical study of industry and firm effects in the biopharmaceutical industry [Article]. *Research Policy*, 30(8), 1235-1251. [https://doi.org/10.1016/S0048-7333\(00\)00142-6](https://doi.org/10.1016/S0048-7333(00)00142-6)
- Rothaermel, F. T., Hitt, M. A., & Jobe, L. A. (2006). Balancing vertical integration and strategic outsourcing: Effects on product portfolio, product success, and firm performance [Article]. *Strategic Management Journal*, 27(11), 1033-1056. <https://doi.org/10.1002/smj.559>
- Saunders, M., Lewis, P., & Thornhill, A. (2012). Formulating the research design in: *Research Methods for Business Students sixth edition (sixth)*. England: Pearson.
- Schiele, H. (2006). How to distinguish innovative suppliers? Identifying innovative suppliers as new task for purchasing [Article]. *Industrial Marketing Management*, 35(8), 925-935. <https://doi.org/10.1016/j.indmarman.2006.05.003>
- Schiele, H. (2007). Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement-performance link [Article]. *Journal of Purchasing and Supply Management*, 13(4), 274-293. <https://doi.org/10.1016/j.pursup.2007.10.002>
- Schiele, H. (2010). Early supplier integration: The dual role of purchasing in new product development [Article]. *R and D Management*, 40(2), 138-153. <https://doi.org/10.1111/j.1467-9310.2010.00602.x>
- Schiele, H. (2012). Accessing supplier innovation by being their preferred customer [Article]. *Research Technology Management*, 55(1), 44-50. <https://doi.org/10.5437/08956308X5501012>
- Schiele, H., Hofman, E., Zunk, B. M., & Eggers, J. (2021). WHY and HOW to INVOLVE PURCHASING in NEW PRODUCT DEVELOPMENT? [Article]. *International Journal of Innovation Management*, 25(3), Article 2150027. <https://doi.org/10.1142/S1363919621500274>
- Schiele, H., Krummacker, S., Hoffmann, P., & Kowalski, R. (2022). The “research world café” as method of scientific enquiry: Combining rigor with relevance and speed. *Journal of business research*, 140, 280-296.

- Schmelzle, U., & Tate, W. L. (2022). Purchasing orchestration practices – Introducing a purchasing-innovation framework [Article]. *Journal of Purchasing and Supply Management*, 28(2), Article 100756. <https://doi.org/10.1016/j.pursup.2022.100756>
- Schoenherr, T. (2022). The knowledge-based view. *Handbook of theories for purchasing, supply chain and management research*, 118-139.
- Servajean-Hilst, R., & Calvi, R. (2018). Shades of the innovation-purchasing function-the missing link of open innovation [Article]. *International Journal of Innovation Management*, 22(1), Article 1850008. <https://doi.org/10.1142/S1363919618500081>
- Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box [Review]. *Academy of Management Review*, 32(1), 273-292. <https://doi.org/10.5465/AMR.2007.23466005>
- Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource orchestration to create competitive advantage: Breadth, depth, and life cycle effects [Review]. *Journal of Management*, 37(5), 1390-1412. <https://doi.org/10.1177/0149206310385695>
- Song, M., & Thieme, J. (2009). The role of suppliers in market intelligence gathering for radical and incremental innovation [Article]. *Journal of Product Innovation Management*, 26(1), 43-57. <https://doi.org/10.1111/j.1540-5885.2009.00333.x>
- Spina, G., Caniato, F., Luzzini, D., & Ronchi, S. (2016). Assessing the use of External Grand Theories in Purchasing and Supply Management research [Article]. *Journal of Purchasing and Supply Management*, 22(1), 18-30. <https://doi.org/10.1016/j.pursup.2015.07.001>
- Spina, G., Verganti, R., & Zotteri, G. (2002). Factors influencing co-design adoption: Drivers and internal consistency [Article]. *International Journal of Operations and Production Management*, 22(12), 1354-1366. <https://doi.org/10.1108/01443570210452048>
- Stek, K., & Schiele, H. (2021). How to train supply managers–necessary and sufficient purchasing skills leading to success. *Journal of Purchasing and Supply Management*, 27(4), 100700.
- Stieglitz, N., & Heine, K. (2007). Innovations and the role of complementarities in a strategic theory of the firm [Article]. *Strategic Management Journal*, 28(1), 1-15. <https://doi.org/10.1002/smj.565>
- Sumo, R., van der Valk, W., van Weele, A., & Bode, C. (2016). Fostering incremental and radical innovation through performance-based contracting in buyer-supplier relationships [Article]. *International Journal of Operations and Production Management*, 36(11), 1482-1503. <https://doi.org/10.1108/IJOPM-05-2015-0305>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.

- Toon, M. A., Morgan, R. E., Lindgreen, A., Vanhamme, J., & Hingley, M. K. (2016). Processes and integration in the interaction of purchasing and marketing: Considering synergy and symbiosis [Article]. *Industrial Marketing Management*, 52, 74-81. <https://doi.org/10.1016/j.indmarman.2015.07.014>
- Tracey, M., & Neuhaus, R. (2013). Purchasing's role in global new product-process development projects. *Journal of Purchasing and Supply Management*, 19(2), 98-105.
- Trent, R. J., & Monczka, R. M. (1998). Purchasing and supply management: trends and changes throughout the 1990s. *International Journal of Purchasing and Materials Management*, 34(3), 2-11.
- Turkulainen, V., & Swink, M. L. (2017). Supply chain personnel as knowledge resources for innovation—a contingency view. *Journal of Supply Chain Management*, 53(3), 41-59.
- van Echtelt, F. E. A., Wynstra, F., & van Weele, A. (2007). Strategic and operational management of supplier involvement in new product development: A contingency perspective [Article]. *IEEE Transactions on Engineering Management*, 54(4), 644-661. <https://doi.org/10.1109/TEM.2007.906858>
- Van Echtelt, F. E. A., Wynstra, F., Van Weele, A. J., & Duysters, G. (2008). Managing supplier involvement in new product development: A multiple-case study [Article]. *Journal of Product Innovation Management*, 25(2), 180-201. <https://doi.org/10.1111/j.1540-5885.2008.00293.x>
- Van Poucke, E., Matthyssens, P., & Weeren, A. (2016). Enhancing cost savings through early involvement of purchasing professionals in sourcing projects: Bayesian estimation of a structural equation model [Article]. *Journal of Purchasing and Supply Management*, 22(4), 299-310. <https://doi.org/10.1016/j.pursup.2016.06.004>
- Viale, L. (2019). Intra-functional coordination: the case of purchasing during innovation in the agri-food sector [Article]. *Supply Chain Forum*, 20(2), 104-115. <https://doi.org/10.1080/16258312.2019.1610493>
- Viale, L., Vacher, S., & Bessouat, J. (2022). Eco-innovation in the upstream supply chain: re-thinking the involvement of purchasing managers. *Supply Chain Management: An International Journal*, 27(2), 250-264.
- Wagner, S. M. (2012). Tapping Supplier Innovation [Article]. *Journal of Supply Chain Management*, 48(2), 37-52. <https://doi.org/10.1111/j.1745-493X.2011.03258.x>
- Wagner, S. M., & Hoegl, M. (2006). Involving suppliers in product development: Insights from R&D directors and project managers [Article]. *Industrial Marketing Management*, 35(8), 936-943. <https://doi.org/10.1016/j.indmarman.2005.10.009>
- Williams, A. J., & Smith, W. C. (1990). Involving purchasing in product development [Article]. *Industrial Marketing Management*, 19(4), 315-319. [https://doi.org/10.1016/0019-8501\(90\)90003-E](https://doi.org/10.1016/0019-8501(90)90003-E)

- Wynstra, F., Axelsson, B., & Van Weele, A. (2000). Driving and enabling factors for purchasing involvement in product development [Article]. *European Journal of Purchasing and Supply Management*, 6(2), 129-141. [https://doi.org/10.1016/S0969-7012\(00\)00002-2](https://doi.org/10.1016/S0969-7012(00)00002-2)
- Wynstra, F., Suurmond, R., & Nullmeier, F. (2019). Purchasing and supply management as a multidisciplinary research field: Unity in diversity? [Article]. *Journal of Purchasing and Supply Management*, 25(5), Article 100578. <https://doi.org/10.1016/j.pursup.2019.100578>
- Wynstra, F., Van Weele, A., & Axelsson, B. (1999). Purchasing involvement in product development: A framework [Article]. *European Journal of Purchasing and Supply Management*, 5(3-4), 129-141. [https://doi.org/10.1016/S0969-7012\(99\)00017-9](https://doi.org/10.1016/S0969-7012(99)00017-9)
- Wynstra, F., Van Weele, A., & Weggemann, M. (2001). Managing supplier involvement in product development:: Three critical issues [Article]. *European Management Journal*, 19(2), 157-167. [https://doi.org/10.1016/S0263-2373\(00\)00090-6](https://doi.org/10.1016/S0263-2373(00)00090-6)
- Wynstra, F., Weggeman, M., & van Weele, A. (2003). Exploring purchasing integration in product development [Article]. *Industrial Marketing Management*, 32(1), 69-83. [https://doi.org/10.1016/S0019-8501\(01\)00197-3](https://doi.org/10.1016/S0019-8501(01)00197-3)
- Zsidisin, G. A., & Ellram, L. M. (2001). Activities related to purchasing and supply management involvement in supplier alliances [Article]. *International Journal of Physical Distribution & Logistics Management*, 31(9), 629-646. <https://doi.org/10.1108/09600030110408143>

Appendices

Appendix A. The interview guide

Introduction (5 min)

1. Introduction of me, my research and context of the PhD from Supply Value. Thank you for participating.
 - I would like to record the interview, are you ok with this? Then I want to state the following privacy statement: the interview will be recorded and a transcript will be produced and handled with care. The recording and transcript will be deleted when the research is completed. The provided information will not be shared with any third parties or persons. The information received will be anonymised and published in the article. The results of this interview are used for academic purposes only. The interviewee has the right to stop the interview or withdraw from the research at any time.
 - The reason for this interview is my master thesis with regards to finishing my two masters in Purchasing and Supply Management. This thesis is part of a PhD project from the University of Twente and Supply Value about purchasing involvement.
 - The subject of this interview is the involvement of purchasers in innovation projects with suppliers in the production industry. The interview will have the following structure: first an introduction, a few questions about the company and job context and then I would like to dive into a specific project in which you were involved. We will end with a few closing questions and hopefully we will finish the interview in 60-90 minutes.
 -
2. Introduction of the interviewee. Can you introduce yourself?
 - Experience in this field, at this company, in current function.

Company and job context (15 min) *check recording*

3. Can you tell me about the company you work for.
 - What do they do?
 - How big is the company? In terms of employees? Sales revenue? Amount of purchasers?
 - How important is product development in your industry? What is the amount of R&D employees?
 - Could you say something about the purchasing ratio? purchasing share in turnover?
4. Can you tell me about purchasing at your organisation and your day-to-day job.
 - How is purchasing structured? What kind of roles/functions are there? Who do you report to?
 - Is there a clear organisation of purchasing? Extent of formalization, professionalism and standardisation of tasks/processes?
 - What are your job responsibilities?
5. How are you involved in innovation projects with suppliers?

- Do you work together with co-workers from different departments? Which? Is this a structural process? What is the position of purchasing compared to the other departments?
- What type of projects are these? Small or big changes in the product?

Research question (changing purchasing role during innovation project) (30 min) *check recording*

For the next questions, I would like you to focus on a relevant innovation/NPD project with suppliers in which you were involved.

6. Please explain the innovation project.
 - Describe focus/topic of the project.
 - Complexity of the project?
 - Size of the project?
 - Key participants, what are their functions?
 - Duration of the project?
 - Targets/goal of the project?
 - Have you co-operated with this supplier before? Is this supplier a trusted partner? Are you dependent on this supplier?

7. What was your general role in the project?
 - How did this role relate to the other involved members?

From literature usually 5 different stages in innovation projects are defined. I will explain every phase shortly and then we can discuss the role of purchasing and the performed tasks during that phase.

8. The first phase is the 'idea generation'/scoping phase. This phase often exist out of brainstorming and preliminary market research. Sometimes suppliers will already be involved and this phase will lead to a clear scope of the project.
 - Were you, as a purchaser, already involved at this stage?
 - What was your role at the beginning of the project?
 - What type of tasks are you performing at this stage of the project?
 - Specific examples of performed actions?
9. The next stage is the 'business/technical assessment' stage. In this stage the products and the associated markets are evaluated based on strengths, weaknesses and threats. This is the last stage of the concept development and includes for example product definition, business plan, project plan and feasibility review.
 - What was your role in this second stage of the project?
 - What type of tasks are you performing at this stage of the project?
 - Specific examples of performed actions?
10. The next stage is the product development stage. In this stage the plans of the previous stage are carried out and the design is worked out even more. The product is further developed and this stage results in a product prototype.
 - What was your role in this third stage of the project?
 - What type of tasks are you performing at this stage of the project?
 - Specific examples of performed actions?

11. The next stage is the test and validation stage. In this stage the product will be tested on different levels. Think of a test of the product process and a customer test.

- What was your role in this fourth stage of the project?
- What type of tasks are you performing at this stage of the project?
- Specific examples of performed actions?

12. The last stage is the production and launching stage. In this stage is the marketing strategy an important aspect. Also an estimate of the needed production, inventory and way of distributing will be set up in this stage.

- What was your role in this fifth stage of the project?
- What type of tasks are you performing at this stage of the project?
- Specific examples of performed actions?
- When is the project finished? Does anything happen after this?

Closing questions (10 min) *check recording*

13. Now looking back at the project, how would you describe your role during the project?

- Organising, managing role?
- Leading, facilitating?
- Is there maybe something that falls outside of the scope of these phases?

14. In which of the discussed phases do you think purchasing has the strongest impact?

- Why this stage?
- What qualities do purchasers have that adds to the project?

15. The traditional role of purchasers in innovation project is often seen as a limiting factor by their focus on costs and quality.

- Do you recognise this?
- How do you navigate this field of tension (trade-off) between stimulating innovation and limiting costs?

16. Is there anything else that you would like to add at this point?

Closing statement (5 min)

17. Thank you for your time.

- I will keep you informed of the results of my research. With a small summary, but also a possible conversation to further discuss the results. Do you also want to stay up to date of the PhD research?

Appendix B. Table with all activities

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	Total
Innovation																
Structuring																
Market Scanning	X				X	X	X		X	X	X	X	X	X	X	11
Interface Development	X	X		X	X		X	X	X	X	X	X	X			12
Trust Building	X	X		X	X				X	X					X	7
Resource Portfolio Updating	X	X			X	X	X		X	X	X	X	X	X	X	13
Bundling																
External Coordination	X	X						X	X	X		X			X	7
Supplier Co-location					X											1
Internal Alignment	X	X		X	X			X	X	X	X				X	9
Resource Integration and Resource Re-configuration		X		X	X	X		X	X		X		X	X	X	10
Leveraging																
Customer Need Capturing	X			X		X	X	X		X	X			X		8
Customer Interface Management	X													X		2
Other innovation																
Divesting suppliers/resources		X								X			X			3
Functional specifications, have a frame but use supplier knowledge	X			X				X			X					4
Supplier visits	X											X		X	X	4
Partnership	X			X	X	X		X		X		X				7
Good fit with supplier	X			X				X		X	X	X			X	7
Roadmapping with suppliers					X		X		X			X				4
Traditional																
Cost cutting / controlling	X	X		X	X	X	X	X	X	X	X	X	X		X	14
Contracts / make agreements	X	X		X	X	X	X	X				X	X	X	X	12
Supplier choice	X			X	X	X		X	X	X		X		X		9
Ordering	X			X				X		X	X	X	X	X	X	9
Quality control				X	X		X	X		X	X	X	X		X	9
Prepare for production	X			X	X			X	X	X		X		X		8
Project management		X			X	X	X		X	X		X		X		8
Make business case from cost perspective	X					X		X	X		X	X				6
Leadtime, time management, project planning	X			X			X		X					X		5
Identify risk items, critical part list					X				X			X		X		4
Escalations after finishing project		X		X			X		X							4
Availability products						X						X			X	3
Negotiate		X											X			2
Total codes per respondent	19	12	13	15	12	12	10	13	18	14	11	17	11	12	13	

Appendix C. Table with examples of best practices

	Practices	Best examples
	Structuring	
	Market Scanning	Visiting fairs
		Internal research
		Visiting suppliers to discuss their current and future developments
	Interface Development	Assure external communication as one body by bringing together different internal opinions
		Requesting a document from the supplier in which they show that they understand the drawings and deliverables
		Emailing suppliers about upcoming R&D projects
		Drawing up a list of suppliers with whom engineers are allowed to communicate directly
	Trust Building	Relation management
		Be flexible when suppliers needs something from you so that they will return the favour
		Give long term assurance to suppliers as long as quality is good
		Achieve preferred customer status by putting forward the organization's uniqueness or the exclusiveness of its products and services (Nollet et al., 2012)
		Achieve preferred customer status by organizing meetings between top management members from both organizations (Nollet et al., 2012)
	Resource Portfolio Updating	Perform audits with suppliers to create preferred suppliers with vendor ratings based on KPIs (e.g. performance dashboards)
		Anticipate on potential client questions by pre-selecting supplier that could fill that need
		Prepare options for components that are at the end of the life-cycle
		Be aware of supplier (future) capacity
	Bundling	
	External Coordination	Share technology roadmaps and consider how the suppliers roadmaps fit with your roadmap
		Communicate and retrieve feedback from suppliers on R&D projects
		Communicate demand forecast
	Supplier Co-Location	Supplier visits with your engineers
		Co-locate important/key/crucial employees to supplier (Schmelzle & Tate, 2022)
	Internal alignment	Information sharing in NPD project meetings between the different departments
		Regular meetings with R&D to discuss and improve the NPD process/projects
		Attain feedback from different departments (e.g. quality, engineering)
		Proactively staying close to engineering to prevent being on a 'purchasing island'
	Resource Integration and Resource Re-configuration	Notify engineers about potential interesting developments at suppliers (e.g. technology, knowledge, innovations)
		Have innovation roadmap meetings with engineering and suppliers

		Initiate (e.g. together with sales person from supplier) a meeting between your engineer and suppliers engineer
		Gather and process feedback of suppliers on make-ability of new products
Leveraging		
	Customer Need Capturing	Capturing the 'real' need of customers and engineering to communicate to suppliers
		Always ask critical questions (internal and external)
	Customer Interface Management	Regular meetings with customers about potential occurring problems
		Have an account engineer/program manager present in the NPD project team to secure customer needs
Additional innovation enhancing		
	Partnerships	Together with customer co-invest in a supplier
		Sharing business case with supplier
		Quality and long-term reliability over best price
	Good fit with supplier	Determine if the team of the supplier fits with your team on the soft aspects
		Work with suppliers with similar vision or mission