Papers in purchasing and supply management: A capability-based perspective
Papers in purchasing and supply management:

A capability-based perspective

by Astrid Hanghøj

A PhD thesis submitted to School of Business and Social Sciences, Aarhus University, in partial fulfillment of the PhD degree in Economics and Business

August 2014
To every teacher I ever had and ever will have

- In any way, shape or form.
Contents

Preface ..................................................................................................................................................... vii

Introduction .............................................................................................................................................. 9

Paper 1 How do purchasing capabilities affect innovation? ................................................................. 69

Paper 2 The impact of purchasing capabilities on delivery performance ............................................ 149

Paper 3 Building risk management capability ....................................................................................... 223

Dansk resumé ........................................................................................................................................ 285
Preface

Here it is at last: my dissertation. It could not have been possible without the help of the managers and directors in the firms who participated in the surveys. Please accept my most sincere appreciation for your efforts. Without you, this project would simply not have been possible.

Each Ph.D. project requires supervision. Over the past years, I have been lucky to have the support of my supervisor, Niels Peter Mols. I will always remember him for his integrity and idealism in research.

Leaving Denmark to go on my stay-abroad, I spent six months at Michigan State University where Ram Narasimhan accepted me as a visiting scholar. I could not have imagined a better place to go and I am very grateful for the professional and personal encouragement that I received during my time at MSU. There is a special place in my heart for everyone that I met while living in East Lansing – friends, faculty, and students alike.

Life as an academic researcher has been a challenge and a great opportunity. I am thankful for the experiences and skills that my years in doctoral research have provided me. The thesis is a result of the many comments and constructive feedback that I have received from a multitude of people throughout the years. I would like to acknowledge the support of faculty at both Department of Business Administration and Department of Economics and Business, as well as the emotional and moral support that I received from my many doctoral colleagues.

On this last note, I would like to express my gratitude to those people who read and provided me with feedback on my thesis. To my friends and family: You have had to endure a lot with me for the past years and I am profoundly grateful that you stuck it out with me. If I ever called you crying or sat at your dinner table in tears, you should know that you, too, helped me immensely to regain the necessary composure (and confidence!) to keep pushing.

Risskov, August 11th 2014

Astrid Hanghøj
“Engineers who can’t add, operators who can’t run their equipment, and accountants who can’t foot numbers become purchasing professionals” - Jack Welch, Former CEO at GE (Fuchs, Pais, and Shulman, 2013)

Introduction

In step with the changes in firms’ competitive environments, the purchasing function is receiving increasing attention from managers and researchers alike. Through the past decades, the purchasing and supply management (PSM) literature has shifted towards a more strategic focus (Carter and Narasimhan, 1996; Ellram and Carr, 1994; Paulraj, Chen, and Flynn, 2006; Smeltzer and Siferd, 1998). Globalization, technological advancements and increasing competition are important factors that affect firms’ competitive environments today. As a consequence, it is becoming increasingly harder for firms to rely on old ways of doing business. Thus, firms need to consider which capabilities to invest in, in order to ensure sustainable competitive advantages. This statement is true in both the general strategic management literature and the purchasing and supply management literature.

Strategic management is fundamentally concerned with how firms achieve and sustain competitive advantages (Teece, Pisano, and Shuen, 1997). This thesis sets out to integrate the capability-based view into the PSM literature. In doing so, it combines empirical and theoretical research from the PSM literature on one hand with the strategic management theory on the other, thus addressing an unequivocal call for better theoretical integration in the field of PSM (Giunipero et al., 2008; Hitt, 2011; Kerkfeld and Hartmann, 2012; Quintens, Pauwels, and Matthyssens, 2006b). The thesis addresses a gap in research as very little research has been done on purchasing capabilities (Spina et
al., 2013). From a practitioner’s point of view, this endeavor is valuable. In a recent report, managers report that the most important factors for successful purchasing are purchasing capabilities (Fuchs, Pais, and Shulman, 2013) and today purchasing is also perceived to be one of the functions with the highest potential to impact on long-term profitability in firms (Quintens, Pauwels, and Matthyssens, 2006a). In order to ensure that a firm reaps full benefits of their investment in and development of purchasing capabilities, the research agenda needs to address at least two key points: first, we need to understand what performance benefits can be reached by investing in capabilities, and second, we need to understand what those capabilities are. This thesis aims to contribute this agenda.

This introductory chapter contains five sections. The first section introduces the reader to the purchasing and supply management literature research domain. The second part presents a brief introduction to the theoretical lens – the capability-based view. The third section discusses the need for theory in PSM. Based on the preceding sections the overall research question is clarified in section four. The fifth section describes the overall research design and the final section summarizes each of the papers in the dissertation. The introduction is not meant to be a contribution in itself, but merely serves as a way of preparing the reader for what follows by setting the scene with respect to the empirical and theoretical domain. The three individual papers should be thought of as independent pieces of work and can each be read outside the context of this introductory chapter.
The research domain

Firms are becoming more fragmented relying on a number of suppliers for input to production. In fact, some have argued that business-to-business competition is being replaced by a supply-chain to supply-chain mode of competition (Lee et al., 2000; Wang, 2002). Upwards of 50-70% of firms’ revenues are spent on purchasing (Birou and Fawcett, 1993; Spekman, Kamauff, and Spear, 1999; Sánchez-Rodríguez et al., 2006). In other words, purchasing is responsible for procuring more than half of the final value of a firm’s products and services. This emphasizes the purchasing function as more than a supportive business function. At its best, purchasing can tap into supplier competences and add to the competitive strength of the buying firm. At its worst, inefficiencies in purchasing can bite into potential profits (Janda and Seshadri, 2001).

Traditionally, purchasing has been considered as merely having a passive role (Ellram and Carr, 1994) or supportive role (Carr and Smeltzer, 1997). In its most critical form, the view on purchasing has described the function as a powerless, paper-pushing business function (Pearson and Gritzmann, 1990). In the past decades this assumption has been challenged as purchasing has taken on an increasingly strategic role.

The importance of purchasing first became heavily stressed by the mid-seventies oil crisis where the raw materials shortage drew attention to the importance of purchasing (Ellram and Carr, 1994). Later purchasing’s role in corporate strategy was underlined in Porter’s seminal work. Here buyers and suppliers were identified as two of the critical forces (Carr and Smeltzer, 1997; Ellram and Carr, 1994). The following section seeks to familiarize the reader with the PSM domain by outlining the different
types of topics covered by the PSM literature and presenting what is to be considered state-of-the-art in the field.

The PSM literature suffers from semantic and conceptual confusion (Quintens, Pauwels, and Matthyssens, 2006b) and many of the field’s central constructs have evaded clear definitions for many years. For example Carr and Smeltzer (1997) note that there is a difference between purchasing strategy and strategic purchasing. In their paper, purchasing strategy refers to the specific actions the purchasing function takes to achieve its objectives and strategic purchasing refers to the planning process that purchasing follows as part of the overall management process. Spina et al. (2013) defined PSM as “the strategic approach to planning for and acquiring the organization’s current and future needs through effectively managing the supply base” (Spina et al., 2013 p. 1). A similar definition is presented by Quintens, Pauwels, and Matthyssens (2006b) where global purchasing is defined as “the activity of searching and obtaining goods, services and other resources on a possible worldwide scale, to comply with the needs of the company and with a view to continuing and enhancing the current competitive position of the company” (Quintens, Pauwels, and Matthyssens, 2006b p. 171). Spina et al. (2013) stress that there is a difference between PSM and supply chain management (SCM), with PSM being a subset of SCM. They define SCM as being “a process-oriented approach to managing product, information and funds flows across the supply network, from the initial suppliers to the final end consumers” (Spina et al., 2013 p. 1).
Other authors have stressed the need for PSM researchers to broaden their scope to adjacent fields such as supply chain management (Quintens, Pauwels, and Matthyssens, 2006b) noting that purchasing is the first step towards global supply chain management. The relationship between supply chain management (SCM) and purchasing and supply management (PSM) is depicted in Figure 1 above. Yet others have suggested that PSM should lean towards more established theoretical domains such as strategic management literature (Hitt, 2011). A more thorough discussion of the need for theory in PSM is addressed later in this introduction.

**Literature reviews in the PSM domain**

A number of reviews pertaining to PSM have been published over the years. Some of these have focused on specific areas relating to the field of PSM for example relational capabilities (e.g. Pagano,
Ellram and Carr (1994) conducted the first general literature review on PSM (Spina et al., 2013). In this review, the authors divided the literature into three streams of research: purchasing’s strategic concerns, purchasing’s role and the evolution of the purchasing function to a strategic level. The authors identified five issues of concern to purchasing: the make or buy decision, supplier technology, supplier relationship, the external environment, and the purchasing functions support of corporate strategy (Ellram and Carr, 1994 p. 17). The review identified no papers which focused on purchasing’s capabilities, but noted that purchasing operations had not yet developed the skills to contribute to corporate strategy (Ellram and Carr, 1994 p. 17). Ellram and Carr (1994) stress the perceived role of purchasing as something requiring increased consideration by future researchers. At the time of conducting and writing their literature review, empirical PSM research relied heavily on case studies, which also led the authors to call for more quantitative empirical research.

Quintens, Pauwels, and Matthyssens (2006b) review of the global purchasing literature divided the literature into three basic streams relating to either a) the antecedents of global purchasing (drivers, facilitators and barriers), b) those dealing with the consequences (product, firm and network level) and c) research relating to the global purchasing process (stage models). The review encompassed 123 research papers published in 31 academic journals. The authors argue that purchasing has transformed into a competitive weapon and has thus succeeded in getting the strategic attention of managers and researchers alike. However, the authors conclude that the literature remains stuck in a
mostly descriptive discourse, and therefore call for more in-depth case-based exploration (Quintens, Pauwels, and Matthyssens, 2006b p. 173) or theoretical integration from adjacent fields to explore the phenomenon using quantitative methods.

Zheng et al.’s (2007) review focused on future-looking research in PSM. Their review included 42 papers that were in accordance with specific methodological and theoretical quality criteria. Zheng et al. (2007) identified five overall themes in the PSM literature: business context; strategy; structure, role and responsibilities, system developments; and people and human resource management. The authors observed a lack of empirical papers considering the business context (Zheng et al., 2007 p. 72). Further, they emphasized the role of the internet in the future of purchasing with respect to both strategy (e.g. e-commerce) and system developments (information systems). The authors requested that future research in PSM looks to other countries for data as most of the existing literature is based on North America and the UK, and that researchers consider more advanced empirical methods (Zheng et al., 2007 p. 77). Contrary to the other literature reviews in PSM, Zheng et al. (2007) found that forward looking empirical research in the field favored quantitative methods, and the authors suggested that future survey-based research should seek to confirm external validity through the use of reported perceptions of other functional specialists (Zheng et al., 2007 p. 77).

Wynstra (2010) identified five topics in journal articles published in Journal of Purchasing and Supply Management (JPSM): supplier relations, supply base management/sourcing strategy, PSM strategy and corporate strategy, PSM organization, and information and communication technology. The most popular data collection method was interviews, with qualitative data interpretation naturally
following as the most commonly used data analysis method. Despite statistical analysis such as multiple regression analysis becoming more prevalent in recent years (Wynstra, 2010 p. 286), the overview of methods used in PSM provided in the paper still indicates a relative lack of more theory testing research. Wynstra (2010) still calls for more case studies to be published JPSM (Wynstra, 2010 p. 291).

Spina et al. (2013) conducted a systematic literature review of the PSM literature. Journal papers were selected from three of the leading PSM journals, seven journals in marketing and operations management, and ten in general management journals. They classified the literature according to three questions: what (purchasing process, activities), how (practices, organization and relationship management), and why (motivation and competitive priorities) of purchasing. The authors concluded that the research area has expanded its methodological toolbox (Spina et al., 2013 p. 10). The most commonly used research method was surveys, followed by conceptual papers and case studies (Spina et al., 2013 p. 7). The authors gave no suggestion as to what type of research methods should be pursued further in the field, but contrary to other reviews the authors noted that the field has matured theoretically. According to Spina et al. (2013) the most commonly used theories were transaction-cost theory (TCE) and the resource-based view (RBV) of the firm, with TCE outweighing RBV two to one. The review noted that only one in a thousand papers had used capability theory.

It is worth noting that Spina et al. (2013) is the only literature review that classified the literature in terms of the theories used. They identified that only 146 papers out of 1055 cited any theoretical frame for their studies, which is less than 14% of the articles.
Spina et al. (2013) note that the least researched topic was the organization of the purchasing function. This contrasts with Schneider and Wallenburg’s (2013) review of the literature from the same year, which questions whether more research on organizing the purchasing function is needed. Schneider and Wallenburg (2013) identified twelve areas of research on purchasing organization: structure and formalities, relationship management, strategic performance and measurement, everyday processes and policies, evolving responsibilities, strategic alignment, buying centers and purchasing status, HR and change management, decision making, organizational learning, leadership and culture, and finally IT and e-business. The authors conclude that there is still room for more research on the organization of the purchasing function, and especially on that which is motivated by changes in the environment (Schneider and Wallenburg, 2013 p. 6). The review indicated that quantitative research methods were used more than theoretical and qualitative studies in some areas of purchasing organization.

It is clear that no unequivocal categorization can be made as to what composes the body of literature that is PSM. In the reviews presented here, several different classifications of topics have been proposed. Most of the literature reviews seem to concur that the field of PSM is in a nascent stage. Quintens, Pauwels, and Matthyssens (2006b) go so far as to claim that the literature remains stuck in a premature discourse. With some notable exceptions (Quintens, Pauwels, and Matthyssens, 2006b; Wynstra, 2010), most authors seem to agree that the PSM literature could benefit from more quantitative theory testing research. The skeptics base their concerns on the level of theoretical maturity of the field, and note that a way in which PSM could overcome this obstacle is through the infusions of different theoretical perspectives from adjacent fields. Even though Spina et al. (2013)
indicate that the PSM area of research may have come further with respect to methodological maturity, the area could still benefit from further theoretical maturity in terms of borrowing from adjacent fields and more specifically the capability-based view (cf. Hitt, 2011). Especially, the capability-based literature which remains an underutilized perspective in PSM (Hitt, 2011; Spina et al., 2013). In order to address this concern, this thesis borrows from the strategy literature and incorporates the capability-based view as the theoretical lens of the study. The theoretical discussions in the capability-based view are explored in the subsequent section.

The theoretical lens

The basic tenet of the resource-based view of the firm is that firms must have access to valuable, rare and imitable resources in order to gain competitive advantages. Further they must organize their activities to make use of these resources (Barney and Hesterly, 2006). The capability-based perspective extends from the resource-based view of the firm by emphasizing the capabilities firms use to turn resources into output. Organizations must be capable in order to produce output in the sense that they must possess the knowledge to do so. In increasingly competitive and globalized markets, suppliers are becoming equally accessible to competitors. At the same time, resources provided by suppliers need to be integrated into the focal firm’s value process. This emphasizes the need to understand the relationship between capabilities and performance.

Generally, management scholars accept that capabilities can be a major source of organizational performance (Drnevich and Kriauciunas, 2011). In light of the growing importance of PSM, the
capabilities to fully tap into the potential of purchasing become key components in securing a competitive strategy. Where the resource-based view focuses on the unique access to valuable resources, proponents of the capability-based view argue that, in a dynamic and rapidly changing competitive environment, it is the development and application of capabilities that generates long-term competitive advantages. In this thesis, the capability-based view is applied to PSM in relation to the capabilities used by the purchasing functions.

Firms are heterogeneous – even in the way they accomplish similar tasks, organizations tend to have distinctive ways of doing things. The supply risk management of one company (reviewing supplier audits, attending team meetings, visiting suppliers) may be very different from that of another company. It may rely on the same resources (i.e. a central database of supplier credit ratings), but be accomplished through different routines by the firms. However firms share the conscious effort of trying to reduce or manage supplier-related risks, and may be more or less capable of doing so. Likewise, we can easily imagine that one organization may give emphasis to building relationships with one or more suppliers, while another company may put emphasis on market intelligence in the search for new suppliers or products. These organizations then differ with respect to their capability endowments. In this thesis, I explore which capabilities are important for different performance outcomes in PSM (see summary of the papers).

The capability-based perspective is increasingly being used in the supply chain management literature (Hitt, 2011), but has received only very limited attention in the PSM literature (Spina et al., 2013). Thus, by using this theoretical lens, the thesis contributes to this nascent area in research and the
diffusion of the capability-based theory to PSM. In the following, I review the literature on organizational capabilities to outline the theoretical frame of the dissertation.

Capabilities – definitions and core concepts

The following paragraph explores the definitions and core concepts of the capability-based literature. First, I present the seminal work by Teece, Pisano, and Shuen (1997). Second, I explain how the capability-based concept has evolved along different conceptual dimensions and exemplify the differences in conceptual understanding by showing the differences in definitions of the main authors in the field (e.g. Winter and colleagues, Eisenhardt and colleagues, and Helfat and colleagues). Third, given the multitude of terms used in the field, I show how key theoretical concepts relate to one another. Fourth, I present alternative approaches to studying capabilities in the literature primarily focusing on how capabilities interact together to create competitive advantages.

Teece, Pisano, and Shuen’s (1997) article is the seminal work of the capability-based perspective. The authors define dynamic capabilities as “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano, and Shuen, 1997 p. 516). In this seminal work, dynamic refers to the capacity to renew one’s competence to fit the changing environments. This aspect relating to what constitutes the dynamism of dynamic capabilities is disputed and is one of the dimensions of conceptual variance in the field (cf. Barreto, 2010). Teece, Pisano, and Shuen (1997), attempt to establish dynamic capabilities as a theoretical perspective by moving towards a terminology in the field. In their work, the authors focus on six core
concepts: factors of production, resources, routines/competencies, core competencies, dynamic capabilities, and products. Factors of production are inputs that are readily available in the factor markets and are not firm specific. Resources are firm-specific assets that are difficult to imitate. Routines or competencies are group-level clusters of firm-specific assets. Core competences are the fundamental basis of the firm and are expressed through the range of a firm’s products and services. Products are the final goods and services produced by a firm. The foundation for the capability-based view is made by comparing four paradigms of strategy: competitive forces, strategic conflict, resource-based perspective, and finally the dynamic capability perspective.

Teece, Pisano, and Shuen (1997) have been criticized for being too broad and allowing too much reinterpretation of definitions, leading to an impeded emergence of conceptual consensus (Easterby-Smith, Lyles, and Peteraf, 2009). Inconsistencies and overlapping definitions not only plague the domain of PSM (cf. Quintens, Pauwels, and Matthyssens, 2006b), but also affect the capability literature (Wu, Melnyk, and Flynn, 2010). In order to identify and clarify the dimensions along which the capability-based view has evolved, Barreto (2010) conducted a literature review on the theoretical domain of the capability-based view. Barreto (2010) outlined seven different dimensions along which the capability-based view has been developed and discussed. These dimensions are depicted in Figure 2 on the following page.
First, the concept has been discussed with respect to the *nature*. This has been defined either as a capacity, a process or as a routine. Second, the specific *role* of capabilities has also been discussed. This has centered on the different locus of change. For example, some argue that dynamic capabilities act to change a resource base, while others have argued that dynamic capabilities act to change other capabilities. The third dimension is the *context* of capabilities, which has been discussed with respect to the level of dynamism in the environment for dynamic capabilities to be a sensible concept. Fourth, the concept has varied with respect to the *mechanisms* of capabilities. These mechanisms are the ones through which capabilities are created and developed e.g. through repeated action or conscious effort. Fifth, the main authors in the field have discussed the *assumptions of heterogeneity*. This refers to the degree to which firms can vary in the differences in their capabilities. Authors following the RBV have assumed that dynamic capabilities are firm specific and unique, while others have claimed
that there are commonalities across firms such as best practices. Sixth, there are different theoretical positions on the outcome of dynamic capabilities. Some authors have argued that dynamic capabilities create organizational performance while others have argued that dynamic capabilities are necessary – but not sufficient – conditions for competitive advantage (Barreto, 2010 p. 263). The seventh dimension refers to the purpose of dynamic capabilities i.e. as to what extent they work to improve efficiency, alter the resource base, or create market change.

In his review, Barreto (2010) proposed a new definition of dynamic capabilities as “the firm’s potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base” (Barreto, 2010 p. 271). Barreto (2010) supports a relationship between capabilities and performance indirectly: Capabilities alter the firm’s resource base, and by doing so it may influence the firm’s market position and affect its performance.

The two most important dimensions along which the debate on dynamic capabilities has evolved are the definition (nature) and consequences (outcome). Authors from several different fields and backgrounds have been attracted to the capability-based view and have contributed to defining capabilities as either routines or processes depending on the authors own research tradition (Easterby-Smith, Lyles, and Peteraf, 2009). Winter and colleagues’ definition reflects their departure point in evolutionary economics (Easterby-Smith, Lyles, and Peteraf, 2009) and by defining capabilities from a routine-perspective. Winter (2000, 2003) defines capabilities as: “An organizational capability is a high-level routine (or collection of routines) that, together with its implementing input flows,
confers upon an organization’s management a set of decision options for producing significant outputs of a particular type” (Winter, 2003 p. 991; Winter, 2000 p. 983). In relation to the definition of capabilities, Winter (2000) argues that contrary to routines, capabilities are substantial in scale and significance.

Capabilities are a large chunk of activity that clearly matters to an organization and enables the production of output relevant to the organization’s survival (Winter, 2000 p. 983). Winter (2000) focuses on the development mechanisms of capabilities. Capabilities are learned through conscious effort and guided by a satisficing principle. The satisficing principle suggests that firms develop their capabilities according to the level of their aspirations as low aspirations lead to observable (overt) learning ending sooner. According to Winter (2000) the outcome of the exercise of an individual capability is multidimensional and non-perfectible. In his work, he discusses the outcome with respect to capability learning, i.e. the acquiring of a new capability.

Winter (2003) elaborates on his definition of capabilities by focusing on the difference between routines and capabilities. Routines are highly patterned, repetitious or quasi-repetitious behavior. Routines are founded in tacit knowledge and the specificity of objectives. Dynamic capabilities involve long-term commitments to specialized resources (Winter, 2003 p. 993). Winter (2003) distinguishes between different levels of dynamic capabilities. The higher the level of dynamic capabilities, the more robust the capability is to exogenous change. The possible levels of dynamic capabilities extend into infinity, and superiority at one level always trumps superiority at a lower level.
Zollo and Winter (2002) define dynamic capabilities as “a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness” (Zollo and Winter, 2002 p. 340). The authors focus on the learning mechanism that supports the development of dynamic capabilities by looking at tacit and explicit knowledge formulation. They argue that explicit articulation and codification is more effective than the tacit accumulation of past experiences in developing dynamic capabilities when 1) the frequency of experiences is low, 2) the heterogeneity of tasks experiences is high, 3) the degree of causal ambiguity is high. Improved effectiveness is the outcome of dynamic capabilities.

Eisenhardt and Martin (2000) depart from the resource-based view and define dynamic capabilities as “The firm’s processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change. Dynamic capabilities are thus the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die” (Eisenhardt and Martin, 2000 p. 1107). The authors argue that dynamic capabilities themselves can lead to competitive advantage, but that sustainable competitive advantages stem from the dynamic capabilities’ ability to reconfigure underlying resources. Dynamic capabilities are idiosyncratic, meaning that they are distinct in their specific details, yet share commonalities across firms. Eisenhardt and Martin (2000) link this to the equifinality of capabilities. Equifinality means that a given outcome (dynamic capability) can result from different paths or combinations of antecedents. Thus, the equifinality of dynamic capabilities means that the development of one firm’s product development capability may come about as a result of different underlying routines or resources. Dynamic capabilities all involve a learning component. Eisenhardt
and Martin (2000) describe the learning component as some element of structure that guides the reproduction of capabilities by changing and altering them. The structure that guides dynamic capabilities becomes less complicated, more experiential and iterative in highly volatile markets. Because the structure that guides dynamic capabilities becomes more of a semi-structure at the edge of chaos (Eisenhardt and Martin, 2000 p. 1113), dynamic capabilities themselves can be hard to sustain in high-velocity markets. Irrespective of their idiosyncratic nature and the equifinal path-dependence of dynamic capabilities, best practices exist across firms. That means that a pattern of similarities between the effective features arises amongst the dynamic capabilities adopted by firms.

Helfat and Peteraf (2003) define capabilities as “the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result” (Helfat and Peteraf, 2003 p. 999). Further, they define resources as “an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis” (Helfat and Peteraf, 2003 p. 999). The authors argue that all capabilities have the potential to accommodate change and can therefore be considered dynamic (Helfat and Peteraf, 2003 p. 998), but distinguish between operational capabilities, which have a particular output (e.g. manufacturing), and dynamic capabilities as those capabilities that do not involve the production or provision of a marketable good/service. The authors argue that organizational capabilities reside within the team-level, and that they require the routines to perform and coordinate individual tasks. Capabilities go through a life cycle that consists of the founding, the development, and the maturity stage. In more recent work, Helfat and Winter (2011) recognize that the line between operational capabilities and dynamic capabilities is inevitably blurry. They define capabilities as firms’ “capacity to
perform a particular activity in a reliable and at least minimally satisfactory manner” (Helfat and Winter, 2011 p. 1244). The authors confer the notion of the existence of zero-order capabilities. They are referred to as operational capabilities: those that enable the firm to make a living in the present. The problem of distinguishing between operational capabilities and dynamic capabilities is made harder because change is always happening, and therefore both operational and dynamic capabilities deal with change. Further, capabilities may be used for both dynamic and operational purposes.

In recent work Teece (2007) explores the distinction between dynamic and operational capabilities. The paper builds on a Schumpeterian understanding of the generation of competitive advantages and rents. Teece (2007) differs from Winter and colleagues in the sense that he does not talk about capabilities of different order. He argues that dynamic capabilities can be classified into only three categories: sensing, seizing and reconfiguration capabilities. The author elaborates on the micro foundations of dynamic capabilities – e.g. processes to support sensing, protocols, trust and commitment to support seizing, governance and knowledge management to support transforming. In this paper Teece (2007) argues that the management of operations (including purchasing) cannot be considered dynamic capabilities. On the other hand, he argues that operational capabilities have shown the ability to generate competitive advantages over time. One of the examples mentioned is the development of production systems during the post-war industrial revolution. These inarguably changed production oriented firms’ resource endowments in terms of production systems and brought about a new Schumpeterian equilibrium. Thus, operational capabilities may in some cases lead to competitive advantages, but cannot be considered dynamic because they are not concerned with entrepreneurial management in terms of sensing, seizing and transforming capacities.
As noted by Wu, Melnyk, and Flynn (2010), the capability-based literature suffers from inconsistencies and contradictions in definitions. Thus, the final part of this introduction to the theoretical lens of the study is an attempt to clarify the understanding of relations amongst key terms in the field. Salvato and Rerup (2011) attempt to bridge the theoretical gap in multilevel research by tying together organizational routines and capabilities. The resulting framework is a chart of interlinkages amongst multi-level collective entities in organizational research from individual behavior to firm strategy. In his framework, Salvato and Rerup (2011) only incorporated a routine-based perspective. Below, I have adapted the figure from Salvato and Rerup (2011) to show the relationship between the key constructs explored above. As noted by Easterby-Smith, Lyles, and Peteraf (2009), the definition of (dynamic) capabilities remains one of the most debated aspects of the theory itself. Helfat and Winter (2011) note that the distinction between operational capabilities and dynamic capabilities remain inevitably blurry and thus follows Winter’s (2003) hierarchy of different order levels of capabilities. This is reflected in Figure 3 on the following page with a stipulated line between capabilities and dynamic capabilities.
The capability-based view is not yet fully developed, and as discussed above there is still some conceptual disagreement in the field. As a part of the evolving nature of the theoretical domain, researchers are continuing to attempt to push the boundaries of the theory. In recent literature, researchers have focused more extensively on the deployment mechanisms of capabilities, especially in relation to combining different capabilities. Some of these attempts are explored below.

For example Gruber et al. (2010) adopt a configurational lens to study capabilities and their performance implications. The authors find that firms tend to have resources and capabilities in configurations that are generally poor, good or mediocre. They note that capabilities and resources seem to emerge in few internally consistent configurations (Gruber et al., 2010 p. 1346).
Adopting a similar perspective on capabilities, Sirmon et al. (2010) argue that it is the configuration of a firm’s strength and weakness ‘sets’ of capabilities that determines the strength of the firm’s competitive advantage. Firms can either have a low or a high level in their relative strength set, and similarly a low/high level of their relative weakness set. Competitive advantages are classified as being offsetting, robust, undermining, or precarious, depending on the combination of relative weaknesses/strengths. Each combination is associated with a specific level of performance (neutral, positive and negative). The authors study the evolution of capabilities over time. They find that a firm’s relative performance grows increasingly positive as its strength sets are improved, suggesting that firms should not remain static when achieving synergies between competitive strengths because further developing strengths may yield increasingly positive relative performance (Sirmon et al., 2010 p. 1402). The authors do not find increased levels of firms’ weakness-sets to hurt relative performance. They find support for differing levels of relative performance-effects according to the possible combinations of weakness and strength-sets. The authors stress the importance of considering not only capability-strengths, but also capability-weaknesses in order for future research to fully understand how capabilities may be linked to competitive advantages and performance.

Makadok (2001) explores the complementarity and substitutability of capabilities. He defines capabilities as “a special type of resource—specifically, an organizationally embedded nontransferable firm-specific resource whose purpose is to improve the productivity of the other resources possessed by the firm [original emphasis]” (Makadok, 2001 p. 389). According to the author, capabilities generate economic profit (Makadok, 2001 p. 389). He contrasts resource picking (resource selection) and capability building (resource deployment). He suggests that the two mechanisms may be
complimentary in some instances and substitutable in others, however both mechanisms are theoretically linked to improved levels of economic profit.

The need for theory in PSM

Theory is the building blocks of hypotheses. Hypotheses and their tests are the foundation of understanding (Schmenner et al., 2009 p. 339). Without theory, we simply cannot craft good hypotheses. Without good hypotheses, we will not have good tests. Without good tests, we will not have good understanding of the phenomena. The need for better theory in the field of purchasing and its related disciplines has been pointed out by many (amongst others Amundson, 1998; Hitt, 2011; Quintens, Pauwels, and Matthyssens, 2006b; Schmenner and Swink, 1998; Schmenner et al., 2009; Spina et al., 2013). The general suggestion is that PSM should adopt theories from adjacent fields – referred to by Amundson (1998) as alien theories – in order to build on a solid foundation. Rather than re-inventing the wheel, PSM can simply “borrow” from more established fields in order to quickly advance the field with respect to theoretical maturity.

The mainstream strategic management literature offers a multitude of theories to draw from. In the context of this thesis, the most important theory is of course the capability-based view, but other theories are also promising and have been used e.g. the most widely used theory in PSM: transaction cost economics (Spina et al., 2013). The capability-based view – often referred to concurrently with the resource-based view offers some specific advantages which are discussed below.
Amundson (1998 p. 349), equating capabilities with resources, argues that the benefit of the resource-based view is that it emphasizes internal capabilities and that it provides the criteria by which the competitive contribution can be judged. Likewise, a similar argument can be proposed for the capability-based view: that it provides a frame and criteria within which the contributions of certain purchasing capabilities can be discussed. For example with respect to how purchasing adapts to rapidly changing environments, or how they may use certain capabilities to alter or improve other capabilities or resources.

Research in the field of PSM is dominated by a few actively publishing researcher from a small set of institutions. This in itself may lead to some amount of groupthink (Wynstra, 2010 p. 291) with the consequence of a diminished influx of new ideas and theories. This is corroborated by Spina et al. (2013) who review of PSM literature clearly shows that the theory-base used in PSM research is rather small. Therefore, the integration of the capability-based view may also aid to counteract the effects of groupthink.

Further, the adoption of the capability-based lens in PSM and its related discipline may also benefit the strategic management literature, because PSM offers an empirical and theoretical research domain that has a strong tradition for being closely linked with managers and practitioners. In this way the field offers an empirical research domain in which abstract theoretical concepts can be linked closely to real, managerial problems. Therefore the adoption of alien theories has the potential to benefit both fields (Amundson, 1998; Hitt, 2011).
There are pitfalls associated with using any theory as a theoretical lens, because while it does focus the researcher’s attention and magnifies the factors that are important explanatory factors within the theoretical lens, it also directs the attention away from the periphery – explanatory factors on the edge of the theoretical lens or outside its scope completely. For example, the resource-based view and the capability-based view is not able to adequately explain industry effects (Amundson, 1998 p. 350). On the other hand, using a theoretical lens that has not commonly been employed to study a given phenomenon may offer alternative, perhaps even competing explanations to those typically in the field. An example of this type is the make-or-buy decision, where different theoretical perspectives offer completely different predictions between firm and market performance with respect to different contingencies (cf. Poppo and Zenger, 1998). While this thesis does not compare any theoretical perspectives as such, it may still offer insights based on an alien theoretical perspective.

**Research question**

Despite the increasing recognition of the importance of competence in purchasing and the role of purchasing as a strategic important activity for firms, capabilities remain an underexplored research area in purchasing and supply management with as little as one in a thousand papers published on the topic (Spina et al., 2013). This finding is underpinned by a general topic search on Thomsons Scientific Web of Knowledge which results in only 12 results on “purchasing capabilities” of which only three are in the PSM domain (The three articles are: Ellegaard, 2009; González-Benito, 2007;
The previous section discussed the need for theory in purchasing and supply management, and delineated some of the benefits of adopting the capability-based view as a theoretical lens. To sum up, the capability-based view offers potential to explain performance differences amongst firms in the face of environmental change (Teece, Pisano, and Shuen, 1997) and by the reconfiguration of resources and capabilities. The capability-based view offers potential to deliver the theoretical integration that several authors have called for (Hitt, 2011; Quintens, Pauwels, and MatthysSENS, 2006b). The capability-based view remains an underutilized perspective in PSM (Spina et al., 2013) and very little research has been done in this area. Thus, this thesis seeks to integrate the capability-based literature with the purchasing and supply management literature. In doing so, I have formulated the following overall research question:

What purchasing capabilities explain performance differences amongst Danish firms?

**Research design**

As I am interested in explaining the outcomes and relative performance differences amongst firms, the quantitative approach is useful. A quantitative research design focuses on explaining the causal paths that leads to different outcomes. The quantitative research design is one of the three main types of design (Creswell, 2009 p. 3): quantitative, qualitative and mixed methods. The quantitative research design tests objective theories by examining relationships amongst variables (Creswell, 2009 p. 4), whereas the qualitative design explores the meaning ascribed to social or human problems. The mixed methods research originated from Campbell and Fisk’s study of validity of psychological traits.
(Campbell and Fiske, 1959), in which the authors encouraged others to employ their multimethod matrix to examine approaches to data collection.

Research studies tend to be either more qualitative or quantitative (Creswell, 2009 p. 3) along a continuum spanning from qualitative on one side to quantitative on the other side with mixed methods in the middle. The research design of this thesis tends to the quantitative side of the continuum. This chapter seeks to explain the research strategy within this design, as well as how inputs from the mixed methods design approach have been used.

The selection of a research design depends on the research problem, personal experiences and the intended audience (Creswell, 2009 p. 18): As argued throughout this introduction, very little research exists on purchasing capabilities. Because very little research has been done on purchasing capabilities, a researcher may decide to design a qualitative research study to explore the phenomena. Qualitative research studies are more explorative in nature, and are often used when the important variables to examine are unknown. However, as the intended purpose of the thesis is to explain performance differences (a causal mechanism), the specific research problem calls for using quantitative methods. Further, the research question formulation also requires some level of generalizability of the findings which are not possible with strictly qualitative methods.

The third option is using a combination of both in a mixed method study. The options here are the sequential method in which one method is used to expound on the findings from another method, or the concurrent approach in which the researcher would seek convergence between or merging of
quantitative and qualitative data, and finally the transformative in which one theoretical lens provides the framework for both qualitative and quantitative data interpretations.

Personal experience, according to Creswell (2009) also influences the choice of approach. Typically, the researchers' formal training will be the key factor here, but other factors may also influence this aspect. In this research project, the personal aspect played a role. Due to my own serious illness I had to take an extended medical leave of absence in the middle of my research project. During this time I also had to change supervisors and department. A research design in which I would be personally committed to conducting long interviews for several days was simply not possible because of the nature of my illness. Therefore, the final research design probably leans more towards the quantitative research design than it might otherwise have done. Finally, the audience of the research may influence the chosen research design. The intended audience of the thesis is researchers in the purchasing and supply management domain. In this domain, both quantitative and qualitative research is accepted. Even though some authors have called for more qualitative studies (such as for example the call for more case studies in JPSM), the domain still favors quantitative design such as survey research (Spina et al., 2013).

The problem statement is perhaps the most important factor in shaping a good research design. As argued, the problem statement requires investigation of causal mechanisms (favoring a quantitative design), but is positioned in a gap in literature where very little research has been done (favoring a qualitative design), the problem statement would have lend itself well to a mixed method design in which qualitative methods could be used to identify the variables used for theory testing. However,
due to personal limitations, the final choice of research design leans more towards the quantitative side of the continuum. In an effort to use some qualitative insights and to guide the design of the survey, some interviews were conducted. The purpose of these interviews was primarily to confirm the coverage of the capabilities included in the survey with respect to the interviewees’ real-life context and clarifying any problems in the item-formulations.

I was inspired by how authors in the marketing research domain had integrated the dynamic capabilities approach, in particular the work by Vorhies and Morgan (2009). These authors identified the existence of marketing capabilities by synthesizing insights gained from qualitative findings from focus groups with insights from the marketing literature. The derived capabilities closely relate to the 4Ps (or marketing mix) which has become a widely accepted and used concept in the marketing literature (McCarthy, 1960; Van Waterschoot and Van den Bulte, 1992). In an attempt to identify the purchasing capabilities that may explain performance differences amongst firms, I decided to begin by identifying a generic typology of the purchasing function. To this end, purchasing process models are a good starting point. I used the process model presented in the purchasing and supply chain management teaching book written by Arjan Van Weele. A purchasing-process model is presented in this book (Weele, 2005 p. 13). According to this model, the purchasing function is responsible for determining specifications, selecting suppliers, contracting, ordering, expediting and evaluation, and follow-up. These tasks or processes, for which the purchasing function is primarily responsible, were used as keywords for the literature search. This led to an initial draft for a survey. Following the initial survey formulation, a total of five interviews were conducted with senior level purchasing managers. The purpose of these interviews were to discover if we had constructed a survey which covered
capabilities that would be relevant for explaining performance differences in purchasing in the broadest sense. These interviews confirmed that the capabilities we had included in the survey had sufficient coverage. However the interviews led us to revise some of the questions as well as include an additional construct to measure purchasing’s ability to negotiate, as this was stressed as an important factor in purchasing especially by one of the respondents. These interviews resemble the sequential mixed methods design where qualitative methods are used to expand the findings of another method.

Data collection

The data collected for my thesis is collected from a sample of 2257 Danish firms. The firms were identified using the Experian database. The Experian database is recognized as the most complete database of all VAT-registered companies in Denmark. The sample is restricted to companies with 50 or more employees located in the 5 Danish regions. The final sample consists of joint-stock companies, cooperative societies, limited liability companies, trade foundations, and branches of foreign companies. Further, the sample was restricted by selecting the following NACE categories: A (Agriculture, hunting, forestry and fishing), B (Mining and quarrying), C (Manufacturing), D (Electricity, gas and heat supply), E (Water supply; sewerage; waste management and remediation activities), F (Construction), G (Wholesale and retail trade; repair of motor vehicles and motorcycles), I (Accommodation and food service activities), and J (Information and communication). The biggest
industry group is manufacturing with 870 firms in the sample in this industry classification (39%). The second largest is the wholesale and retail trade industry with 683 firms in this category (30%).

Two of the papers in the dissertation focus on the manufacturing firms in the sample. These firms represent 20 different industry groups in the Danish NACE codes between 10 and 33. These groups are: 10 – food manufacturing industry; 11 – drinks; 13 – textiles; 14 – clothing; 16 – tree, cork and straw (excl. furniture); 17 – paper; 18 – prints and media; 20 – chemical products; 22 – rubber and plastic; 23 – other non-metal minerals; 24 – metal; 25 – iron and metal (excl. machinery); 26 – computers, electronics and optics; 27 – electrical equipment; 28 – machinery and equipment; 29 – motor vehicles; 30 – other transportation vehicles; 31 – furniture; 32 – miscellaneous manufacturing industries; 33 – repair and installation of machinery and equipment.

Two surveys were prepared. The first survey was sent out the manager with responsibility for purchasing in each of the firm. The primary focus was on collecting data on the independent variables, the capabilities. The second survey was sent to either the manager with responsibility for production (manufacturing firms in NACE-category C) or the sales/marketing manager (remaining categories). The purpose of this survey was to collect data on the dependent variables as well as possible moderator variables. The data collection process was assisted by a telemarketing company for both surveys. Both surveys were pretested for clarity prior to data collection amongst a group of academic peers. Attention was paid to the design of the survey to ease participation. To entice participation in the first questionnaire, the purchasing respondents were offered an executive
Summary. The questionnaires were administered in Danish through an online self-administered questionnaire using an online software tool from Rambøll Management (SurveyXact).

The first round of data was collected between October 2011 and January 2012. The second round of data collection was collected between January 2012 and March 2012. Only respondents who had replied to the first questionnaire were invited to participate in the second round of data collection. For both surveys, two reminder emails were sent out to respondents who had not completed the questionnaire after one and three weeks.

Summary of the papers

As stated earlier in the introduction, the dissertation is written as a collection of papers. The theoretical point of departure for the thesis is the capability-based view of the firm. The papers themselves are written as independent pieces of research, each focusing on a different topic in PSM. As a collective piece of work, they all contribute to advancing capabilities as a theoretical lens in PSM.

Capabilities can improve efficiency (of other capabilities), alter the resource base, or create market change. The three papers in this dissertation each address these performance outcomes, albeit with a different focus in each paper. Paper 1, focusing on capabilities contribution to innovation primarily addresses what purchasing capabilities contribute to firm innovativeness, and through what mechanism. Paper 2 focus on improved delivery performance which can be seen as an alteration of the resource base constituted by the firms supply base. This paper also address the effect of the
environment on the purchasing capabilities studied. The last paper focuses more on improving the efficiency of risk management capability.

The following section presents each of the papers in the thesis and highlights their contribution and their interlinkages and similarities. Three different aspects of purchasing management are examined. These aspects are innovation, delivery performance and risk management. Table 1 on the following page contrasts the papers of the dissertation and shows the findings and similarities/differences between the papers in structured form.
<table>
<thead>
<tr>
<th>Paper 1</th>
<th>Paper 2</th>
<th>Paper 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable(s)</strong></td>
<td>Products and production technology innovation</td>
<td>Delivery performance</td>
</tr>
<tr>
<td><strong>Independent variables</strong></td>
<td>Supply and practice innovation</td>
<td>Direct effects</td>
</tr>
<tr>
<td>Integrate capability</td>
<td>Supplier evaluation capability</td>
<td>Intelligence capability</td>
</tr>
<tr>
<td>Relational capability</td>
<td>Risk management capability</td>
<td>Negotiation capability</td>
</tr>
<tr>
<td>Innovative capability</td>
<td>Demand uncertainty</td>
<td>Contract design capability</td>
</tr>
<tr>
<td>Intelligence capability</td>
<td>Technological uncertainty</td>
<td><strong>Mediators</strong></td>
</tr>
<tr>
<td><strong>Explanatory mechanisms explored</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effects</td>
<td>Environmental-contingency perspective (interaction with environmental variables)</td>
<td></td>
</tr>
<tr>
<td>Synergies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configurations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strengths</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weaknesses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compensatory system of effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>764 Danish manufacturing and non-manufacturing firms. Purchasing respondent.</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td>Hierarchical regression analysis</td>
<td>Hierarchical regression analysis</td>
</tr>
<tr>
<td>Cluster analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply and practice innovation is positively associated with integrative, innovative, and intelligence capabilities. There is a negative synergy between integrative and innovative capabilities.</td>
<td>Risk management capability improves delivery performance from suppliers. Supplier evaluation capabilities negatively affect deliveries from suppliers as perceived by the manufacturing respondent. Environmental variables are not significant moderators, however higher demand uncertainty is linked to poor delivery performance.</td>
<td>Intelligence capability improves risk management capability. This effect is partially mediated through negotiation and contract design capabilities. The indirect mediated effects are statistically significant.</td>
</tr>
<tr>
<td><strong>Findings</strong></td>
<td>Products and technology are positively associated with integrative, relational and innovative capabilities. There is a negative interaction effect between integrative and relational capabilities and a positive synergy between intelligence and innovative capabilities.</td>
<td></td>
</tr>
</tbody>
</table>
Paper 1: How do purchasing capabilities affect innovation?

The first paper in the thesis focuses on purchasing’s role in contributing to the innovation of a company. Firms can use purchasing’s relation to the external environment through relations with suppliers and knowledge on factor markets to generate innovative inputs for the firm. For example, Procter & Gamble employs technology entrepreneurs who scan and exploit opportunities in the market to realize product and technology innovations (Huston and Sakkab, 2006). Li & Fung, a Hong Kong based manufacturer of textiles, reinvented their entire supply chain to cut throughput time drastically and revamp their competitive advantage (Magretta, 1998).

The paper examines purchasing’s contribution to (1) product and production technology innovations and (2) supply and practice innovations. More specifically, the paper looks at the firm’s integrative, relational, innovative and intelligence capabilities in generating purchase driven innovations. The integrative capability ensures that purchasing is able to collaborate with internal partners and impact strategic decisions. The relational and intelligence capability represents a mechanism through which purchasing may gain external input for innovation: through collaborations with suppliers and through knowledge about the factor markets. Finally, innovative capability facilitates the innovative process in finding and accepting new ideas.

The paper explores six different explanatory mechanisms. First, the paper tests the hypotheses relating to the direct effects of the four capabilities on both types of innovation. Second, the paper explores the interdependencies between capabilities as capability interaction effects, representing what researchers refer to as complementarities, synergies
or interconnectedness of capabilities (Dierickx and Cool, 1989; Morgan, Vorhies, and Mason, 2009; Wu, Melnyk, and Swink, 2012). Third, the paper explores the proposition of equifinality between capabilities (Eisenhardt and Martin, 2000) by looking at clusters of capabilities. Fourth, the paper explores the suggestions derived from the resource-based view that capability strengths determine performance. Fifth, the paper explores the contrasting view that capability weaknesses are able to predict performance. Finally, the paper examines if capabilities are compensatory in nature – i.e. that trade-offs are possible between capabilities (Wu, Melnyk, and Swink, 2012).

This paper features the use of hierarchical regression analysis and cluster analysis. The paper relies on data from the purchasing respondent. Results are shown to be mostly robust across different model specifications taking into account industry differences. Contrasting the different theoretical perspectives pursued in the paper, our findings are found to be robust across the different theoretical models. In addition, we find that the direct and interaction-effects models best represent the data.

All of the hypotheses relating to the theoretical perspectives explored are supported. In the paper, we compare the relative quality of the models and find that the model specifying direct and interaction effects most adequately explains the data. The other competing theoretical models support the robustness of the findings from the direct and interaction-effects model through yielding consistent results in relation to the effects of the capabilities explored.

In the direct and interaction-effects models, the paper finds that integrative and innovative capabilities contribute to both types of innovation investigated in the paper. Relational
capabilities only contribute to products and production technology innovation. Intelligence capability positively affects supply and practice innovations. The paper finds negative synergies between having both integrative capability and innovative capability with respect to supply and practice innovations. Integrative capability and relational capability likewise have negative synergistic effects with respect to products and production technology innovation, whereas intelligence capability and innovative capability have positive interaction effects.

Paper 1 is co-authored with Niels Peter Mols. A shortened version of this paper will be published in International Journal of Procurement Management (forthcoming).
Paper 2: The impact of purchasing capabilities on delivery performance

The focus of the second paper is on the logistical side of PSM. Ensuring a constant flow of goods for production is important in manufacturing firms to avoid bottlenecks in production, and to ensure an effective flow of goods for production. Deficiencies may hamper the competitive advantage of firms, because poor delivery performance makes the firm less efficient. Delivery performance is increasingly being considered an important differentiator and researchers have called for identifying the antecedents of delivery performance (Fawcett, Calantone, and Smith, 1997). This paper explores the antecedents from a capability-based view.

The paper argues that the capability antecedents of delivery performance are supplier evaluation capability and risk management capability. These two capabilities are proposed to impact delivery performance through different mechanisms relating to the supplier-specific and the supplier non-specific risks that may impact delivery performance. Supplier evaluation capability should ensure that a firm ends up with the best possible supplier and risk management capability ensures that a firm mitigates outside risks and create contingency plans to avoid unnecessary disturbances. The paper further tests the moderation hypotheses that demand and technological uncertainty increases the need for capabilities to ensure a high level of delivery performance.

The paper relies on data collected from two different respondents within each firm. This data is analyzed using hierarchical regression analysis. The study contributes by advancing the field from a methodological angle by collecting data from both the purchasing responsible and the production responsible within each manufacturing firm. Based on the
data from the respondents, the paper is only able to support the effect of risk management capability’s impact on delivery performance. The paper does not find supplier evaluation capability to improve delivery performance. In fact, in the paper, supplier evaluation capability is found to negatively impact delivery performance. I discuss how this relationship could possibly be caused by increased awareness on poor delivery performance as a consequence of developing superior evaluation capabilities.

Paper 2 is single-authored. This paper will be published in Supply Chain Forum: An International Journal (forthcoming).
Paper 3: Building risk management capability

The final paper uses a framework by Day (1994) to classify three types of purchasing capabilities: outside-in, inside-out, and spanning capabilities. The three capability types were originally proposed to characterize the three types of capabilities unique to market-driven firms. We use this framework to study how purchasing managers may improve their risk management capability. Day’s (1994) seminal paper heavily relied on the market orientation construct proposed by Kohli and Jaworski (1990) and proposed that the most important feature of outside-in capabilities were their ability to sense and act on changes in the market. Thus, in our paper we classify market intelligence i.e. the purchasing ability to conduct supply market analyses as an outside-in capability. Spanning capabilities have neither an internal nor external loci, but rather act to bridge internal and external aspects. In this paper, we classify negotiation and contract design capabilities as capabilities that enable purchasing managers to bridge external and internal aspects. Thus, deriving our hypotheses from Day’s (1994) framework and grounding them in the PSM literature, we are able to test the framework using structural equation modeling. The paper uses responses from 764 purchasing managers. The paper finds that intelligence capability improves risk management capability. In addition, we are able to show that negotiation and contract-management capabilities are mediate the relationship using Sobel’s test for significance of mediation.

Paper 3 is co-authored with Ram Narasimhan. An earlier version of this paper has been presented at the European Decision Science Institute conference at University of Pannonia in Veszprem, Hungary on June 18th 2013.
**Contributions**

The aim of this thesis is to integrate the capability-based view in the purchasing and supply management literature. This broad aim is pursued through the following research question:

What purchasing capabilities explain performance differences amongst Danish firms?

This thesis contributes to an under-developed research area on purchasing capabilities. Very little research has been done (Spina et al., 2013). Therefore this thesis contributes to theory by focusing on a firm’s internal capabilities to improve performance in purchasing. First and foremost, the thesis identifies and measures eight distinct purchasing capabilities. Given the lack of literature in this area, scales were adapted from previous research. The capabilities were identified using existing literature. In each of the papers the capabilities are discussed in relation to theoretical lens, the capability-based view. These discussions of the capabilities individually seek to contribute to conceptual clarity. The integration of alien theories to the PSM field is made more difficult when neither theory has its underlying assumptions clearly delineated (Amundson, 1998 p. 354). The scales used in the three papers all proved to have sufficient or good validity, and therefore may be a suitable departure point for future studies focusing on PSM capabilities. At best the integration of the capability-based view in PSM will be a slow and iterative process (Amundson, 1998 p. 354).

The measurement of a latent phenomenon is a difficult task, and as discussed is not made easier because neither the PSM field nor the capability-based view clearly delineates the core concepts. Therefore the approach used in this thesis also has some limitations that are discussed in the subsequent section: limitations and future research.
The papers explore hypothesis based on the capability-based view and therefore contributes to theoretical integration as called for by researchers (Giunipero et al., 2008; Hitt, 2011; Kerkfeld and Hartmann, 2012; Quintens, Pauwels, and Matthyssens, 2006b).

In relation to the implications that refer back to the alien theory domain, the most notable contribution in this respect is perhaps made in the thesis’ first paper. This paper simultaneously explores different theoretical mechanisms of capabilities (e.g. capability interdependencies, capability configurations and relative strengths and weakness perspectives) in the same study. This is a contribution that extends beyond the purchasing and supply management literature, because it allows comparison of different theoretical perspectives within the capability-based view. To my knowledge, a comparison encompassing all these perspectives at the same time has not been done before. This comparison showed that the model yielding the highest percentage of variance explained was the direct and interaction-effects models. The direct effects and interactions model held more explanatory power than any of the competing perspectives; capability strengths and weaknesses or the capability configurations.

The capability-based view suggests that capabilities are needed in the face of rapidly changing environment (Teece, Pisano, and Shuen, 1997). This echo with the motivation often brought forth in the PSM literature; increasingly globalized and changing environments are often mentioned as drivers of an increasing managerial focus on purchasing and supply management. Schneider and Wallenburg (2013) have proposed the future research avenues for PSM are exactly those, which are motivated by changes in the environment. This makes the capability-based view a promising theoretical lens. This thesis, however, does not
confirm that capabilities are more advantageous under increasing levels of environmental uncertainty (contribution from paper 2). Schmenner et al. (2009) criticizes theory grounded research for being too cautious with theory. They encourage researchers to have the courage to debunk theory that does not stand to be verified by empirical enquiry (Schmenner et al., 2009 p. 341). The small empirical basis for paper 2 (n=197) makes taking the step to “debunk the capability-based theory” difficult at best. In addition, the general lack of research in the field of purchasing capabilities and the lack of any previous studies examining the effect of environmental uncertainty on purchasing capabilities, the thesis question the extent to which the advantages of capabilities are derived from their ability to deal with changing environments. On the other hand, capabilities do have an effect on other capabilities (paper 3), and can be used to change the competence-base to fit with competitive requirements.

Risk management is an important capability in purchasing and supply management. As firms become increasingly dependent on suppliers for input for production, they also increasingly rely on their suppliers to perform consistently. Risk management has been shown to improve delivery performance (paper 2) even when accounting for environmental dynamism and common method bias. The last paper shows how firms can improve their efficiency of risk management capabilities by building stronger intelligence, contract design, and negotiation capabilities. It thus extends beyond the simple suggestion that managers can improve risk management by playing “risk scenarios”, in which managers try to envision possible scenarios, to avoid supply-chain breakdown (Chopra and Sodhi, 2004). Risk
management can be improved by developing and maintaining other capabilities to sustain and improve its efficiency.

The thesis also offers some contributions from a methodological angle. The most noteworthy contribution is the use of multiple respondents in paper 2. The multiple respondents design is the most effective way to deal with common method variance in quantitative research (Podsakoff and Organ, 1986; Podsakoff et al., 2003). Common method variance when present may yield unreliable results on hypotheses test, because the significance of the tests can be ascribed to the method used rather than the existence of ‘real’ effects. This contribution is especially noteworthy because it concurrently addresses a concern external validity (Zheng et al., 2007) by spanning a functional barrier in the respondent firm: risk management capabilities do have an impact on delivery performance when delivery performance is measured as perceived from the point of view of the production responsible. The data used in the thesis is relatively large, and both surveys have yielded high response rates compared to similar research. This strengthens the findings because it increases generalizability of the findings.

From a practitioner’s point of view, the thesis discusses the need for internal capabilities to deal with the procurement of external resources. Managers who are thinking about the long-term goals and strategic planning of the purchasing function may be especially interested in reading the first paper on purchasing innovation. Very little research has been done in this field, but this paper presents a number of hypotheses relating to purchasing contribution to innovation. Business is indeed transforming and the future economy is to become increasingly more dynamic. Therefore the need for capabilities to deal with this
increasing complexity and uncertainty should be on the managerial agenda, and purchasing managers should also consider how they themselves can fuel their companies’ competitiveness by transforming the business through purchase driven innovation. Purchase driven innovations extends beyond the boundary of the firm and may contribute to competitive advantages in the future market through delivering anew goods or quality of goods, introduction of new production methods, opening new markets, securing new suppliers of inputs, and reorganizing of industries (Schumpeter, 1934/1961). If upwards of 70% of firm’s revenues are spent on purchasing (Birou and Fawcett, 1993; Spekman, Kamauff, and Spear, 1999; Sánchez-Rodríguez et al., 2006) this means that the purchasing function is responsible of more than half of the economic value of the company. Not considering how the purchasing function can actively contribute to strategic and innovative long-term profitability of the firm may be a very costly mistake to make, because companies thus rely on only half of the company to ensure the long term competitive survival and advantage of the firm.

Form a more operational perspective, the thesis stresses the importance of building risk management capabilities to ensure a high level of delivery performance. Problems in deliveries may stall production. The thesis shows that risk management is significantly related to delivery performance. Therefore, purchasing managers should pay special attention to risk management. This may be particularly important when bottlenecks are present in production (Gelderman and Van Weele, 2003; Kraljic, 1983). The effect of risk management capabilities on delivery performance remains significant even when accounting for industry effects and common method variance. This is good news for managers, because
it proves that risk management is a very robust way of dealing with risks related to delivery performance. Managers who are interested in improving their risk management capabilities may also benefit from the guidance offered in the thesis last paper. This may provide suggestions on how to improve their risk management capabilities through developing intelligence capabilities, negotiation and contract-design capabilities.

The implications of the thesis extend beyond the boundaries of the purchasing function. Perhaps most importantly are the derived consequences for the recruitment and development of talent in purchasing. Relating back to the opening quote of the thesis, the purchasing function cannot solely rely on “engineers who can’t add, operators who can’t run their equipment, and accountants who can’t foot numbers” (Fuchs, Pais, and Shulman, 2013). Recruiters, senior purchasing managers and directors need to consider what individuals to employ in lower level and higher level positions to ensure the proper development and maintenance of capabilities for long term competitive advantages. This answer for question does not lie solely in this thesis, but managers may consider their recruitment initiatives in light of the capabilities outlined in this thesis.

**Limitations and future research**

The thesis is subject to a number of limitations, which also offers the potential for future research. First to be mentioned are the limitations concerning the research design: The lack of research on purchasing capabilities (Spina et al., 2013) justifies an explorative research design using more qualitative methods. A more explorative research design may allow for development of measurements and scales that are founded on a deep, qualitative (but also
context-specific) understanding of the capabilities in question for example by using a case-study approach (Yin, 2009). The pit-fall in a more qualitative exploration of purchasing capabilities is relying on too few cases. Because of path-dependency (Eisenhardt and Martin, 2000; Teece, Pisano, and Shuen, 1997), the emergence of a capability in a qualitative study may rely to a large extent on the context in which they were developed. The broad and general relevance of highly context-specific and path dependent capabilities may be rather low. However because capabilities also share commonalities across firms, it is expected that patterns of capabilities will emerge given enough exploration in diverse contexts. The qualitative exploration of purchasing capabilities is an avenue left for future research. The literature review presented in this introduction offers several perspectives on capabilities which could be interesting to explore empirically, for example Teece’s later work from 2007, classifying capabilities as either sensing, seizing or reconfiguration capabilities. It would further be interesting to explore this perspective further, perhaps with the integration of further insights from the innovation literature.

As mentioned previously, the use of capabilities as a theoretical lens may also present some pitfalls because it focuses the attention on what is within the lens (capabilities) and may draw away from the periphery (Amundson, 1998 p. 346). The thesis has attempted the integration of two different research streams (capabilities and PSM), and the capability-based view has taken the role as the theoretical lens within which the purchasing function is viewed. In addition to this, the thesis has also drawn on a number of other theoretical fields: e.g. innovation, logistics, and supply chain management. Logistics and supply chain management is more closely related to purchasing and supply management (Spina et al.,
The innovation management literature does not border on the PSM field in the same way, but has been used to explain different phenomena (Hartmann, Kerkfeld, and Henke, 2012 p. 25). In the capability-based view, innovation is an important outcome of dynamic capabilities (Teece, Pisano, and Shuen, 1997), because it represents the set of difficult-to-imitate competencies that a firm chooses to develop (Teece, Pisano, and Shuen, 1997) in order to support its strategy of how to compete in future markets. Insights from the innovation literature has only to a limited extend been implemented in this thesis, and there is a lot of possible avenues for future research along this dimension. As a theoretical lens, innovation itself may also be an interesting through which to look at PSM. For example the open innovation paradigm (Chesbrough, 2003; Lichtenthaler and Lichtenthaler, 2009) could be interesting.

In order for the capability-based view to become a viable theoretical lens in the PSM field and to avoid semantic and conceptual confusion about the definitions and operationalization of its constructs, the field needs to develop a taxonomy of purchasing capabilities. A deep qualitative exploration of the phenomenon would undoubtedly aid to this purpose.

This research has focused on purchasing capabilities and their performance implications. With the exception of one paper (paper 2), the thesis has mostly ignored other factors that play a role in shaping a firm’s e.g.: strategy, availability of suppliers in the market, power of the buyer etcetera. Future researchers may consider looking at how and what purchasing capabilities firms develop in the face of resource scarcity for example because there are a restricted number of suppliers to choose from, or the buying form has little power over the
suppliers. Further, it could be interesting to look at how the firm’s overall strategy affects the capabilities developed and used in purchasing.

The three papers follow in order from here.
References


Schneider, L. and Wallenburg, C. M. 2013. "50 years of research on organizing the purchasing function: Do we need any more?" *Journal of Purchasing and Supply Management* 19 (3): 144-164.


Paper 1

How do purchasing capabilities affect innovation?
How do purchasing capabilities affect innovation?

Astrid Hanghøj, Niels Peter Mols

Department of Economics and Business, Aarhus University, Aarhus V, Denmark

Abstract

We present a number of hypotheses relating four purchasing capabilities to two measures of purchasing’s contribution to innovation. The hypotheses are tested with data collected through a web-survey completed by 321 purchasing professionals in Danish production companies. Our results show that integrative, relational, innovative, and intelligence capabilities lead to more innovative purchasing. However, relational capabilities are not found to have significant effect on purchasing’s contribution to supply and practice innovation, i.e. new markets, new suppliers, and new purchasing practices, and the relationship between intelligence capabilities and purchasing’s contribution to products and production technology innovations depends on the level of innovative capabilities. The paper also examines a number of competing theoretical perspectives on the impact of capabilities on purchasing innovation relating to positive and negative complementarities between capabilities, clusters of distinct configurations, strengths and weakness perspectives, as well as the existence of a compensatory system of effects. The analysis finds that the model showing direct effects and interactions between capabilities is relatively better than the other models. Thus, we further show that certain interactions between capabilities are associated with purchasing innovation. The paper also addresses implications for research and practice.
Keywords: purchasing, innovation, capability-based view, integrative capability, relational capability, innovative capability, intelligence capability, supply and practice innovation, products and production technology innovation
Introduction

Purchasing holds a unique position in relation to the external environment with ties to suppliers as well as knowledge on factor markets. This opens the opportunity for innovations beyond what the firm could achieve by itself (e.g. Hartmann, Kerkfeld, and Henke, 2012; Ramsay and Croom, 2008). For example, Procter & Gamble has defined a strategy that emphasizes suppliers in generating the firm’s innovative products. In this strategy, purchasing managers are ‘technology entrepreneurs’ (Huston and Sakkab, 2006), who scan and exploit opportunities in the external environment by identifying needs and connecting with the external parties. Hong Kong based clothing manufacturing company Li & Fung is another example of a firm that has realized the need for an innovative approach to purchasing and supply management. By reconfiguring its supply chain and analyzing each step of its manufacturing process, it has been able to cut down the throughput delivery time from three months to only five weeks (Magretta, 1998). In order to achieve innovative gains in purchasing, purchasing managers need to reconsider the capabilities they develop and employ to deliver results. This paper is the first to look at which capabilities lead to purchasing innovation.

Research on purchasing and innovation has been highly descriptive and tends to rely on anecdotal evidence (Quintens, Pauwels, and Matthyssens, 2006b). When examining innovation in relation to purchasing, the dependent variable has often been new product development (Johnsen, 2009; Wynstra, Axelsson, and Weele, 2000). A number of different independent variables has been used for explaining purchasing’s contribution to innovation, as for example early and extensive supplier involvement (e.g. Johnsen, 2009), the
organization of the purchasing department (e.g. Luzzini and Ronchi, 2011), and different management activities (e.g. Wynstra, Axelsson, and Weele, 2000). Despite calls for more research on purchase-related capabilities (Quintens, Pauwels, and Matthyssens, 2006a), only few researchers have used capability-based theory in PSM (Spina et al., 2013) and this is the first study to link purchasing capabilities with purchasing’s contributions to innovation.

In this paper we apply a capability-based approach to explain purchasing’s contribution to (A) supply and practice innovations, i.e. new markets, new suppliers, and new purchasing practices and (B) products and production technology innovations. Hence, we try to answer the question: do integrative, relational, innovative, and intelligence capabilities lead to more innovative purchasing? We test our hypotheses with data from a survey completed by 321 purchasing professionals. We examine a number of competing theoretical perspectives: complementarities (e.g. Morgan, Vorhies, and Mason, 2009) and rigidities (e.g. Leonard-Barton, 1992) of capabilities, a capability-type based perspective based on the existence of distinct clusters of capabilities, a strengths (e.g. Barney, 1991) and weakness perspective (e.g. West III and DeCastro, 2001) and finally a compensatory system of effects (e.g. Wu, Melnyk, and Swink, 2012).

The remainder of the paper is structured as follows. First, the theoretical background of this research is presented. Second, we develop a number of hypotheses linking purchasing capabilities with purchasing innovation. Third, the answers from 321 purchasing managers are used to test the hypotheses. Finally, the paper ends with a discussion of findings and implications.
Theoretical background

The capability-based view

Whereas the resource-based view focuses on the relationship between the characteristics of a firm’s existing resource base and its sustainable competitive advantage (Barney, 1991), the capability-based view try to explain how certain capabilities are needed in order for firms to develop and change their resource-base. These capabilities are the firms’ dynamic capabilities, and they may be defined as “the capacity of an organization to purposefully create, extend or modify its resource base” (Helfat et al., 2007 p. 4). As noted by Helfat et al. (2007), although dynamic capabilities do work to change firms’ resource bases, they do not necessarily improve performance and lead to competitive advantage. It is generally agreed that dynamic capabilities are needed to cope with changing environments, and Teece, Pisano, and Shuen (1997) note that the capability-based view is especially relevant in a Schumpeterian world of innovation-based competition. The line between dynamic capabilities and other types of capabilities is inevitably blurry, especially because some capabilities may have both a dynamic and an operational purpose (Helfat and Winter, 2011). In other words, some capabilities that serve operational purposes may be classified as dynamic when they help create innovative outputs.

Purchasing capabilities

Though capabilities are often developed and studied in functional areas (Amit and Schoemaker, 1993; Vorhies and Morgan, 2005) few researchers have explicitly used the terms purchasing capabilities or supply management capabilities. Instead the terms
knowledge, skills, competences and capabilities are used interchangeably (Axelsson, Rozemeijer, and Wynstra, 2005; Lintukangas et al., 2010). Some papers have tried to empirically identify dimensions of purchasing capabilities. Das and Narasimhan (2000, p. 18) use the term purchasing competence, which they define as the “capability to structure, develop, and manage the supply base in alignment with the manufacturing and business priorities of a firm.” The elements of purchasing competence are identified as supply base optimization, buyer-supplier relationship development, supplier capability auditing and purchasing integration, and they find that purchasing competence has a positive relationship with manufacturing performance. Narasimhan, Jayaram and Carter (2001) define purchasing competence by use of five underlying dimensions: empowerment, employee competence, interaction frequency-tactical, interaction effectiveness-NPD, and buyer-seller relationship management, and they find that purchasing competence has a positive effect on customer satisfaction and total quality management performance. In a more narrow study, Lintukangas (2011) identifies five dimensions of supplier relationship management capabilities, which she defines as the organization’s capacity and ability to manage its suppliers and conduct internal tasks and responsibilities related to supplier relations in order to achieve the desired results.

A number of empirical studies focus on one or a few purchasing capabilities. For example, Petersen, Frayer, and Scannell (2000) find a positive relationship between global sourcing business capabilities and the effectiveness of global sourcing strategy, and Lado, Paulraj and Chen (2011) find a positive relationship between supply chain relational capabilities and customer focus and customer service. Tracey, Lim and Vonderembse (2005) divide supply
chain management capabilities into outside-in, inside-out, and spanning capabilities and find a positive relationship between supply chain management capabilities and performance. Allred et al. (2001) focus on customer and supplier orientation and external/internal collaboration and find that even moderate levels of collaborative capabilities improve performance. Strong collaborative capabilities remain rare among the firms studied. Finally, Ziggers and Henseler (2009 p. 795) use the term inter-firm network capability, which has three components centering on the firm’s ability to: build effective network structures, foster close working relationships with a limited number of suppliers, and developing a long-term orientation. They find that this capability positively affects supplier performance, buyer performance, and financial performance of the buyer.

More comprehensive conceptual frameworks of purchasing capabilities are almost absent from the literature. Quintens, Pauwels and Matthyssens (2006a) suggest a conceptual framework in which the effect of purchase-related capabilities on performance is mediated by global purchasing strategy. They distinguish between two types of purchase-related capabilities. The first capability is “related to the assimilation and dissemination of information on suppliers and markets” (Quintens, Pauwels, and Matthyssens, 2006a, p.888). The second type is relationship-building capabilities. The authors propose that these capabilities affect both the efficiency of the purchasing function and the firm’s cost advantages and product/technological advantages. Another framework for the study of the capabilities required in supply net management is developed by Svahn and Westerlund (2007). In their paper they identify four components of supply net management: influencing, controlling and monitoring, coordinating, and integrating, and for each component they
identify a number of key managerial capabilities. Finally, Balaji and Brown (2005) identify three capabilities relevant for Information System sourcing: vendor management, project management, and process management and argue that managerial capabilities relating to the sourcing setup may give the purchasing firm a competitive advantage (Balaji and Brown, 2005).

Though a few papers focus on purchasing capabilities and their performance consequences, none of the reviewed studies and frameworks link purchasing capabilities to purchasing’s contribution to different types of innovation.

*Purchasing innovation*

Innovation is an important factor in creating and maintaining competitive advantages. Lawson & Samson (2001) note that “high performing innovators deliberately and systematically enable and motivate the chaotic, divergent behaviors required for breakthrough innovation” (Lawson and Samson, 2001 p. 388). Hence, viewing innovation as a part of the way purchasing is done is necessary to foster an environment where purchasing professionals can take chances and bring new ideas, products and processes to the firm. In a Schumpeterian-based economy, competitive advantages erode if a firm does not renew the value of its asset endowments (McGrath et al., 1996). Schumpeter proposed that innovation results from (a) delivering a new good or (b) quality of good, (c) introduction of new production methods, (d) opening up of new markets, (e) securing new suppliers of inputs, and (f) reorganizing of industries (Schumpeter, 1934/1961). Since then, theory has proposed several definitions of innovation. Recently Johannessen, Olsen, and Lumpkin (2001) have
attempted to reconcile these definitions by arguing that nearly all share a focus on the concept of newness. The concept of newness rests on three sub questions: What is new? How new? And new to whom?

Johannessen, Olsen, and Lumpkin (2001) show that the Schumpeterian categorization is theoretically and empirically an adequate measure of innovation to explain the phenomenon across these three sub-dimensions. They argue that the different dimensions along which the innovation concept has varied since the early work by Schumpeter can be collapsed to the dimensions summarized in the six items in Schumpeter’s definition. We follow Johannessen, Olsen, and Lumpkin (2001) and Schumpeter (1934/1961) by adopting the Schumpeterian notion of innovation. We propose that purchasers may contribute to innovation by introducing new goods, quality of goods or production methods. Further, they may contribute to breaking new markets, for example by realizing new opportunities in foreign markets and securing new suppliers ahead of competition. They may also change the way purchasing is done in an industry, for example by being the first to employ JIT-principles to purchasing or by adopting an online auction solution for procurement.

Purchasing and supply management has focused on different directions of innovativeness: (1) integration of purchasing in product development, (2) identification of innovative products and capabilities in the supply market and (3) focusing on innovative purchasing tasks (Hartmann, Kerkfeld, and Henke, 2012 p. 25). The latter two dimensions proposed by Hartmann corresponds to our categorization following Schumpeter (1934/1961) and Johannessen, Olsen, and Lumpkin (2001), but may also encompass the first direction through for example the integration of new products, components or suppliers in early product
development. Thus, we believe that our measure of innovation captures the ways in which purchasing may contribute to innovation and subsequently to the generation of rents and competitive advantages (McGrath et al., 1996). In this paper we focus on purchasing’s contribution to (A) supply and practice innovations, i.e. new markets, new suppliers, new purchasing practices and (B) products and production technology innovations.

In the following, we use Schumpeter (1934/1961) and Johannessen, Olsen, and Lumpkin (2001) and focus on two categories of innovation. First, we focus on new goods, quality of goods and production methods, which are labeled products and production technology innovation. Second, purchasing may contribute to breaking new markets, for example by realizing new opportunities in foreign markets and securing new suppliers ahead of competition. Purchasing managers may also change the way purchasing is done in an industry, for example by being the first to employ JIT-principles to purchasing or by adopting an online auction solution for procurement. These innovations are labeled supply and practice innovation.

In the absence of any frameworks that relate purchasing capabilities to innovation, we decided to focus on four distinct capabilities: integrative, relational, innovative, and intelligence capabilities. This selection is inspired by a number of case-studies on purchasing-based innovation (see also Andersen, Hanghøj, and Mols, 2010). IKEA is an example of a manufacturing company, which used its knowledge on markets to suggest input to reorganize their production activities and improve their bargaining power and significantly impact the industry in which they operate (Kinch, 1984). Supplier relationships have been emphasized as a source of innovative potential for the 7-11 stores (Gottfredson, Puryear,
and Phillips, 2005), who has used strategic partnerships to develop novel products. Similarly, Li & Fung also used supplier relationships as a lever to achieve innovative gains: they were able to coordinate different supplier’s activities and cut-down throughput time drastically from months to weeks in the fashion industry, allowing for greater flexibility (Magretta, 1998). Market-based intelligence is a key cornerstone in P&G’s strategy to ensure access to new and innovative technologies through their connect & develop program (Huston and Sakkab, 2006). The focus on market intelligence is so strong that the company a part of the purchasing functions now employs people who are referred to as “technology entrepreneurs”. These people seek out new and interesting ideas in the market, which is also an example of how to build innovative capabilities to accept new ideas in purchasing. These capabilities also cover the three ways in which purchasing can drive innovation, according to Hartmann, Kerkfeld, and Henke (2012, p. 4): “Firstly, by integrating PSM internally into the product development process. Secondly, by identifying innovative new products and capabilities available in the supply market. Lastly, by guiding employees to focus on innovative tasks instead of transactional work.” In the following, we present our hypotheses on these capabilities effect on the two types on innovative output. Further, we also argue for how interactions and interdependencies between these capabilities may further strengthen or weaken the effect on purchasing innovation.
Research framework and hypotheses development

Integrative capability

Purchasing integration does not have a formally accepted definition (Cousins, Lawson, and Squire, 2006; Flynn, Huo, and Zhao, 2010; Pagell, 2004) and has been used to describe different organizational phenomena (Pagell, 2004). Narasimhan and Das (2001, p. 593) refer to purchasing integration as the “integration and alignment of strategic purchasing practices and goals with that of the firm”. They suggest that purchasing integration involves activities such as participation in strategic planning and coordination of purchasing decisions with other strategic decisions in the firm. So purchasing integration is not an adoption of a specific practice e.g. earlier supplier involvement in new product development (e.g. Wynstra, Weggeman, and Van Weele, 2003), but it bears some resemblances to integration as “a process of interdepartmental interaction and interdepartmental collaboration that brings departments together into a cohesive organization” (Kahn and Mentzer, 1998 p. 56).

Integrative capability has been defined as the “capability to integrate knowledge from sources both external and internal to the firm and utilize it productively” (Woiceshyn and Daellenbach, 2005 p. 310). Handfield et al. (2009, p. 104) mention that one of the components of supply chain integration capabilities is cross-enterprise integration, which is “the ability of the sourcing function to actively influence functional decision making”. Further, Handfield et al. (2009) stress the importance of building a solid case around purchasing’s approach with key internal decision makers.

We apply an internal focused view of integrative capabilities as purchasing’s ability to collaborate and participate in firm-wide activities and decisions. According to Helfat and
Winter (2011) integrative capabilities are enablers of communication and coordination across organizational units and firms. They serve several objectives within the firm (Helfat and Winter, 2011 p. 1248). One example is the sharing of information across structural boundaries that can be seen as an operational activity, but they may also support change initiatives. In that sense, integrative capabilities may be viewed as dynamic capabilities.

The integration of internal business functions is a challenge in most organizations (Cousins, Lawson, and Squire, 2006) and levels of integration are rarely reported as high in the literature despite indications that it leads to higher levels of performance (Pagell, 2004). Narasimhan and Kim (2002) have examined integration in relation to product diversification and found that integration is a moderator of product diversification and financial success. Unrelated product diversification must overcome the challenges related to the lack of economies of scope and internal administrative complexities. Internal integration helps disperse the risks through interaction and coordination among the business functions within the firm (Narasimhan and Kim, 2002 p. 305). Following this logic, the authors suggest that the “accomplishment of internal integration across the supply chain could lead to the adoption of new organizational forms and operating relationships, perhaps based on a higher level of information integration and use across the internal value chain of the firm” (Narasimhan and Kim, 2002 p. 306). We formulate the following hypothesis:

Hypothesis 1a: Integrative capability positively affects purchasing supply and practice innovation.
Cross-function collaboration enhances innovation through the integration of processes and knowledge from different parts of the organization and actors may cross-fertilize ideas and speed up innovation (Jassawalla and Sashittal, 2006). The integration of several business functions is important to tailor R&D and design to the skills and competencies of the firm and inter-functional integration may facilitate communication about product design (Hitt, Hoskisson, and Nixon, 1993). The integration of purchasing in key strategic decisions may help leverage the purchasing managers’ knowledge as input in product design for example by tapping into his or her knowledge about the emergence of a new technology in the market or a new type of components available from suppliers. Integrative capabilities therefore lead to more products and production technology innovation, and thus yields the following hypothesis:

Hypothesis 1b: Integrative capability positively affects purchasing’s contribution to products and production technology innovation.

Relational capability

The term relational capability is a relatively new concept, which Dyer and Singh (1998, p. 672) define as “a firm’s willingness and ability to partner”. Different definitions are provided by Lorenzoni and Lipparini (1999, p. 317) who define it as “the capability to interact with other companies”, and Swan et al. (2007) who define it as “…the ability of organizations within an innovation system to collaborate with other, diverse organizations” (Swan et al., 2007 p. 530). A couple of recent papers review the concepts of relational and network capabilities. In their comprehensive review of the literature on network and relational
capabilities Äyväri and Möller (2008) identify a wide variety of elements used for describing network and relational capabilities, and they show that the concepts have been used to describe both firm level and inter-firm level capabilities as well as individual skills. Likewise Pagano (2009) finds that different researchers emphasize different elements of relational capabilities e.g. communication, coordination, cooperation, and trust. Finally, some researchers have divided the concept of relational capabilities into different types. For example, Ngugi, Johnsen and Erdélyi (2010) look at four different types of relational capabilities: human relational capabilities, technological relational capabilities, managerial systems relational capabilities and cultural relational capabilities, and link these four types of relational capabilities to innovation and value co-creation. We apply a more narrow view of relational capabilities as firm-level capabilities and focus on the manifestations of relational capabilities in the form of coordination of activities with suppliers and making decisions in collaboration with suppliers. Hence, relational capabilities are internal skills and knowledge, exercised through organizational processes that enable a firm to develop relationships and cooperate with other firms, e.g. to make decisions in collaboration with suppliers and to coordinate activities with suppliers.

Studies in diverse contexts have suggested a positive relationship between relational capabilities and innovation (eg. Capaldo, 2007; Croom, 2001; Lages, Silva, and Styles, 2009; Ngugi, Johnsen, and Erdélyi, 2010; Swan et al., 2007), and between relational capabilities and other performance measures (eg. Ling-yee and Ogunmokun, 2001; Zhao and Stank, 2003). For example, Lages, Silva, and Styles (2009) find a significant relationship between relational capabilities and product innovation in their study of the determinants of export
performance. In their study of small and medium sized suppliers, Ngugi, Johnsen, and Erdélyi (2010, p. 274) find that suppliers’ relational capabilities have a positive effect on innovation, and they conclude that both suppliers and customers benefit from these cooperative relationships. Based on the results from case studies in three Italian firms, Loranzoni and Lippararini (1999) argue that relational capabilities lower coordination costs in interfirm relationships and that the relational capabilities improve the access to and transfer of knowledge. This again has positive effects on innovation. In his study of innovation and relational capabilities Capaldo (2007) also describes how frequent and intense dyadic inter-organizational collaboration leads to growing trust and learning about each other, which is a preliminary condition for knowledge creation and innovation in inter-organizational relationships. However, he also suggests that over time a few strong relationships may prevent change and hence negatively impact innovation.

In accordance with most of the existing literature we propose that relational capabilities are positively related to purchasing’s contribution to innovation. The stronger the relational capabilities of a purchaser the better he will be at cooperating and coordinating with suppliers. Buyers and suppliers will more freely exchange information, and they will be more likely to make decisions in collaboration. This will have a number of positive effects on innovation.
First, strong relational capabilities make it easier for purchasers to change the way manufacturers interact with their suppliers. In other words, it makes it easier to implement changes in purchasing practices such as implementations of lean purchasing and on-line auctions. When buyers and suppliers build stronger relationships and share plans for the future, they may even influence industry standards (Handfield et al., 1999). As the industry adapts to new standards, the purchaser has succeeded in influencing purchasing practices in the industry. Interactions and collaborations between purchaser and suppliers may also help identify new suppliers and markets, e.g. by identifying and providing access to better complementary suppliers and third tier suppliers. Based on the preceding section, we propose the following hypothesis:

_Hypothesis 2a: Relational capability positively affects purchasing supply and practice innovation._

Second, suppliers often have expertise as specialists within their fields and thus, they may be well-informed about possible new products, components or technologies. Firms that are capable of building, maintaining and coordinating supplier-relationships may over time get access to this body of knowledge possessed by the suppliers. Relational capabilities that lead to strong relationships, may serve to ensure suppliers that they will continue as suppliers to the firm, and thus feel safe in sharing knowledge on new innovations and technologies. Joint decision making may enhance products and production technology innovation because the responsibility for recognizing and exploiting new opportunities are shared between buyer and supplier. The ability to constructively coordinate several suppliers’ activities may help to
orchestrate innovations that rely on more than one supplier by dividing the labor to utilize specific supplier competencies or by streamlining procurement processes to reduce time-to-market (Magretta, 1998). Hence, purchasers may tap suppliers for ideas or inputs to generate new products or production technologies. Thus we propose:

Hypothesis 2b: Relational capability positively affects purchasing’s contribution to products and production technology innovation.

Innovative capability

Innovative capability has been defined in various ways. For example it has been defined as “the specific expertise and competence related to the development and introduction of new processes and products” (Hagedoorn and Duysters, 2002 p. 168), as “a firm’s ability to generate knowledge in the form of intellectual property” (Zhao et al., 2005 p. 212), as “the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders” (Lawson and Samson, 2001 p. 384) and innovation capacity has been defined as the “ability of the organization to adopt or implement new ideas, processes, or products successfully” (Burns and Stalker, 1961; Hurley and Hult, 1998). Measurements and definitions of innovative capabilities have also included elements of innovativeness, i.e. the receptivity to new ideas and innovations, and the capacity to innovate, i.e. the ability to implement innovations (eg. Adler and Shenhar, 1990; Akman and Yilmaz, 2008; Zhao et al., 2005). Innovative capabilities have often been defined broadly and as being multidimensional (eg. Guan and Ma, 2003; Lawson and Samson, 2001). According to Calantone, Cavusgil, and Zhao (2002) much of the work innovation capability is found in the innovation diffusion literature, focusing on the extent to which innovation is
adopted more rapidly than others in the same social system (Calantone, Cavusgil, and Zhao, 2002 p. 517). Calantone, Cavusgil, and Zhao (2002) implicitly equate innovativeness with innovation capability. In line with Calantone, Cavusgil, and Zhao (2002), we define innovative capability as an ability to seek out new ideas, to encourage and accept innovation, and to implement innovations.

Purchasers with a higher degree of innovative capability will be more likely to actively pursue new work practices and question status quo. Encouraging innovation in the purchasing context may increase purchasing professionals’ propensity to consider new processes as a substitute for old practices through receptivity to innovation. When adequate resources are present, and the firm values innovation, it increases the implementation of innovations (Hult, 2002; Hurley and Hult, 1998). By continually reconsidering existing procedures and suppliers, purchasers with a high innovative capability will be more likely to recognize and exploit opportunities. Purchasing functions with high innovative capabilities are characterized by continually seeking out new ideas, and encouraging and accepting new ways of doing things. Innovation is closely related to organizational learning (Calantone, Cavusgil, and Zhao, 2002), which enables firms to develop insights that have the potential to change the firm’s behavior (Hult, 2002). Thus, with high innovative capabilities, purchasing is likely to be a driver and a facilitator of innovations, because it not only contributes to developing innovation ideas, but also eases the implementation. This may lead to more innovative solutions in purchasing practices. This leads to:

*Hypothesis 3a: Innovative capability positively affects purchasing supply and practice innovation.*
Innovative capability encompasses openness to new ideas and helps direct attention towards innovations within the supply network. The active pursuit of new technologies in supply markets may improve the likelihood of purchasing’s contribution to products and production technology innovations. Huston and Sakkab (2006) explain how entrepreneurial employees have helped P&G look for new product innovations in proprietary networks such as labs and research institutions. Purchasing functions with a high innovative capability will be more likely to seek out new ideas and technical solutions. They will be more likely to find solutions and suppliers that solve future problems and meet the future needs of internal clients. They are better able to exploit opportunities, because they have developed the capacity to handle changes. Innovative capabilities make the purchasing function less static and more likely to consider new alternatives to current products and production technologies. Firms with a high innovative capability are more inclined to seek out new products, qualities and technologies both within current buyer-supplier relationships, but also with potential suppliers that they’re not currently doing business with. We present:

_Hypothesis 3b: Innovative capability positively affects purchasing’s contribution to products and production technology innovation._

_Inelligence capability_

Information gathering is an important task in purchasing (e.g. Cousins, Lawson, and Squire, 2006; Handfield et al., 2009; Pearson, 1999). Cousins, Lawson, and Squire (2006) include information gathering as a subset of purchasing skills. Purchasing skills measure the ability of
purchasing personnel to “monitor changes in the supplier market; the depth of technical capabilities; the ability to reduce total costs of business; and interpersonal skills” (Cousins, Lawson, and Squire, 2006 p. 781). Handfield et al. (2009) argue that supply market intelligence builds on purchasing managers’ ability to ‘scan’ supply markets. Their market intelligence construct consists of purchasing managers’ skills in monitoring and interpreting market changes, helping suppliers improve processes, and improving the costs associated with suppliers. External knowledge acquisition is recognized as a key factor in innovation (Slater and Narver, 1995). Analysis of factor markets may lead to the selection of new suppliers in different markets. Firms that collect information about their markets and industry will be more knowledgeable about the existence of alternative sources of supply, thus gathering and analyzing this information will positively affect the firm’s propensity to switch, substitute or bring in new suppliers compared to firms with little knowledge of alternatives. When purchasing managers are actively engaged in generating knowledge about their industry and surroundings, they may be more receptive to changes that generate or demand changes of current purchasing practices. Therefore we propose:

Hypothesis 4a: Intelligence capability positively affects purchasing supply and practice innovation.

Insight into supply market trends can help improve product and process development decisions (Handfield et al., 2009; Handfield, 2006), and hence purchasing may come up with different solutions that offer a variety in cost, availability and contribution to product innovation (Bernardes and Zsidisin, 2008). This way, intelligence capability enables the
purchasing function to contribute through market-based product innovations. The challenge for the purchasing function is to seek out information that may lead to buying services or products that add value to the consumer, and which are currently not offered by competitors. As purchasers devote resources to becoming more knowledgeable about markets and potential suppliers, they may discover new opportunities for innovation. Firms with superior intelligence capabilities will be receptive to changes in supplier options and market offerings and may be better able to shift towards new technologies or standards when they arise. This will help the firm improve its products and production technologies, and thus we suggest the following hypothesis:

*Hypothesis 4b: Intelligence capability positively affects purchasing products and production technology innovation.*

**Interdependencies between capabilities**

Recent literature on capabilities has tried to describe and explain how interdependencies between capabilities affect performance, and while some studies have corroborated the effect from interdependencies between capabilities (e.g. Gruber et al., 2010; Weigelt, 2013), few results have questioned the importance of interdependencies between capabilities (e.g. Wu, Melnyk, and Swink, 2012). It is possible to identify several different perspectives on how the interactions between capabilities are associated with performance. These views will be explored on the following pages.
**Interaction effects**

First, it has been suggested that interactions between capabilities are positively associated with performance. The positive interactions between capabilities have been described as complementarities (e.g. Morgan, Vorhies, and Mason, 2009), synergies (e.g. Wu, Melnyk, and Swink, 2012), and asset interconnectedness (Dierickx and Cool, 1989). When there are complementarities, synergies or interconnectedness between capabilities, then the effectiveness of one capability depends on the level of another capability. For example Dierickx and Cool (1989 p. 1508) argue that when new product and process developments depend on customer suggestions, the lack of an extensive service network with access to the customers will make it difficult to develop and exploit relevant technological knowhow. Hence, positive interaction is found when the results from applying one capability feed into another capability, or when one capability is a precondition for good results from another capability. There may be several complementary capabilities. For purchasing to contribute to innovation in a firm it needs several different complementary capabilities. Intelligence capabilities are needed in order to collect information, analyze supply markets, and detect changes in suppliers’ products and services. Relational capabilities are needed in order to be efficient at cooperating and coordinating with suppliers. Innovation capabilities are needed for seeking out new ideas, accepting innovations, and implementing new ideas and technical innovations. Finally, purchasing needs integrative capabilities in order to be efficient at cooperating with other internal departments. If one or more of these capabilities are weak or lacking, it may reduce the performance effect of the other capabilities. For example, strong intelligence capabilities can be used by the buyer for gathering information about suppliers’ potential contributions to innovative products, but without the ability to
implement new ideas the information will never result in actual innovations. In other words, the immediate prediction is that there are positive complementarities between the four capabilities. Consequently, we derive the following hypothesis:

*Hypothesis 5a: The interactions between capabilities is positively associated with innovation performance.*

Capabilities may also negatively interact in their influence on innovations, and the use of one specific capability may exclude the use of another capability. Hence, capabilities may be substitutes (Eisenhardt and Martin, 2000; Lavie, 2006; Weigelt, 2013). This has been widely noted in the resource-based view of the firm (e.g. Barney, 1991; Dierickx and Cool, 1989). This may be the case when two capabilities are functionally equivalent. The same effect may be found when a purchasing department has multiple strong skills, but due to limited resources has to choose between using one or another of these different skills. Furthermore, there may be capabilities whose simultaneous use will cause conflicts or tensions, which reduce the effectiveness of these capabilities, and hence they may moderate each other. Finally, some capabilities may cause inertia and can be categorized as rigidities regarding innovation (e.g. Leonard-Barton, 1992), and such capabilities may prevent other capabilities from having a positive effect on performance. For example, Srivastava and Gnyawali (2011) find that strong internal capabilities make firms more protective of their internal knowledge and more unwilling to reach out for external knowledge. In a recent paper by Stieglitz and Heine (2007), the authors argue that complementary assets - i.e. capabilities which added
value depends on the use of another capability – raise the value of a firm’s technological innovations (Stieglitz and Heine, 2007 p. 2).

In a purchasing context, strong capabilities in cooperating with and helping internal departments’ development and design of new products could weaken the contribution from an ability to make decisions in cooperation with external suppliers. Hence, there may be a tension between on the one hand cooperating with internal departments in the development and design of new products, and on the other hand cooperation and collaborative decision making with external suppliers. Though the purchasing function may be strong at both, it will not be able to exploit both capabilities in the pursuit of innovations for example due to limited resources. Therefore the interaction of the two capabilities will be negatively associated with innovation. Another example is the potential tension between close cooperation and integration with other internal departments and being innovative in the purchasing function. Hence, close cooperation and integration limit the autonomy and freedom of the purchasing unit to freely exploit their innovative capabilities. This means that strong integrative capabilities negatively moderate the effect of the innovative capability on purchasing’s contribution to innovation. Thus, even though integration and innovation capabilities positively affect innovation, the interaction between the two capabilities may be negatively associated with performance. In other words, the lack of one or a limited number of important capabilities may have both a direct negative effect on performance but also have an indirect and negative effect because it may lower the effectiveness of other capabilities. This leads to the following hypothesis:
Hypothesis 5b: The interaction between capabilities is negatively associated with innovation performance.

Capability clusters

Many of the researchers focusing on capabilities in specific functional areas have argued that different capability configurations lead to differences in performance, but at the same time some capability configurations may lead to the same performance though the capability configurations may be quite different. In other words, it may be possible for equifinality to be present (e.g. Eisenhardt and Martin, 2000). This proposition has been corroborated in studies of sales and distribution capabilities (Gruber et al., 2010), and strategic capabilities (Raymond and St-Pierre, 2013). The results from studies of these other functional areas have shown that specific capability profiles have an impact on the dependent variables. Following this logic, it is probable that purchasing capabilities can be grouped into a few distinct configurations as well, and that these configurations of purchasing capabilities influence purchasing innovation. Therefore, we suggest that purchasing capabilities are also studied as configurations, and that these configurations have different effects on innovation performance. Furthermore, different configurations can be associated with high innovation performance, and therefore we explore this last hypothesis:

Hypothesis 6: Distinct configurations of capabilities are associated with high innovation performance.
Other competing models

Classic strategy literature has emphasized that performance depends on firms’ strengths and weaknesses and this has been the starting point for the development of the resource-based view. The first resource-based view identified the necessary characteristics of resources and capabilities in order for these to lead to sustainable competitive advantage (Barney, 1991; Peteraf, 1993). This view suggests that one or a few strong capabilities determine performance, and hence this view emphasizes the effect of firm strengths. We test propose the following hypothesis:

Hypothesis 7a: The level of the strongest capability is positively associated with innovation performance.

However, this early work has been criticized for ignoring firm weaknesses, and it has been argued that differences in weak capabilities are related to differences in performance (e.g. West III and DeCastro, 2001; Wu, Melnyk, and Swink, 2012). For example, it is suggested by West III and DeCastro (2001) that weaknesses have been overlooked, despite its place in the early management literature. For example the SWOT framework (strengths, weaknesses, opportunities, and threats) emphasized that firms should consider their weaknesses and strengths alike as part of their strategy development. The authors propose that weak capabilities may be key to understanding performance. Thus, the relationship between the individual capability and performance depends on whether the capability is the weakest capability among a number of important capabilities. A system in which the weakest
capability determines the level of performance is additive (Wu, Melnyk, and Swink, 2012 p. 134). Hence, according to this theory the level of performance will depend on a certain threshold level of the capabilities. In line with Wu, Melnyk, and Swink (2012), we propose:

**Hypothesis 7b: The level of the weakest capability is positively associated with innovation performance.**

Finally Wu, Melnyk, and Swink (2012) also propose that capabilities may follow a compensatory system of effects. If capabilities are compensatory, it means that the weakness of one capability may be overcome by the strengths of other practices. For example, improvements in innovation outcomes could be gained by investment in for example intelligence capabilities, regardless of improvements in any of the other capabilities. According to Wu, Melnyk, and Swink (2012), this logic suggests that capabilities could be compensatory in nature (Wu, Melnyk, and Swink, 2012 p. 139). The compensatory system is less restrictive than the additive system, because tradeoffs are possible. In other words, lack of investments in one capability can be compensated by investment in other capabilities that may yield effects on innovation performance. Following Wu, Melnyk, and Swink (2012), we propose:

**Hypothesis 7c: The level of the average capability is positively associated with innovation performance.**
Data and methodology

Data collection and sample

Firms were identified using Experian, a nation-wide database of all publicly registered companies in Denmark. Firms with 50 or more employees were included in the sample. Each firm was called by telephone to identify the purchasing-responsible and participation in the study was encouraged. This procedure has been shown to increase response rates in survey-based research in the supply chain management field (Melnyk et al., 2012). Upon accept, the purchasing responsible received an email invitation to an online self-administered survey. Those responsible for purchasing had titles such as VP of purchasing, Director, Supply Chain Manager, Purchasing Team Manager, Project Manager, Global Supply Manager or VP of Logistics and Production. Data was collected between October 2011 and January 2012 and two reminder emails were solicited following one and three weeks after the initial invitation email. An executive summary report of the findings was offered to the respondents to entice participation. 870 manufacturing firms were included in the sample. 321 purchasing managers responded to the survey constituting a total response rate of 36.90 %.

Measures and scale reliability

We developed our questionnaire based on existing literature in the field of purchasing and supply chain management. The questionnaire was pretested with the help of 3 academics and 5 professionals prior to the data collection procedure. Our pretest led us to rephrase some of the questions to improve understanding, but overall the professionals expressed satisfaction with the coverage of our capabilities given their work-based context. All the
items used for measuring the independent and dependent variables are listed in the appendix (Table 7) along with scale reliabilities and factor loadings.

The dependent variables were based on an innovation measure that was recently developed by Johannessen, Olsen, and Lumpkin (2001). This measure of innovation is based on Schumpeter (1934/1961), who described innovation as (a) delivering a new good or (b) quality of good, (c) introduction of new production methods, (d) opening up of new markets, (e) securing new suppliers, and (f) reorganizing of industries. We adapt the items developed by Johannessen, Olsen, and Lumpkin (2001) to focus on purchasing’s contribution to innovation, and we divide innovation into two categories: supply and practice innovation (A) and products and production technology innovation (B).

The independent variables are represented by the capability constructs discussed in the research framework. We measure integrative capabilities with four items which are adapted from Cousins, Lawson, and Squire’s (2006) measure of internal integration. For relational capabilities we focus narrowly on the ability to cooperate with external suppliers and to make decisions in collaboration with external suppliers. This is a rough measure with only four items that cannot capture all dimensions of relational capabilities (cf. Pagano, 2009). Our measure of innovative capabilities consists of four items, which are adapted from Hult (2002). Finally, our four item-measure of intelligence capability is inspired by Jaworski and Kohli (1993). We use a scale of (1) “Much worse than our competitors” to (5) “Much better than our competitors” similar to the scale used in previous capability-based studies (Morgan, Vorhies, and Mason, 2009; eg. Vorhies and Morgan, 2005).

Control variables
Age and firm size are often used as control variables (e.g., Craighead, Hult, and Ketchen Jr, 2009; Germain and Droge, 1997; Heimeriks and Duysters, 2007; Hult, 2002; Hult, Craighead, and Ketchen Jr, 2010; Lintukangas et al., 2010). For example, age may lead to bureaucracy and less innovation (Hage and Aiken, 1967; Hurley and Hult, 1998). With respect to size, theory predictions are mixed. Larger firms have access to more resources that can generate innovations. Smaller firms may make quicker decisions and thus generate innovations ahead of competition (Oke and Kach, 2012). Furthermore, smaller firms may be less likely to perceive their purchasing design as leading-edge or innovative (Trent, 2004). Size was operationalized using the number of employees, and both size and age were logarithmically transformed. We also controlled for industry specific effects. The firms in the sample represented 21 manufacturing industries according to the Danish NACE (Nomenclature Générale des Activités Économiques dans les Communautés Européennes). The industry groups were between 10 and 33. The biggest group was the machinery and equipment group (NACE industry code 28). It represented 75 firms in the sample and was used as the hold out sample in the regression analyses. The following industry groups were represented in the sample (number of firms in parenthesis): 10 – food manufacturing industry (31); 11 – drinks (3); 13 – textiles (5); 14 – clothing (2); 16 – tree, cork and straw (excl. furniture) (12); 17 – paper (4); 18 – prints and media (3); 20 – chemical products (8); 21 – manufacturing of pharmaceutical products (5); 22 – rubber and plastic (22); 23 – other non-metal minerals (19); 24 – metal (7); 25 – iron and metal (excl. machinery) (47); 26 – computers, electronics and optics (29); 27 – electrical equipment (13); 28 – machinery and equipment (75); 29 – motor vehicles (6); 30 – other transportation vehicles (1); 31 – furniture (18); 32 –
miscellaneous manufacturing industries (7); 33 – repair and installation of machinery and equipment (4).

Non-response bias and comparison of early and late wave respondents

Because mail surveys are likely to suffer from non-response bias, we did a number of tests (Armstrong and Overton, 1977). First, we compared the manufacturing firms who replied to our survey (n=321) to those that did not (n=549). Using independent t-tests we found no significant differences in variances and means for the control variables age and size. Further, we tested for differences in variances, means and medians in the three groups: early, mid and late respondents in the sample. Levene’s test indicated a significant difference in the variances across the different groups for integrative capability. Tukey’s test showed that there was a difference in means on integrative capability where the late respondents (n=20) scored higher than the mid-wave (n=58) respondents. Because the differences were only found in one of the capabilities studied, we deemed that this was not a cause for concern.
Analysis and results

The analyses were conducted using SPSS 20 and AMOS 21. All analyses were conducted using list-wise deletion for missing data. First, we ran an exploratory factor analysis (EFA) and then a confirmatory factor analysis (CFA) as suggested by Anderson and Gerbing (1988). During the EFA we used Harman’s one factor test to assess if common method bias was a problem. The first factor captured 25.76% of the variance, indicating that common method bias was not a concern (cf. Podsakoff and Organ, 1986).

The EFA resulted in 5 factors with varimax rotation with both dependent variables yielding one factor. However, when running an EFA for each factor from the full five-factor EFA solution, we found that the items reflected 6 constructs as shown in Table 7 in the appendix for this paper. Based on the individual EFAs, we aggregated them together into a full measurement model (CFA). The CFA achieved $\chi^2=358.073$ (df=194). Fit indices were at appropriate levels according to Hair et al. (2006). The model achieved CFI=.943 and RMSEA=.049. All parameter estimates were significant at $p<.001$ level (two-tailed) indicating convergent validity (cf. Anderson and Gerbing, 1988).

Discriminant validity among constructs is achieved when their correlation differs significantly from 1 (Bagozzi, Yi, and Phillips, 1991). To test this we constructed pairs of all constructs, constrained their correlation to 1 and did a chi-square difference test between the constrained and the unconstrained model. The correlation between constructs was significantly different from 1 in all instances $p<.001$ (one tailed). All variables were standardized prior to running the regression analyses to reduce the effects of
multicollinearity as suggested by Cohen et al. (2003). The table of correlations between the theoretical constructs is shown below.

Table 1: Correlations of survey constructs

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Age</td>
<td>.20**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Integrative capability</td>
<td>-.03</td>
<td>-.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Relational capability</td>
<td>-.17**</td>
<td>-.01</td>
<td>.27**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Intelligence capability</td>
<td>.12*</td>
<td>-.01</td>
<td>.35**</td>
<td>.28**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Innovative capability</td>
<td>.15**</td>
<td>-.11</td>
<td>.32**</td>
<td>.19**</td>
<td>.36**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Supply and practice innovation</td>
<td>.07</td>
<td>-.08</td>
<td>.24**</td>
<td>.11</td>
<td>.26**</td>
<td>.26**</td>
<td></td>
</tr>
<tr>
<td>8 Products and production technology innovation</td>
<td>.02</td>
<td>-.03</td>
<td>.35**</td>
<td>.22*</td>
<td>.17**</td>
<td>.29**</td>
<td>.49**</td>
</tr>
</tbody>
</table>

*) correlation is significant at p<.05 (2-tailed)
**) correlation is significant at p<.01 (2-tailed)
n=321

Hypothesis testing

The following paragraphs test the hypotheses presented in the research framework section of this paper. The analysis is divided into three parts: First, evaluating the hypotheses regarding direct and interaction effects (Hypotheses 1a through 5b), next, evaluating Hypothesis 6 about the existence of distinct configurations of capabilities using cluster analysis; and finally evaluating Hypothesis 7a, 7b, and 7c which relate to the competing models presented last in the research framework section.
Direct and interaction effects

The following section evaluates Hypotheses 1a through 5b regarding the direct and interaction effects presented in the research framework and hypothesis development section of this paper. For this purpose we use linear regression analysis, more specifically the hierarchical entry method. Table 2 on the following page shows the results of the linear regression analysis. The left-hand side of the model tests our hypotheses in relation to the dependent variable supply and practice innovation, the right-hand side our hypotheses with dependent variable products and production technology innovation. Model 1 and Model 6 include only the control variables age and size. Models 2, 3, 7, and 8 test only direct effects, and Models 4, 5, 9, and 10 include interaction effects (product terms). In the following section, we report β and R² from the full models including both dummies and interaction terms.

Model 5 and Model 10 in Table 2 report the results of the tests of Hypotheses 1a-5b and both models have reasonably good explanatory power; R²=.218 for Model 5 (supply and practice innovation) and R²=.282 for Model 10 (products and production technology innovation).

Integrative capability is positively associated with both purchasing supply and practice innovation (β=.14, p<.05) and products and production technology innovation (β=.30, p<.01), supporting both Hypothesis 1a and 1b.

Relational capability is not associated with purchasing and supply practice innovation (β=.05, p>.10) and thus fail to provide support for Hypothesis 2a. Relational capability has a
significant effect on purchasing’s contribution to products and production technology innovation ($\beta=.16, \ p<.01$) and thus provide support for Hypothesis 2b.

Hypothesis 3a states that innovative capability positively affects supply and practice innovation, and Hypothesis 3b states that innovative capability positively affects products and production technology innovation in purchasing, and the hypotheses are supported for both supply and practice innovation ($\beta=.13, \ p<.05$) as well as products and production technology innovation ($\beta=.20, \ p<.01$).

Intelligence capability is positively associated with purchasing supply and practice innovation, indicating support for Hypothesis 4a ($\beta=.17, \ p<.01$). The parameter estimate for intelligence capability’s association with products and production technology innovation was insignificant ($\beta= -.04, \ p>.10$), indicating no support for Hypothesis 4b.
Table 2: Results of linear regression – direct and interaction effects

<table>
<thead>
<tr>
<th></th>
<th>Supply and practice innovation (A)</th>
<th>Products and production technology innovation (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Industry dummies</td>
<td>Not included</td>
<td>Not included</td>
</tr>
<tr>
<td>Size</td>
<td>.09</td>
<td>.04</td>
</tr>
<tr>
<td></td>
<td>(t=1.51)</td>
<td>(t=.77)</td>
</tr>
<tr>
<td>Age</td>
<td>-.09</td>
<td>-.06</td>
</tr>
<tr>
<td></td>
<td>(t=1.62)</td>
<td>(t=1.10)</td>
</tr>
<tr>
<td>Integrative capability</td>
<td>.13*</td>
<td>.15*</td>
</tr>
<tr>
<td></td>
<td>(t=2.23)</td>
<td>(t=2.47)</td>
</tr>
<tr>
<td>Relational capability</td>
<td>.01</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>(t=1.7)</td>
<td>(t=.39)</td>
</tr>
<tr>
<td>Innovative capability</td>
<td>.15*</td>
<td>.14*</td>
</tr>
<tr>
<td></td>
<td>(t=2.48)</td>
<td>(t=2.23)</td>
</tr>
<tr>
<td>Intelligence capability</td>
<td>.16*</td>
<td>.15*</td>
</tr>
<tr>
<td></td>
<td>(t=2.56)</td>
<td>(t=2.40)</td>
</tr>
<tr>
<td>Integrative capability</td>
<td>-.06</td>
<td>-.06</td>
</tr>
<tr>
<td>Relational capability</td>
<td>(t=1.77)</td>
<td>(t=1.93)</td>
</tr>
<tr>
<td>Innovative capability</td>
<td>-.15*</td>
<td>-.17**</td>
</tr>
<tr>
<td>Relational capability</td>
<td>(t=2.28)</td>
<td>(t=2.22)</td>
</tr>
<tr>
<td>Intelligence capability</td>
<td>.01</td>
<td>.04</td>
</tr>
<tr>
<td>Relational capability</td>
<td>(t=.12)</td>
<td>(t=.61)</td>
</tr>
<tr>
<td>Innovative capability</td>
<td>.10</td>
<td>.08</td>
</tr>
<tr>
<td>Relational capability</td>
<td>(t=1.50)</td>
<td>(t=1.19)</td>
</tr>
<tr>
<td>Innovative capability</td>
<td>.11</td>
<td>.07</td>
</tr>
</tbody>
</table>

Standardized values. Two-tailed t-tests for hypothesized effects. a p<.10; * p<.05; ** p<.01 (n=321)
In Models 5 and 10 there are also three significant interaction effects. The combination of intelligence and innovative capabilities is positively associated with products and production technology innovation ($\beta=.16, p<.05$), indicating support for Hypothesis 5a. The interaction between integrative capability and relational capability is negatively associated with products and production technology innovation ($\beta=-.14, p<.05$), and the interaction between integration and innovative capabilities is negatively associated with supply and practice innovation ($\beta=-.17, p<.01$), thus lending support to Hypothesis 5b. Most interactions between capabilities are not significantly associated with the two innovation measures.

Age and size are not clear predictors of our dependent variables. The level of significance for age depends on whether or not we control for industry specific effects. The significant terms for each of the direct and interaction effects remain significant regardless of whether or not industry effects are controlled for (cf. Table 2 on the previous page). The variance inflation index (VIF) was below 1.8 for the individual variables across all model specifications. Hair et al. (2006) suggest below 10 as a common threshold for VIF values. Thus, the VIF values in Models 1 through 10 suggest that multicollinearity is not a concern in the analysis.

**Cluster analysis**

To test Hypothesis 6a, we performed a two-stage cluster analysis. First we used the hierarchical clustering procedure developed by Ward (1963) to establish the appropriate number of clusters. Ward’s procedure has demonstrated the highest accuracy (Blashfield, 1976). Based on the entire sample ($n=321$), we found support for a three, five and seven factor cluster solution by examining the dendrogram. Hair et al. (2006) encourage researchers to pick the stopping rule that takes into account
consideration increases in heterogeneity. As clusters are reduced in numbers, researchers should stop before increases in heterogeneity between the clusters make sudden jumps. Based on our analysis, all three cluster solutions were deemed viable. Therefore, we segmented our sample into ten subsamples each consisting of approximately 70% randomly selected cases and conducted Ward’s hierarchical clustering procedure for each sample. Based on these ten subsamples, the five-cluster solution was the most appropriate number of clusters as it was the most consistent of the three possible cluster solutions across all ten subsamples.

The second step in our cluster analysis uses the K-means clustering method, which is generally less susceptible to outliers (Punj and Stewart, 1983). Based on Ward’s hierarchical clustering procedure for the entire sample, we obtained seed points for the second step in our cluster analysis. The K-means method was used to assign each case to the appropriate cluster. We assessed the stability of the K-means clustering procedure by splitting the sample in two halves and using the seed points generated earlier to assign each case to clusters. We then compared the cluster center means generated in each of the two halves and found that each cluster corresponded to the same cluster in the other half. We then added the clusters, and compared the individual case assignments against the assignments generated previously using K-means on the entire sample. The case assignments were consistent in 84.1% of the cases.

Classification of clusters is only valuable if they have valid implications for hypothesis generation, theory building, prediction, or management. This can be demonstrated if the clusters are related to other variables than those which were used to generate the solution (Punj and Stewart, 1983). Thus, in addition to cluster-variable means we also present the means of the two dependent variables in Table 3. The dependent variables were not used for classification of clusters.
The superscripts indicate cluster means that are not significantly different from each other. Integrative capabilities perfectly discriminate all five clusters (no two clusters’ centroids are statistically equal). The clusters appear to be fairly different across the other capabilities. With respect to the two dependent variables, Clusters 2, 3, and 5 are not significantly different. Clusters 1 and 4 are statistically significant different from each other with respect to supply and practice innovation. The cluster solutions discriminate each other less perfectly with respect to products and production technology innovation. The cluster centers (means) are reported in Table 3 below.

<table>
<thead>
<tr>
<th>Table 3: Cluster identification and description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Integrative capability</td>
</tr>
<tr>
<td>1.36&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Relational capability</td>
</tr>
<tr>
<td>Intelligence capability</td>
</tr>
<tr>
<td>Innovative capability</td>
</tr>
<tr>
<td>Supply and practice innovation (A)</td>
</tr>
<tr>
<td>Products and production technology innovation (B)</td>
</tr>
<tr>
<td>Number of firms in clusters</td>
</tr>
<tr>
<td>Verbal naming of clusters</td>
</tr>
</tbody>
</table>

Values reported are cluster centers (means) for each cluster. Clusters with the same superscripts indicate that the means are not significantly different between the clusters (significance tested using one-way ANOVA p<.05). The means are based on standardized values and thus values close to 0 approaches the average for the sample.

**Cluster descriptions**

Cluster 1 contains 6% of the firms. The firms have on average the strongest capabilities and the highest performance compared to the other clusters, and hence they are top performers.

Firms in Cluster 2 are the products and production technology innovators. Their level of innovative capability is high and not significantly different from the top performers. They are second best on integrative and intelligence capabilities, but only third regarding relational capabilities. Their level
of supply and practice innovation is third highest whereas products and production technology innovation is second highest, however both their performance means are not statistically significant from Clusters 3 and 5.

Firms in Cluster 3 perform well above average on the relational capability dimension, but have below average innovative capability. Their innovation performance is close to the average for the sample of firms. Remember that the variables used for the analysis were standardized prior to the analysis and thus 0 represents perfect average across the entire sample.

Cluster 4 is the neglects. All their capabilities rate well below average, and they have the lowest innovation performance. Despite neglecting all capabilities – capability means are below the average – only their supply and practice innovation performance is significantly lower than all the other clusters.

Cluster 5 is the largest cluster consisting of 29% of the firms. Their capabilities are below average except for the innovative capability which is the second best of the clusters. Their performance is above average for supply and practice innovations, but not significantly different from Clusters 2 and 3.

In order to compare the explanatory power of the clusters to the other models proposed in this paper, we entered cluster membership dummies into the regression analysis. Because Cluster 1 was significantly different with respect to the two dependent variables, we used this as the hold out sample. Table 4 on the following page shows the results of linear regression analysis using the cluster memberships as explanatory variables.
Table 4: Results of linear regression – explanatory power of clusters

<table>
<thead>
<tr>
<th>Industry dummies</th>
<th>Not included</th>
<th>Included</th>
<th>Not included</th>
<th>Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>.07</td>
<td>.10 ($)</td>
<td>.01</td>
<td>.06</td>
</tr>
<tr>
<td>Age</td>
<td>-.09</td>
<td>-.14*</td>
<td>-.01</td>
<td>-.05</td>
</tr>
<tr>
<td>C2</td>
<td>-.35**</td>
<td>-.38**</td>
<td>-.28**</td>
<td>-.27**</td>
</tr>
<tr>
<td>C3</td>
<td>-.37**</td>
<td>-.39**</td>
<td>-.37**</td>
<td>-.37**</td>
</tr>
<tr>
<td>C4</td>
<td>-.60**</td>
<td>-.62**</td>
<td>-.59**</td>
<td>-.59**</td>
</tr>
<tr>
<td>C5</td>
<td>-.33**</td>
<td>-.33**</td>
<td>-.47**</td>
<td>-.46**</td>
</tr>
<tr>
<td>R²</td>
<td>.132</td>
<td>.205</td>
<td>.121</td>
<td>.184</td>
</tr>
<tr>
<td>BIC</td>
<td>-.810</td>
<td>86.440</td>
<td>-8.483</td>
<td>82.935</td>
</tr>
</tbody>
</table>

Standardized values; Two-tailed t-tests for hypothesized effects. a p<.10; * p < .05; ** p<.01 (n=321)

All four remaining clusters are significantly related to both dependent variables. Cluster 2 (products and production technology innovators) is statistically and significantly related to both types of innovation performance. Thus, having the capability configuration that most resembles the products and production technology innovators thus leads to performing worse on both types of innovation compared to the superior capability configuration of Cluster 1 (top performers). Membership of Cluster 2 hurts supply and practice innovation (β=-.35, p<.01) comparatively more than production technology innovation (β=-.27, p<.01). Similarly, resembling the cluster configuration of supply and practice innovators (Cluster 5) also reduces the overall level of innovation performance compared to Cluster 1. For this group products and production technology innovation (β=-.33, p<.01) is reduced more than supply and practice innovation (β=-.46, p<.01). Further membership of Cluster 3 (non-innovators) and Cluster 4 (neglects) also
reduces both types of innovation. The variance inflation index (VIF) was below 4.4 for the clusters across all model specifications, suggesting that multicollinearity is not a problem, and findings were robust across model specifications (including and excluding industry dummies).

The results of our analysis support Hypothesis 6. The top performers (Cluster 1) statistically discriminate themselves almost consistently from the other clusters (with the exception that they resemble Cluster 2 with respect to innovative capability).

Other competing models

To test Hypotheses 7a, 7b, and 7c, we constructed the following models following the empirical methods outlined in Wu, Melnyk, and Swink (2012):

\begin{align*}
(a) \quad Y &= \beta_0 + \beta_1 \text{MAX(Capabilities)} + \beta_i(Controls) + \varepsilon \\
(b) \quad Y &= \beta_0 + \beta_1 \text{MIN(Capabilities)} + \beta_i(Controls) + \varepsilon \\
(c) \quad Y &= \beta_0 + \beta_1 \text{AVG(Capabilities)} + \beta_i(Controls) + \varepsilon
\end{align*}

Table 5 on the subsequent page shows the results of our regression analysis. We see that the maximum capability term is significantly related to both supply and practice innovation ($\beta=.22$, $p<.01$) and products and production technology innovation ($\beta=.35$, $p<.01$). This provides support for Hypothesis 7a which suggests that the level of the strongest capability is positively associated with innovation performance. The term representing the weakest of the capabilities is also positively and significantly related to both supply and practice innovation ($\beta=.29$, $p<.01$) and products and production technology innovation ($\beta=.28$, $p<.01$) supporting Hypothesis 7b. Last, but
not least the average capability model representing the compensatory system suggested by Hypothesis 7c is also positively and significantly related to both supply and practice innovation ($\beta=.32, p<.01$) and products and production technology innovation ($\beta=.39, p<.01$). The VIF values were below 1.4 for all variable-terms entered into Model 15 through 26 in Table 5 on the next page. Comparing the models, we see that the average-capability model achieves better fit indices than the maximum and minimum models (higher $R^2$ and lower AIC and BIC), e.g. Model 20 is better than Model 18 and 16. Likewise, Model 26 is better than Models 24 and 22.

When we compare the models where industry effects are not accounted for (Models 16, 18, and 20 for supply and practice innovation and Models 22, 24, and 26 for products and production technology innovation), we are able to confirm the hypotheses, suggesting that the findings are robust with respect to industry specific effects. We also see that the average capability model achieves a better fit than any of the two other models (maximum and minimum) in both the models adjusted for industry effects and the models excluding industry dummies.
Table 5: Results of linear regression – resource-based, additive and compensatory models

<table>
<thead>
<tr>
<th></th>
<th>Supply and practice innovation (A)</th>
<th>Products and production technology innovation (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 15</td>
<td>Model 16</td>
</tr>
<tr>
<td>Industry dummies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not included</td>
<td>.09</td>
<td>.12</td>
</tr>
<tr>
<td>Included</td>
<td>(t=1.54)</td>
<td>(t=2.07)</td>
</tr>
<tr>
<td>Age</td>
<td>-.08</td>
<td>-.13</td>
</tr>
<tr>
<td>Included</td>
<td>(t=.48)</td>
<td>(t=2.16)</td>
</tr>
<tr>
<td>Maximum capability</td>
<td>.20</td>
<td>.22</td>
</tr>
<tr>
<td>(t=3.66)</td>
<td>(t=3.93)</td>
<td>(t=5.52)</td>
</tr>
<tr>
<td>Minimum capability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average capability</td>
<td>.053</td>
<td>.129</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standardized values. Two-tailed t-tests for hypothesized effects. a p<.10 * p < .05; ** p<.01 (n=321)
Choosing between proposed models

In order to compare the different theoretical models proposed in the paper, the coefficient of determination ($R^2$), Akaike’s Information criterion (AIC), and the Bayesian Information Criterion have been included for all models. These criteria help researchers choose between rival models, when such models are non-nested (i.e. restricting any one given model will not yield the other model). AIC and BIC both penalize the number of estimated parameters in the models when they do not add to the explanatory power of the model. In Table 6 below, the best criteria value have been highlighted. Higher $R^2$-values represent a better model fit, and smaller AIC and BIC-values indicate a better fit of the model.

<table>
<thead>
<tr>
<th>Supply and practice innovation (A) (industry dummies not included)</th>
<th>Products and production technology innovation (B) (industry dummies not included)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>$R^2$</td>
</tr>
<tr>
<td>11</td>
<td>.132</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply and practice innovation (A) (industry dummies included)</th>
<th>Products and production technology innovation (B) (industry dummies included)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>$R^2$</td>
</tr>
<tr>
<td>3</td>
<td>.186</td>
</tr>
<tr>
<td>5</td>
<td>.218</td>
</tr>
<tr>
<td>16</td>
<td>.129</td>
</tr>
<tr>
<td>18</td>
<td>.165</td>
</tr>
<tr>
<td>20</td>
<td>.178</td>
</tr>
</tbody>
</table>
Each of the models has been specified both with accounting for industry differences, and a general model without the industry dummies as control variables. The models excluding industry dummies yield better AIC and BIC values because the industry dummies add to the complexity of the model, but do not contribute notably to the explanatory power. AIC and BIC are relative criteria and thus do not reveal anything about the absolute true quality of a model. However, for comparing the relative quality of the Models presented in this paper, AIC and BIC were deemed sufficient.

In Table 6, we see that the $R^2$, AIC, and BIC values do not provide an unequivocal answer to which of the models predicting supply and practice innovation yield the better relative explanation. The coefficient of determination ($R^2$) favors the fully specified models with direct and interaction effects (Models 4 and 5), while Akaike’s information criterion favors the cluster-based models (Models 11 and 12). The Bayesian information criterion favors the models proposing a compensatory system of effects (average capability-based Models 19 and 20).

The models predicting products and production technology innovation yield a slightly clearer picture. Here both the coefficient of determination and Akaike’s information criterion favor the fully specified direct and interaction effects models (Model 9 and 10). However, the Bayesian information criterion gives an unclear answer between preferring the simple direct-effects or the compensatory model. Model 8 (estimating direct and interaction effects) is preferred when
accounting for industry differences and Model 25 (compensatory model) is preferred when industry effects are not accounted for.

Comparing the relative quality of our models yields an inconclusive picture in regards to supply and practice innovation (any one model is not preferred by all criteria). However, with respect to products and production technology innovation, two out of three criteria favor the models estimating direct and interaction effects.

Discussion and conclusion

Our analysis contributes by linking purchasing capabilities with purchasing innovation and by exploring different capability models for explaining how purchasing capabilities may be associated with purchasing innovation. Overall our results are in accordance with the general predictions of the resource-based view of the firm, namely, that higher levels of capabilities are associated with higher levels of performance, and that interactions between capabilities are associated with performance (i.e. synergies exist between capabilities).

Some of our capabilities are related to both measures of innovation whereas other capabilities have insignificant relationships with one of the measures of innovation. Thus, our results indicate that capabilities have different effects in terms of their contribution to overall innovation performance.
Direct and interaction effects

For both integrative capabilities and innovative capabilities we found significant direct positive effects on both types of innovation. This is in accordance with expectations. However, the interaction between integrative and innovative capabilities is negatively associated with supply and practice innovation. This suggests that if both capabilities are very strong, they make each other redundant and hence eliminate the positive effect on innovation that each of the capabilities have on their own.

We found that relational capabilities are not positively related to purchasing’s supply and practice innovation (new markets, new suppliers, new purchasing practices). However, there is nothing in our results that indicates that relational capabilities inhibit this type of innovation. This suggests that relational capabilities are not a core rigidity regarding the adoption of new suppliers and new purchasing practices (Leonard-Barton, 1992).

The decision to develop relational capabilities should therefore be motivated by which type of innovation the firm aims for, since the effect of relational capabilities differs for the two dependent variables. The results indicate that relational capabilities may help innovative effort aimed at improving the quality of end-products, improving production technologies or creating new end-products. This is in accordance with the literature on buyer-supplier relationships which suggests that relational capabilities improve the ability to work effectively together with suppliers. The way manufacturers deal with their suppliers, impacts the suppliers’ willingness to participate in project development (Wynstra, Weggeman, and Van Weele, 2003). This improved
collaboration may take the form of a higher willingness to share information, focus on common goals, and share ideas that may help improve existing products, create new products, or improve production technologies.

In the literature on relational capabilities it is argued that relational capabilities have a positive effect on innovation (e.g. Lorenzoni and Lipparini, 1999). Our results show a significant positive relationship between relational capabilities and products and production technology innovation, and thereby it corroborates a large part of the existing literature. An exception is Capaldo (2007) who suggests that there may be long-term negative effects of having few close relationships with other firms. Our results add to this discussion by indicating a lack of relationship between relational capabilities and new suppliers and new purchasing practices. Thereby our results question that relational capabilities have a positive effect on all types of innovations, and the results suggest that a closer look at the relationships between relational capabilities and different types of innovation may reveal interesting differences.

In our data we see that having both relational and integrative capabilities inhibits products and production technology innovation. This suggests that it may be difficult for firms to exploit strong capabilities for internal integration while simultaneously using the relational capabilities for building close cooperative relationships with their suppliers. Allred et al. (2011) propose that relational capabilities encompass both aspects directed at the extended supply chain as well as internal collaboration. Their study shows that collaborative capabilities improve customer and supplier orientation’s impact on both productivity and satisfaction. Collaboration capability is
reflected by internal and external collaboration. Our study shows that it is fruitful to distinguish between capabilities supporting internal collaboration (integrative capabilities) and external collaboration (relational capabilities) as these capabilities are found to have different impacts on our innovation performance measures. While we recognize that the constructs used by Allred et al. (2011) are different from those used in this study, we suggest that it may be better to think of these constructs as separate theoretical entities because they have different outcomes i.e. in relation to their effect on innovation performance measures rather than as two constructs reflecting a higher order construct as proposed by Allred et al. (2011).

Intelligence capabilities have a direct and positive statistically significant relationship with supply and practice innovation, whereas the direct association with products and production technology innovation is insignificant. The results indicate that intelligence capabilities only have a positive effect on products and production technology innovation when the purchasing department has strong innovative capabilities.

**Capability configurations**

We examined competing perspectives on the capabilities necessary for increasing innovation performance. We found support for the existence of distinct configurations of capabilities that were shown to predict innovation performance. Cluster analysis was used to investigate whether a few distinct configurations of capabilities are associated with high innovative performance, and we found that a specific configuration is associated with higher innovation
than other configurations. However, based on the study we do not find several distinct configurations of capabilities associated with high innovation. This means that we do not find evidence for equifinality, i.e. that different capability configurations lead to superior performance. Furthermore, the final models only explain a small percentage of the variation in supply and practice innovation (Model 12: $R^2=.205$) and products and production technology innovation (Model 14: $R^2=.184$). There are only 19 firms in the group of high performers. This indicates that purchasing capabilities may be rare, valuable, inimitable, and non-substitutable, and thus purchasing capabilities may contribute to a firm’s sustainable competitive advantage (cf. Barney, 1991).

**Other competing models**

We also found support for the three models using the maximum, minimum, and average values of the capabilities. In Models 16 and 22 we found a significant relationship between the strongest capabilities and innovation performance. However, compared to the models with direct and interaction effects (cf. Table 2) the models focusing only on purchasing strengths explain less of the variation in innovation. This suggests that basic resource-based arguments emphasizing few strong capabilities (e.g. Barney, 1991; Peteraf, 1993) and ignoring less strong capabilities and interaction effects are too simple to explain purchasing innovation performance. The same applies for Models 18 and 24 which show a significant relationship between the weakest capabilities and performance, but compared to the alternative models they explain less of the variation in purchasing innovation. So as suggested by e.g. West III and
DeCastro (2001) and Wu, Melnyk, and Swink (2012) weak capabilities do matter, but they are unlikely to explain more of the variation in performance, and thus they represent a partial view. Finally, the average-capability models (Models 20 and 26) explain more of the variance than both the minimum and maximum models, which emphasizes that the strength and weakness perspectives may not hold as much promise in explaining the variation in innovation performance.

When comparing the rival perspectives to the direct and interaction effects models, we see that the different measures of model fit are ambiguous about the prevailing theoretical explanation. With respect to product and technology innovation, the direct and interaction-effects models are vaguely preferred over any of the other models. This suggests that capabilities follow a more complex system of effects and that it’s necessary to take into consideration the interactions between capabilities, supporting the notion that there are complementarities, synergies, and asset-interconnectedness between capabilities. To our knowledge, no single study has integrated all these different theoretical perspectives into one. Wu, Melnyk, and Swink (2012) compared the minimum (additive) and average (compensatory) capability-based models and found that the system of capabilities depends on the outcome in question, with the additive system explaining three out of five performance types in the supply chain. When solely comparing the additive and compensatory models, we see that the additive model better explains our data. This seemingly corroborates with Wu, Melnyk, and Swink’s (2012) findings that the additive system better explains the nature of capabilities in the supply chain. However, in our paper, we are able to show that both the additive and compensatory system as well as
the strengths-perspective typically dictated by the resource-based view is outperformed by the more complex model specifying direct and interaction effects. The significant interactions between different purchasing capabilities are in accordance with results from studies of marketing capabilities (cf. Vorhies and Morgan, 2005). This means that purchasing capabilities exhibit some of the same characteristics as for other business functions and that interactions between capabilities are likely to be important for understanding how capabilities affect performance.

Though our results may seem inconclusive as to which model is preferred when observing the model fit indices $R^2$, AIC, and BIC, we observe highly similar and consistent results across the different model specifications. For example, both the cluster analysis (cf. Table 5) and the interaction models (cf. Table 2) indicate that strong relational capabilities are only weakly associated with supply and practice innovation. This provides us with evidence of robustness of the relationships between the capabilities and the two performance measures.

Managerial implications

Traditionally, the purchasing function has been viewed as a paper-pushing function (Chao, Scheuing, and Ruch, 1993 p. 38; Pearson and Gritzmacher, 1990) which greatest achievement was to cut cost in production - for example by negotiation for lower prices on input from suppliers or outsourcing activities to lower-cost countries. However, recently this view has begun to be challenged with the move towards a more strategic perspective on the purchasing
function. The strategic perspective may offer some benefits over a more operational perspective, but we believe that the purchasing function holds a potential that goes beyond those that can be ascribed to simple short or long term strategic goals. The purchasing function can deliver innovative insights from factor markets or discover new products or means of production that can change the buying firm’s business through innovation, which may be transformative for the buying firm or even the entire industry (Schumpeter, 1934/1961). Our results support the notion that the purchasing function can contribute to innovation performance. This suggests that purchasing should be an active part when firms face changing environments and want to innovate. The results show positive relationships between the four purchasing capabilities and innovation, but the relationships depend on the type of innovation that a firm wants to promote.

Furthermore, some of the interactions between capabilities are significantly associated with innovation. Therefore managers face a complex task when they want to coordinate and decide about which purchasing capabilities to maintain and develop in order to improve performance. Simultaneously developing capabilities to a too strong level may be detrimental to the level of innovation performance. The positive side of this managerial problem is that competitors face even larger problems of imitating the capability configurations which lead to a high performance.

The interaction-regression models (Models 5 and 10) explain most of the variance in our data (based on R²-values), and AIC further indicates that this is the preferred explanatory model for
products and production technology innovation. Therefore, in the following we draw managerial implications in lieu of these models. We have shown that purchasing managers can improve innovation by investing in the right capabilities. Depending on which type of innovation purchasing aims for, different capabilities should be developed.

Integrative capabilities improve purchasing innovative performance with respect to supply and practice innovations and products and production technology innovation. In other words, integrative capabilities may lead to innovation both in terms of new markets, new suppliers, new purchasing practices, new or improved products, and new or improved technologies.

Integrative capabilities can be improved by looking at how purchasing cooperates with other departments on process and product design, and actively engaging in making strategic decisions. Purchasing managers should focus on joint strategic decision making and on cooperating with other departments on new product development. Beyond the improvements in innovation outputs, high levels of purchasing integration should also improve competitive priorities such as cost, quality, customer satisfaction, and delivery performance (Narasimhan and Das, 2001).

The effects of developing integrative capability together with innovative capability reduce innovation performance in relation to supply and practice innovation. This suggests that there may be rigidities in the systems where developing both capabilities to a high level reduces the effect on innovation performance. Having the capability to collaborate and cooperate with other departments while focusing on encouraging innovation and seeking out new ideas in
purchasing reduces supply and practice innovations such as getting access to new markets, providing new suppliers and changing purchasing practices. Similarly, developing integrative capabilities together with relational capabilities (i.e. coordinating and collaborating with suppliers) may reduce purchasing’s contribution to creating new products and production technologies.

Our study indicates that firms do not improve innovation related to new suppliers, new markets or new purchasing practices merely by investing in relational capabilities. Hence, building and investing in relational capabilities is not a good strategy to support innovation in terms of supply and practice innovation. On the other hand, firms should not be afraid of developing relational capabilities fearing that they may be dysfunctional in the search for new suppliers and new purchasing practices.

The ability to coordinate and collaborate with suppliers has a positive effect on purchasing’s contribution to innovation in terms of new products and production technologies. Relational capabilities and integrative capabilities exhibit substitutable effects with respect to products and production technology innovation. Thus it may not be possible to reap the benefits of both internal and external collaboration with respect to innovation performance.

Innovative capabilities positively contribute to both supply and practice innovations and products and production technology innovation. Thus purchasing must seek out new ideas, encourage and accept innovation in the purchasing process. Managers should improve purchasing professionals’ capacity and competences to handle changes and opportunities,
namely by directing efforts and seeking out new ideas and bringing them to life within the firm as technical innovations or new processes.

Intelligence capabilities contribute to purchase driven-innovations in securing new markets, suppliers and purchasing practices. Thus, firms that are more susceptible to realizing changes in their industry may be better able to meet new challenges in purchasing by adapting new practices or suppliers. Surprisingly, the ability to recognize changes in a supplier’s products and services does not seem to lead to more innovation in terms of products and production technologies, thus suggesting that merely collecting and analyzing knowledge on supply markets do not improve supply and practice innovation.

When intelligence and innovative capabilities are combined they yield complementary effects with respect to products and production technology innovation. Thus, allocating resources to both intelligence and innovative capability improves innovation performance (products and production technology) beyond what having an innovative capability could achieve by itself. Because intelligence capabilities themselves cannot lead to improved products and production technology innovation, the effect of having both is truly synergistic (Stieglitz and Heine, 2007). Developing these capabilities will yield a better return than developing either alone, because they complement each other. In practice, combining search activities that make the purchaser more knowledgeable about factor markets with the ability to seek out and implement innovative ideas will improve purchasing’s contribution to new products and production technologies. The synergistic effect does not yield any performance gains with respect to supply
and practice innovation. The ability to combine knowledge gained through intelligence capabilities with innovative capability therefore does not yield a contribution to the innovation in the broadest sense.

Capabilities are costly to develop and maintain and the discussions provided in the previous section should help guide the managerial choice of developing certain capabilities while passing over others. The capabilities examined in this study may improve or inhibit other functional outcomes than innovation, and the decision to develop certain capabilities more than others may be influenced by other objectives than innovation. Likewise, the decision to support one type of innovation over another may depend on the strategic objective and path of the firm. For example, the benefits of innovating through new products and services may be easier to emulate by competitors (Oke and Kach, 2012) than changes in purchasing practices. Managers who decide to pursue this type of innovation should therefore develop intelligence capabilities and either integrative or innovative capabilities, because they appear to be substitutes. In which case, looking to the other type of innovation performance (products and production technology innovation), developing innovative capabilities rather than integrative capabilities appears to be a favorable choice because innovative capabilities complement intelligence capabilities that were needed for supply and practice innovation.

We hope that this discussion of our results may help purchasing managers consider which capabilities to develop in the pursuit of purchasing innovation. It’s clear that choosing which capabilities to develop is not straightforward. On the other hand, purchasing managers who
successfully develop and foster capabilities that lead to purchasing innovation may find that they have achieved a competitive position which is not easily imitable by competitor. In addition they will have achieved a set of capability endowments, which lets them adapt to increasingly complex and dynamic environments.

**Limitations**

This study has several important limitations. First, the study included four different capabilities, which were all positively related to innovation. A number of operational capabilities have not been included, and therefore the study may ignore capabilities which create rigidities and are counterproductive for generating purchasing innovation (Leonard-Barton, 1992). Second, the study focused on two measures of purchasing innovation. However, the innovation literature has a long tradition for looking at different dimensions of innovation (Damanpour, 1996), and these dimensions are left for future research to explore. Third, although we have included a number of control variables, these variables only describe a few differences between the firms in the sample. Fourth, our measures of capabilities are simple, and more studies are needed to improve the understanding of the individual capabilities, and how the interactions between capabilities are associated with purchasing performance. Finally, the study has ignored the costs of dynamic capabilities (Lavie, 2006), and it has not related innovation to other performance measures.
## Appendix

### Table 7: Table of survey constructs, factor loadings, average variance extracted, descriptive statistics, and scale reliabilities

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loadings</th>
<th>Mean</th>
<th>S.d.</th>
<th>Scale reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integrative capability</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>.56</td>
<td></td>
<td>.49 .84</td>
</tr>
<tr>
<td>Suggest changes in products as a consequence of analyses and/or knowledge about supply markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in the development and design of new products</td>
<td>.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in process and design improvements</td>
<td>.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperate with other departments on strategic decisions</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Relational capability</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>.48</td>
<td>2.33</td>
<td>.34 .79</td>
</tr>
<tr>
<td>Coordinate production activities with suppliers</td>
<td>.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make decisions in collaboration with our suppliers</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordinate different suppliers’ activities</td>
<td>.69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify overlap between our different suppliers</td>
<td>.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intelligence capability</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>.45</td>
<td>2.13</td>
<td>.34 .76</td>
</tr>
<tr>
<td>Analyze our supply markets</td>
<td>.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detect changes in our suppliers’ products and services</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collect information about our industry through informal channels (e.g. business dinners or talks with business partners)</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detect fundamental changes in our industry</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Innovative capability</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>.64</td>
<td>2.59</td>
<td>.48 .88</td>
</tr>
<tr>
<td>Implement new technical innovations</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seek out new, innovative ideas in purchasing</td>
<td>.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accept innovation in the purchasing process</td>
<td>.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage innovation in the purchasing process</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supply and practice innovation</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td>.43</td>
<td>2.13</td>
<td>.45 .69</td>
</tr>
<tr>
<td>We [purchasing] have contributed to getting access to new markets</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We [purchasing] often provide new suppliers</td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We [purchasing] have been instrumental in changing the way, purchasing is done in our industry</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Products and production technology innovation</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td>.41</td>
<td>2.28</td>
<td>.39 .67</td>
</tr>
<tr>
<td>We [purchasing] have contributed to improving the quality of our end-product</td>
<td>.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We [purchasing] have contributed to implementing new or improving existing production technologies</td>
<td>.69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We [purchasing] have contributed to creating new end products</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Each of the sections was initiated by the following paragraphs. Scales used are in parenthesis.

a) Please evaluate your business unit’s capabilities in each of the following areas. Please evaluate your capabilities relative to your closest competitors. Our ability to... (1=Much worse than our competitors, 2=Worse than our competitors, 3=Equal to our competitors, 4=Better than our competitors, and 5=Much better than our competitors).

b) Please rate your business units’ performance for each of the following: (1=Very much disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Very much agree)
References


Kinch, N. 1984. "Strategy and structure of supplier relationships in IKEA. A case from the furniture and interior decoration industry." *Between Market and Hierarchy, Department of Business Administration, University of Uppsala*


Paper 2

The impact of purchasing capabilities on delivery performance
The impact of purchasing capabilities on delivery performance

Astrid Hanghøj

Department of Economics and Business, Aarhus University, Aarhus V, Denmark

Abstract

This article aims to integrate capability-based theory in purchasing management to explain how purchasing capabilities can contribute to delivery performance in the face of technological and demand uncertainty. In particular, the research model presented in the paper focuses on how supplier evaluation capability and risk management capability impact delivery performance. Further, the paper explores the moderating effect of demand and technological uncertainty. The methodology relies on a multiple informant survey design with responses from purchasing and production managers in Danish manufacturing companies. Hypotheses are tested using regression analysis with data collected from 197 firms. Risk management capability is found to increase delivery performance, and demand uncertainty and supplier evaluation capability decreases delivery performance. Technological uncertainty is not found to impact delivery performance. Further, no support is found for increased importance of capabilities under higher levels of demand and technological uncertainty.
Keywords: purchasing, capabilities, risk management, supplier evaluation, delivery performance, environmental uncertainty
Introduction

Purchasing and supply management (PSM) continues to become an increasingly more important activity for firms. Purchasing managers need to demonstrate that they make a valuable contribution to the bottom line (Carr and Pearson, 1999) and that purchasing can contribute to the strategic success of the firm (Ellram and Pearson, 1993). In increasingly competitive and globalized markets, suppliers are becoming equally accessible to competitors. At the same time, resources provided by suppliers need to be integrated into the focal firm’s value process. This poses a challenge to the focal firms’ managers, who are better acquainted with the attributes of internal resources (Hitt, 2011) and competences. Researchers in the PSM field have mainly focused on what firms should do to achieve competitive advantages rather than how they do this (Kerkfeld and Hartmann, 2012). Thus, very little research has focused on the effect of purchasing capabilities on performance (Kerkfeld and Hartmann, 2012; Spina et al., 2013) leading to a call for better theoretical integration (Hitt, 2011; Kerkfeld and Hartmann, 2012). In line with Förstl et al. (2011), this paper builds on the notion that firms who adopt and invest in purchasing capabilities will outperform those that do not. As firm-to-firm competition is increasingly being substituted for supply-chain-to-supply-chain competition (Lee et al., 2000 p. 470), firms placed further downstream need to develop the capabilities to ensure efficient flows of goods for production. Therefore, this paper focuses on a single dimension of purchasing performance, namely delivery performance.

Delivery performance is a critical metric for manufacturing firms who rely on suppliers for input and has become the focal point of firms’ competitive strategies (Fawcett, Calantone, and Smith,
Delivery performance has been identified as a key to unlocking supply chain excellence (Stewart, 1995 p. 74), which could lead to sustained competitive advantages. Poor delivery performance in terms of late deliveries may result in production breakdown, and early deliveries may cause excess inventory, both of which are costly and hurt the firm’s financial performance. In cases of poor delivery performance, problems tend to cascade forward in the supply chain (Milgate, 2001), which ultimately impacts the end customer and the focal firm’s competitiveness. Overall, deficiencies in the supply chain hamper the competitive advantage of firms because they are not able to compete as efficiently as their competitors. Cost and quality have been the focus of improving competitiveness for so long that they have eroded their potential for competitive advantage and are now viewed as qualifiers rather than order winners. In this context, delivery performance is an increasingly important differentiator (Fawcett, Calantone, and Smith, 1997). Fawcett, Calantone, and Smith (1997) have called for identifying the antecedents of delivery performance, both with respect to how delivery performance impacts firm performance, but also what factors enhance it. In this paper I focus on the capability antecedents of delivery performance. Using the capability-based theory as the theoretical lens for this study, this paper proposes the overall research question: How can purchasing managers improve delivery performance?

This paper contributes to theory in two principal ways. First, theoretically by integrating capability-based theory it takes a step in the direction of better theoretical integration in the PSM field as called for by researchers (e.g. Giunipero et al., 2008; Quintens, Pauwels, and MatthysSENS, 2006b). Using capability-based theory, the paper explores the moderating effects
of environmental uncertainty on the relationship between purchasing capabilities and delivery performance. Second, methodologically by employing a more advanced methodology that addresses concerns about common method variance (Podsakoff and Organ, 1986; Podsakoff et al., 2003). This is done by collecting data on the key theoretical constructs from two independent respondents within each organization crossing functional boundaries. This answers a call for more advanced research methods as called for by Carter and Ellram (2003) and Giunipero et al. (2008) and ensures external validity as called for by Zheng et al. (2007 p. 77).

The remainder of this paper is structured as follows: The next section presents the theoretical background and is followed by the conceptual framework and hypotheses development section. In the fourth part of the paper, the survey methodology and the data collection are presented. Finally, the analysis and results are followed by the final discussion and conclusion section.

**Theoretical background**

The following section presents the theoretical lens – the capability-based view and briefly outlines its application as it is relevant to the PSM research domain. The capability-based perspective extends from the resource-based view (Barreto, 2010). Whereas the resource-based view focuses on the unique access to valuable resources, proponents of the capability-based view argue that in a dynamic and changing competitive environment, it is the development and application of capabilities that generates long-term competitive advantages. Capability-theory is still in a very young stage, but has gained traction in the broader strategy
literature. It has attracted the attention of scholars and currently represents a large and very varied body of research (Barreto, 2010) and has been adopted in a large amount of disciplines. In the supply chain literature (SCM), it is amongst one of the theoretical frameworks that are increasingly being used (Hitt, 2011), however it has not yet gained much attention in the PSM literature (Spina et al., 2013). Different definitions have been proposed and are being used. For example, Day (1994 p. 38) defines capabilities as “bundles of skills and accumulated knowledge, exercised through organizational processes that enable firms to coordinate activities and make use of their assets”. In their seminal work, Teece, Pisano, and Shuen (1997 p. 516) define dynamic capabilities as a “firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments”. Helfat and Peteraf (2003 p. 999) define organizational capabilities as the “ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result”. Examining the literature on capabilities reveals that the disagreements extend beyond defining capabilities. Barreto’s (2010) review of the literature outlined seven dimensions along which the disagreements in capabilities have unfolded: Their nature, role, context, mechanisms, heterogeneity assumptions, outcome, and finally their purpose. Two of the specific dimensions of conceptual disagreement are especially relevant to this paper. These dimensions are what Barreto (2010) refers to as the role and context of capabilities. The role dimension refers to whether capabilities operate to change other capabilities (e.g. Winter, 2003), or if they operate to change the operating routines, or the resource base (e.g. Zahra, Sapienza, and Davidsson, 2006; Zollo and Winter, 2002). The context of capabilities is whether capabilities are relevant in
highly dynamic environments, stable environments or whether they are important in both stable and dynamic environments (Barreto, 2010 p. 261). In this paper capabilities are viewed as having a functional or cross-functional performance outcome (cf. Salvato and Rerup, 2011), and the line between dynamic and operative capabilities is seen as blurry (Helfat and Winter, 2011). Capabilities may have both dynamic and substantive effects at the same time. Thus, capabilities may be operational in terms of bringing about a certain outcome, and dynamic in terms of changing the outcome with respect to the future needs of the firm. To the extent that capabilities are considered of higher level (Winter, 2003), their effect on performance should depend on the level of environmental uncertainty. In perfectly stable environments, capabilities of higher order are no more effective than ad-hoc problem solving, which comes at a cheaper cost to firms. Thus, in stable environments firms may prefer not to develop capabilities but simply solve problems in an ad-hoc manner (cf. Winter, 2003). In line with this thinking, firms should profit equally from having capabilities of higher order and using ad-hoc problem solving, thus rendering any effect of capabilities on performance insignificant. Others have contested this, arguing that there is a high degree of path dependency in the development and deployment of capabilities (Teece, Pisano, and Shuen, 1997), and that bundles of capabilities may yield differentiated performance levels (Zott, 2003) or even different outcomes.

In the PSM and SCM literature, the term capability is often used interchangeably with skills, knowledge and competences (Axelsson, Rozemeijer, and Wynstra, 2005; Lintukangas et al., 2010) or synonymously with competitive priorities (Ward et al., 1995 p. 102), and sometimes even interchangeably with performance (e.g. Fawcett, Calantone, and Smith, 1997). These
perspectives all emphasize how purchasing managers contribute to competitive advantages, which reflects the ambition of this paper: to examine how – through purchasing capabilities – purchasing managers can impact delivery performance. According to Spina et al. (2013) only one paper in the PSM literature used the capability-based view as a theoretical departure point. This is supported by Shook et al. (2009) who do not mention capability-based theory in their review of theories relevant to the sourcing function. Shook et al. (2009) recognize the precursor, the resource-based view as being relevant to the sourcing function through the unique assets and capabilities that ensure competitive advantages for the buying firm.

In the following, I briefly review some of the recent work in the broader context of PSM/SCM that has applied either directly or indirectly a capability-based view to study purchasing phenomena. Some authors have tried to establish definitions pertinent to purchasing capabilities - for example purchasing competence which is defined as the “capability to structure, develop, and manage the supply base in alignment with the manufacturing and business priorities of a firm” (Das and Narasimhan, 2000 p. 18). Narasimhan and Das (2001) show that purchasing competence improves manufacturing performance and that increased purchasing integration further improves performance. Purchasing competence also improves total quality management and customer satisfaction (Narasimhan, Jayaram, and Carter, 2001). Petersen, Frayer, and Scannell (2000) found that international language capabilities and global sourcing business capabilities improve global sourcing effectiveness. Quintens, Pauwels, and MatthysSENS (2006a) propose that purchasing capabilities can be divided into two sets, those who are related to the assimilation and dissemination of supply market information and
relationship-building capabilities. Lado, Paulraj, and Chen (2011) find that supply chain relational capabilities lead to increased customer service. Allred et al. (2011) find that dynamic collaboration capability (composed of both internal and external collaboration) lead to increased satisfaction and productivity in supply chains. Perhaps due to the nascent stage of the adoption of the framework in PSM literature, very comprehensive models built on a capability-based framework are absent from the literature. Tracey, Lim, and Vonderembse (2005) and Svahn and Westerlund (2007) represent some of the more comprehensive frameworks available. Adopting Day’s (1994) definition and classification of capabilities into outside-in, inside-out and spanning capabilities, Tracey, Lim, and Vonderembse (2005) apply this framework to supply chain management. In their framework, purchasing is placed as a capability in the spanning category. Purchasing along with other spanning capabilities then improve on outside-in and inside-out capabilities and overall performance. Svahn and Westerlund (2007) use capability-theory to understand supply net management. The authors identify a number of capabilities in each of the categories: influencing, controlling and monitoring, coordinating, and integration of supply networks.

No comprehensive set of purchasing capabilities has been developed, and often researchers have sought to infer the existence of the purchasing capabilities studied by either referring to the competencies and skills of managers, or by arguing that if a purchasing or supply management process exists, it must be supported by a corresponding capability. Several authors agree that more research is needed in order to fully integrate the capability-based perspective in PSM (Hitt, 2011; Kerkfeld and Hartmann, 2012; Quintens, Pauwels, and MatthysSENS, 2006a)
and that more effort is needed in identifying and measuring purchasing capabilities (Quintens, Pauwels, and Matthyssens, 2006a). The following section presents the conceptual framework and hypothesis development.

In this paper, I focus on how two capabilities – namely supplier evaluation capability and risk management capability impact delivery performance. The variability in delivery performance can be ascribed to either suppliers-specific criteria or non-suppliers specific criteria such as uncertainties in the distribution or production schedules (Talluri, Narasimhan, and Nair, 2006). Thus by selecting these two capabilities, I address both how the capabilities may improve delivery performance by addressing both supply-base specific and supply-base non-specific variability in delivery performance. Supplier evaluations are commonly believed to increase supplier performance (Tracey and Tan, 2001 p. 175). The ability to perform supplier evaluations may influence the level of performance of suppliers and consequently impact the performance of the firms supply base resource. Risk management reduces the consequences and likelihood of disturbances in the supply chain that could lead to decreased delivery performance. Recall that Teece, Pisano and Shuen’s (1997) definition of dynamic capabilities address the firm’s ability to reconfigure internal as well as external competences to face changing environments. In this paper, technological and demand uncertainty are chosen to represent the volatility of the environment. These variables are commonly used to assess environmental volatility in a supply chain context, cf. Davis (1993).
Conceptual framework and hypotheses development

Figure 1: Research framework

Delivery performance

There is no clear-cut definition of delivery performance. Some authors agree that delivery performance is reflected by the dimensions speed and reliability (e.g. Milgate, 2001; Vachon and Klassen, 2002), others propose that it is reflected by speed and dependability (e.g. Das and Narasimhan, 2001), some emphasize the timeliness of deliveries from suppliers (e.g. Gunasekaran, Patel, and Tirtiroglu, 2001). Others have argued that delivery is not a performance metric, but should rather be viewed as a capability (e.g. Fawcett, Calantone, and Smith, 1997). Even more widespread is the inclusion of delivery performance measures in aggregated constructs such as supplier operational performance (e.g. Cousins and Menguc, 2006), supplier responsiveness (e.g. Carr and Smeltzer, 2000) or purchasing performance (e.g. Sánchez-Rodríguez, Martinez-Lorente, and Clavel, 2003; Sánchez-Rodríguez et al., 2006). In this paper, delivery performance reflects the ability of a focal firm’s suppliers to consistently deliver on
time. Increased delivery performance has been linked to increased performance on a number of dimensions. Cousin and Menguc (2006) view delivery performance as a subset of supplier operational performance. Supplier operational performance consists of delivery performance and efficient communication of customer needs (Cousins and Menguc, 2006 p. 609). The authors find that supplier operational performance improves the buyer’s perceived level of the supplier’s contractual performance. Sánchez-Rodríguez et al. (2006) similarly include on-time delivery performance in their measure of purchasing performance along with cost, quality, and inventory criteria. These authors find that purchasing performance has a significant impact on overall business performance. Sánchez-Rodríguez, Martinez-Lorente, and Clavel (2003) also provide evidence for a positive and significant impact of purchasing performance (including delivery) on business performance. Carr and Smeltzer (2000) include material delivery in their concept of supplier responsiveness. Supplier responsiveness is defined as the “willingness of suppliers to meet the needs of the buying firm” (Carr and Smeltzer, 2000 p. 41) and is measured by material quality, material delivery, price/cost reductions, and volume flexibility. Carr and Smeltzer’s (2000) model explores the relationship between skills and strategic purchasing, firm performance and supplier responsiveness. Despite not formulating a theory to support the relationship, the authors find that supplier responsiveness is positively correlated with firm performance. In their study, firm performance is measured using both strategic and financial performance measures. Decreased delivery performance has also been argued to have a negative impact on responsiveness and increase inventory costs (Milgate, 2001). Early deliveries create excess inventory and increase holding costs, and late deliveries lead to production
breakdown (Guiffrida and Nagi, 2006). Therefore, untimely deliveries impact the financial performance of the firm, because resources are being consumed to cope with the untimely deliveries. Increased competition will put pressure on supply chains to become more efficient. Timely deliveries improve time-to-market for products and increase the firm’s responsiveness and flexibility when facing changes in demand – for example by being able to meet orders for new products faster than competitors and by being able to meet increased demand without delays caused by suppliers. This makes delivery performance an important performance metric to ensure sustained competitive advantages.

**Supplier evaluation capability**

Supplier evaluation capability refers to the ability to make evaluations of the firm’s suppliers and to use this evaluation. The ability to effectively evaluate suppliers is believed to increase supplier performance (Tracey and Tan, 2001 p. 175). Aspects of supplier evaluation and selection has been studied extensively in the PSM literature (e.g. Inemek and Tuna, 2009; Prahinski and Benton, 2004; Teng and Jaramillo, 2005; Tracey and Tan, 2001; Van Der Rhee, Verma, and Plaschka, 2009; Vonderembse and Tracey, 1999), and delivery has been shown to consistently be amongst the most important criteria across the literature focusing on supplier evaluation and selection (Weber, Current, and Benton, 1991 p. 12). Supplier evaluation seldom has been studied as a distinct purchasing capability. For example, Oh and Rhee (2008) use the term supplier evaluation/selection capability, but does not define it. Evaluation capability in a
broad sense has been defined as an “ability to conduct an effective evaluation” (McDonald, Rogers, and Kefford, 2003; Milstein and Cotton, 2000; Preskill and Boyle, 2008). It is also sometimes referred to as evaluation capacity (e.g. Naccarella et al., 2007; Nielsen, Lemire, and Skov, 2011). Evaluation capacity has been defined as the “extent to which an organization has the necessary resources and motivation to conduct, analyze, and use evaluations” (Gibbs et al., 2002 p. 261).

Delivery performance has often been a part of composite measures in the research on evaluation and selection of suppliers. For example Modi and Mabert (2007) find that supplier evaluation and certification are the most important supplier development prerequisites before visiting and training suppliers to improve performance. Supplier evaluation is positively associated with knowledge-transfer activities, which are found to improve supplier performance. Supplier performance is reflected by the components quality, delivery, cost, inventory and design. Vonderembse and Tracey (1999) also find that supplier selection criteria are positively correlated with supplier performance, which is a composite measure involving on-time delivery performance from suppliers (Vonderembse and Tracey, 1999). Watts and Hahn (1993) find that delivery performance was the second most important objective of supplier development efforts (Watts and Hahn, 1993). They argue that evaluations are an important aspect of supplier development programs. Inemek and Tuna (2009) did a study on supplier evaluations from the perspective of the supplier. They found that a buyer’s supplier evaluation and selection strategy are related to the long-term operational performance of the supplier.
Operational performance is reflected by amongst others on-time delivery and delivery lead times.

Effective supplier evaluation increases the likelihood that the firm ends up with the best possible suppliers (Vokurka, Choobineh, and Vadi, 1996) and thereby maximizes the chances of a successful relationship with the chosen suppliers. Very often, supplier evaluations will lead to the buying firm choosing a supplier that is not currently representing a significant amount of business for them. Thus, choosing this supplier will effectively alter the buying firm’s supply base (Vokurka, Choobineh, and Vadi, 1996). Supplier evaluation capability enables the buyer to discover weaknesses that could cause performance issues later, such as for example insufficient production capacity, which could result in delayed deliveries. The buying firm is then able to take precautionary actions and plan accordingly to avoid excessive costs. Moreover, supplier evaluations help ensure that the capabilities of the suppliers meet the long term needs and expectations of the buying firm. Having the ability to evaluate suppliers is a prerequisite for being able to convey areas that the chosen supplier needs to improve upon. Thus supplier evaluation capability affects delivery performance through communication with suppliers (e.g. Prahinski and Benton, 2004). Based on the preceding sections, I propose the following hypothesis:

*Hypothesis 1: Supplier evaluation capability has a positive effect on delivery performance.*
Risk management capability

Risk management capability refers to the ability to identify, assess, and manage risks related to supply chain disruptions. Risk management capability has been defined as a firm’s “ability to properly and systematically address arising issues while taking into account possible risk factors, constraints and magnitudes of risks” (Zou, Chen, and Chan, 2010 p. 855) or as a “capability to assess and manage the trade-offs between supply security, quality, cost, and long term network” (Alinaghian, 2012 p. 31). Pettit, Fiksel, and Croxton (2010) define supply chain capabilities as “attributes that enable an enterprise to anticipate and overcome disruptions” (Pettit, Fiksel, and Croxton, 2010 p. 6). Jüttner, Peck, and Christopher (2003) outline four aspects of risk management: assessing the risks sources, defining the risk concept and consequences, and identifying drivers and mitigating risks (Jüttner, Peck, and Christopher, 2003 p. 208). In a more recent paper they define supply chain risk management as “the identification and management of risks for the supply chain, through a co-ordinated approach amongst supply chain members, to reduce supply chain vulnerability as a whole” (Jüttner, 2005 p. 124). Elkins et al. (2007) note that risk management capability in a procurement context consists of: screening and monitoring, detailing disruption awareness of critical suppliers, estimating expected costs of disruptions, and requiring timely information for suppliers. Zou, Chen, and Chan (2010) propose that risk management capabilities are composed of the management (people and leadership), risk culture, ability to identify risks, ability to analyze risks, and development and application of standardized risk management processes (Zou, Chen, and Chan, 2010 p. 854). Shoult (2003) outlines 3 dimensions of risk management capability maturity.
prepare for risk management, identify and analyze risks, and mitigate risks. While these definitions span in scope from the capability of a single actor to the capabilities (or activities) of an entire chain, they emphasize the ability to offset risks by identifying, managing and mitigating risks. Ritchie and Brindley (2007) decomposes risk management into the following activities: assessment of consequences and alternative responses; acceptance, mitigation or avoidance of risks; and monitoring (Ritchie and Brindley, 2007 p. 1404).

Jüttner (2005) notes that risk management is often done on an ad-hoc basis as the firm go along (Jüttner, 2005 p. 133), because of lack of top management support. This suggests that firms may not develop high levels of risk management capability, but that supply risk management is sought through the use of lower-level capabilities or even as mentioned ad-hoc problem solving. However, as Förstl et al. (2011) note, firms that adopt and invest in supply risk management strategies will perform better than firms that do not pursue active management of supply risk (Förstl et al., 2011). Ritchie and Brindley (2007) suggest that risk management exists as a very fragmented process (Ritchie and Brindley, 2007 p. 1410). They conclude that management of risks is composed of the following activities: identification of risk drivers, measurements of the consequences in terms of scale and likelihood, assessment of alternative responses, an active or proactive acceptance of risks, mitigation, avoidance and finally monitoring and reviewing risks (Ritchie and Brindley, 2007 p. 1404).

Disruptions as a consequence of supply chain risks have a direct effect on firms’ ability to continue operations and serve clients (Jüttner, Peck, and Christopher, 2003 p. 201). The ability
of purchasing managers to take preventive actions reduces the frequency of disturbances (Svensson, 2000) thereby improving delivery performance. The ability to effectively respond to adverse events is critical to firms’ competitiveness and long-term success (Bode et al., 2011). Risk management capabilities help firms avoid, reduce and absorb the consequences of supply chain disruptions (Pettit, Fiksel, and Croxton, 2010) improving the resilience of the supply chain and enabling it to withstand disruptions, for example in relation to delivery disruptions. Wieland and Wallenburg (2012) measure supply chain risk management as the identification, assessment, monitoring and management of risk. The authors find that supply chain risk management significantly increases the agility and robustness of the supply chain. Agility is related to delivery performance because it reflects reliability and responsiveness (Wieland and Wallenburg, 2012 p. 904). Through improved agility and robustness, the supply chain is able to deliver improved customer value and business performance. Based on the theoretical arguments presented in the preceding section, I suggest the following hypothesis:

Hypothesis 2: Risk management capability has a positive effect on delivery performance.

Environmental uncertainty and moderation effects

The environment is considered a critical contingency in organizational theory and strategic management (Child, 1972; Lumpkin and Dess, 2001). Davis (1993) proposed that there are three different sources of environmental uncertainty (Davis, 1993) that affect effective supply chain management: demand, supply and technological uncertainty. Further, similar environmental
variables have been shown to have a direct impact on delivery performance as a strategic priority for firms (e.g. Amoako-Gyampah and Boye, 2001; Ward et al., 1995), i.e. higher levels of environmental uncertainty increase firms’ propensity to view delivery performance as a strategic priority.

Proponents of the dynamic capability view have highlighted the need to develop and renew competences to achieve congruence with the changing business environment (Teece, Pisano, and Shuen, 1997). Some authors have argued that the level of dynamism in the market determines the composition of capabilities from constituting *detailed routines with predictable outcomes* in moderately dynamic markets to *experimental routines with unpredictable outcomes* in high velocity markets (Eisenhardt and Martin, 2000). Others contend that market dynamism is an antecedent of dynamic capabilities driving their development (Wang and Ahmed, 2007). Market dynamism reflects a number of factors such as technological innovation, competitive nature etc. and is sometimes equated with uncertainty (e.g. Aragon-Correa and Sharma, 2003 p. 76). Aragón-Correa and Sharma (2003) proposed that environmental variables including uncertainty moderate the relationship between the capabilities they refer to as proactive corporate environment strategy and competitive advantages. Winter (2003) argues that in relatively stable environments, ad-hoc problem solving carries lower cost than developing capabilities, and thus the value of having a certain set of capabilities depends on the volatility of the market. Capabilities are simply not comparatively better than ad-hoc problem solving in stable markets. When changes are introduced in the environment, having capabilities that are superior to the competition is what determines competitive advantages. Environmental
uncertainty requires that firms are able to respond more rapidly to changes (Desarbo et al., 2005).

Based on the preceding discussion, it is not clear to what extent environmental uncertainty is an antecedent variable or a moderation variable when looking at capabilities and their performance outcomes. Looking at environmental uncertainty in a supply chain context, Fynes, de Búrca, and Marshall (2004) examines the moderating effects of uncertainty on the relationship between supply chain relationship quality and supply chain performance. Based on resource dependence theory the authors argue that firms establish relationships as a strategic response to uncertainty, and as a consequence expect that the factors reflecting supply relationship quality have a greater impact on supply chain performance when uncertainty is high. They argue that higher uncertainty will strengthen the relationship between relationship quality and supply chain performance. Supply chain performance is reflected by amongst others delivery dependability. Fynes, de Búrca, and Marshall (2004) find that demand uncertainty strengthens the relationship, whereas the effects of technological uncertainty cannot be supported. Grewal and Tanushaj (2001) examined the effect of uncertainty on organizational capabilities in managing crisis by looking at market orientation and strategic flexibility. They argue that technological and demand uncertainty weakens the relationship between organizational capabilities and performance after crisis. In their analysis, they find that demand and technological uncertainty are negative moderators of the relationship between strategic flexibility and performance, but strengthen the relationship between market orientation and performance. From these two studies in diverse contexts, it is empirically unclear to what extent
uncertainty weakens or strengthens the relationship between capabilities and performance because the effects have been proposed differently depending on the context and the capabilities studied. With respect to delivery performance, environmental uncertainty has been explored only to some extent. Milgate (2001) did an exploratory study where he examined the impact of supply uncertainty and the technological intricacy of the product on lead and throughput times in the supply chain. He found that technological intricacy had no significant relationship with either dimension of delivery performance. Boon-itt and Wong (2011) explored the moderating effects of technological and demand uncertainty on the relationship between supplier, customer and internal integration and outbound delivery performance, and found significant effects with respect to both supplier and internal integration. Hoffmann, Schiele, and Krabbendam (2013) examined the effect of environmental uncertainty on supply risk management process maturity. The define supply risk management process maturity as a capability to manage risks (Hoffmann, Schiele, and Krabbendam, 2013 p. 202). The authors find a significant relationship between supply risk management process maturity and supply risk management performance (minimizing frequency and magnitude of disturbances), and also find that there is a significant moderating effect of environmental uncertainty on the relationship between risk management process maturity and supply risk management performance. In other words, increased levels of uncertainty increase the value of having the risk management process maturity capability with respect to supply risk management performance.

To sum up, capability theory suggests that dynamism in the market may attenuate the need for firms to develop capabilities to deal with uncertainty. Further, extant research suggests a link
between purchasing related capabilities and various performance outcomes. The analogous argument follows that the effect of having and deploying purchasing capabilities increases as the level of environmental uncertainty increases. In this case, the underlying theory proposes a contingency perspective - i.e. the relationship between the predictor variables and the dependent variable hinges on some third variable, the moderator. This leads to invoking a theory of fit as moderation (Venkatraman, 1989 p. 424). In other words, environmental uncertainty exhibits moderating effects on purchasing capabilities in relation to performance.

In the following I focus on two of the environmental constructs proposed by Davis (1993), namely demand uncertainty and technological uncertainty and their moderating effects on the risk management and supplier evaluation capabilities. In the two following subsections, I develop the hypotheses related to each of the environmental variables by using capability-based theory and a base of literature on purchasing and supply management.

Demand uncertainty

Demand uncertainty is the unknown and unpredictable variation in demand (Fynes, de Búrca, and Marshall, 2004). When firms are unable to accurately forecast the demand for supply requirements and production schedules, they are less likely to ensure that goods arrive in a timely manner and in the appropriate quantities needed as input for production. In this way, demand uncertainty creates problems in planning, scheduling and control that jeopardize delivery performance (Milgate, 2001). When viewed through a supply chain lens, uncertainty
may amplify problems that can cascade throughout the supply chain. Milgate (2001) proposes that delivery speed and reliability worsens as uncertainty increases, analogous to how uncertainty has similar effects within a manufacturing plant. Demand uncertainty impacts the knowledge available to purchasing managers and reduce the precision with which purchasing can plan and control the flow of deliveries. In many cases, firms rely on anticipated demands to overcome long lead times from suppliers (Davis, 1993 p. 39), which amplifies the effects of increased demand uncertainty. In the case of increased demand uncertainty, anticipating demands will become increasingly harder for the focal firm. This uncertainty impacts the focal firm’s supply base because they, too, will be less likely to anticipate the needs of the buying firm because of distortion of demand information (Lee, Padmanabhan, and Whang, 1997). As a consequence they will be less able to tailor their production processes to serve the buying firm, and this may lead to delivery failures. High levels of demand uncertainty may cause customers to suddenly place orders twice the typical order size and lead to poor delivery performance (Boon-Itt and Wong, 2011 p. 258). I propose the following hypothesis:

*Hypothesis 3: Demand uncertainty has a negative effect on delivery performance.*
Supplier evaluation capability allows firms to measure, track, and evaluate supplier performance. Tracking each supplier’s performance over time is valuable because it helps ensure that the production line runs reliably (Davis, 1993). Based on tracked supplier performance, a firm may choose to substitute or initiate changes in their supplier base to ensure undisrupted flow of goods for production. Supplier evaluation capability enables firms to improve upon the supply base to ensure that the firms’ suppliers are the best possible. Given higher demand uncertainty, the ability to evaluate suppliers becomes increasingly critical because increased levels of demand uncertainty impact the criteria on which a firm bases its choice of suppliers. For example, in a perfectly stable environment where demand is easy to forecast, a buying firm may choose its suppliers based on price. When demand uncertainty increases, flexibility of suppliers may become an increasingly important criterion. Flexibility is harder to evaluate than price because of the type of knowledge it requires, thus making supplier evaluation capability more critical. Increasing complexity has led to an emphasis on the buyer selecting the ‘right’ suppliers and systematically evaluating their performance (Pressey, Winklhofer, and Tzokas, 2009). As market conditions change, a decision to choose a specific supplier that may have made perfect sense in the past, may need to be resolved differently (Vokurka, Choobineh, and Vadi, 1996 p. 108). For example, if demand increases dramatically, the chosen suppliers may not be able to fulfill the quota needed for production. Thus, as demand uncertainty increases, the need for a supplier evaluation capability is attenuated. In certain and stable environments, firms may achieve higher delivery performance simply by doing business on an ad-hoc basis rather than by developing and deploying capabilities to
improve performance. Therefore, given stable demand, firms with superior supplier evaluation capabilities may not have competitive advantages over firms without this capability. In other words, supplier evaluation capability is more strongly related to delivery performance under conditions of volatile demand than stable demand. This leads to the following hypothesis:

**Hypothesis 3a:** The greater the demand uncertainty, the stronger the relationship between supplier evaluation capability and delivery performance.

A firm’s risk management capability allows the firm to identify, assess, and manage risks related to disruptions. Demand uncertainty fuels supply chain risks such as forecast errors (Chopra and Sodhi, 2004). Managing risks is harder when there is little ability to predict supply risks (Hoffmann, Schiele, and Krabbendam, 2013 p. 201), and thus firms cannot rely on ad-hoc problem solving, but must develop and deploy capabilities to deal with increased levels of risks. Risk management capability improves delivery performance by mitigating risks that would otherwise cause disruptions of flow of goods for production. When uncertainty increases, the relationship between risk management capability and delivery performance is attenuated. If uncertainty is sparse enough, firms who use ad-hoc risk management and firms with risk management capability may have equal benefits. However ad-hoc risk management will have lower carrying costs than developing higher levels of risk management capability than competitors. However, as uncertainty increases, firms with risk management capability will fare better, thus suggesting that the more uncertain demand becomes, the more critical this
capability also becomes. I suggest that the effect of supply risk management capability on delivery performance increase under higher levels of demand uncertainty. In other words, the interaction effect between demand uncertainty and risk management capabilities is positive. As mentioned earlier in the paper, a recent study by Hoffmann, Schiele, and Krabbendam (2013) found positive interaction effects between environmental uncertainty and risk management process maturity on supply risk management performance (including delivery performance). Derived from the discussion above, I present the following hypothesis:

*Hypothesis 3b: The greater demand uncertainty, the stronger the relationship between risk management capability and delivery performance.*

**Technological uncertainty**

Technological uncertainty can be equated with the rate of technological change (Fynes, de Búrca, and Marshall, 2004) and is a part of environmental dynamism. Increasing environmental dynamism has been linked to increased emphasis on delivery performance as a competitive priority (Ward et al., 1995). This suggests that firms who operate in highly dynamic environments choose a strategy that emphasizes delivery performance. This in itself may suggest that increased levels of technological uncertainty may in fact be positively related to delivery performance, because emphasizing delivery performance as a strategic priority in itself could lead to increased levels of performance as the firm pursues this objective. However, in rapidly changing environments, firms are often caught by surprise. This makes it more likely for
renegotiations of contracts to happen, which is likely to induce problems in relation to delays and supplier opportunism (Hoffmann, Schiele, and Krabbendam, 2013 p. 201). Truly innovative products often rely on emerging technologies (Fynes, de Búrca, and Marshall, 2004 p. 183), of which both the focal firm and the supplier may have no or very limited knowledge. This may harm delivery performance if firms are not able to communicate quickly to accommodate changes in the diffusion stage. When technological uncertainty leads to increased complexity of products, it may hurt delivery performance through delays (Boon-Itt and Wong, 2011; Oh and Rhee, 2008) and worsen delivery speed (Milgate, 2001). Some evidence also suggests that there may not be a negative relationship between technological uncertainty and delivery performance. Despite proposing that technological uncertainty leads to diminished outcomes and negatively impacts cycle time results, Ragatz, Handfield, and Petersen (2002) does not find technological uncertainty to impact cycle time. In this paper, I propose the following hypothesis:

*Hypothesis 4: Technological uncertainty has a negative effect on delivery performance.*

Rapidly changing technologies make it difficult for buyers to evaluate a supplier’s performance and predict future problems in deliveries (Giunipero and Eltantawy, 2004). For example, a manufacturer of central heating equipment who is experiencing that the technology is moving from mechanical thermostats to electronically controlled components will experience that his ability to evaluate suppliers in the changing market becomes relatively more important, because the changes caused by technological shifts make it increasingly difficult to rely on the usual way
of evaluating and selecting suppliers due to changes in supplies/products. Technological uncertainty impacts on the technology of firms’ inputs in the shape of products and components, which increases the complexity of the supplier evaluation task. Exogenous change calls for developing higher order of capabilities (Winter, 2003). Because firms are unfamiliar with the new product and component technologies as well as unfamiliar with possible new suppliers, this puts increased demand on firms’ supplier evaluation capability. If technology changes rapidly, the need to develop and exercise the supplier evaluation capability increases. In other words, superior or higher order supplier evaluation capabilities will have increased effect under technological uncertainty, and thus I propose the following:

Hypothesis 4a: The greater technological uncertainty, the stronger the relationship between supplier evaluation capability and delivery performance.

As technological uncertainty increases, firms’ capabilities are limited because of increased novelty and lack of perfect information (Paulraj and Chen, 2007). When technological uncertainty is low, shelf-life of components and products are typically longer. In situations of low technological uncertainty, buying firms do not have to worry about inventory becoming technologically obsolete at a high rate, providing suppliers and firms with the possibility of simply holding inventory to mitigate disruptions in the supply chain (Chopra and Sodhi, 2004). However, when technological uncertainty increases it limits the ways in which firms can cost-
effectively manage and mitigate risk. Thus, the competency to address risk in the supply chain becomes relatively more important to ensure undisrupted deliveries.

Technological uncertainty indicates that the supply process is evolving and that the supply base may be less well established (Lee, 2002 p. 107). Evolving supply processes are more susceptible to breakdowns and unreliable suppliers. Because of a less well established process, the buying firms have less experience to rely on in terms of mitigating risks, emphasizing the need for supply risk management competence. In fact, Lee (2002) suggests that in the face of evolving supply processes, companies should focus on establishing a risk-hedging supply chain, thus emphasizing the need for supply risk management capability. Based on the preceding section, I present the following hypothesis:

_Hypothesis 4b: The greater technological uncertainty, the stronger the relationship between risk management capability and delivery performance._

**Data and methodology**

**Data collection**

Two survey questionnaires were used to collect data for this study. The first questionnaire collected data on the capabilities studied in this paper. The second questionnaire collected data on the environmental moderator variables, demand uncertainty and technological uncertainty as well as the dependent variable, delivery performance. A first draft of the questionnaires was
prepared. The questionnaires were pre-tested with a group of three academics and three practitioners. A number of modifications were made including clarifying the language and adding extra response items. The final questionnaires were composed in SurveyXact, which is an online survey administration tool.

Data was collected from two temporally separate rounds of data collection using two independent respondents. The first questionnaire was targeted at the purchasing responsible in each of the firms. The second questionnaire was targeted at the production responsible in each of the firms.

The first round of data was collected between October 2011 and January 2012. A telemarketing company was enlisted to call each company in the sample and identify the intended respondent via telephone. The company was instructed to identify the purchasing responsible in each firm. After the purchasing responsible had agreed to participate, the respondent would receive an e-mail within twenty-four hours with a link to fill out the self-administered online questionnaire. Two reminder emails were sent out to respondents who had not completed the questionnaire. These emails were sent out after one and three weeks of not responding to the initial email. A composite summary of results was offered to the purchasing responsible to entice participation.

The second round of data collection was initiated in January 2012 and completed in March 2012. Only firms in which a purchasing respondent had replied to the first questionnaire were invited to participate in this round of data collection. The telemarketing company was
instructed to identify the production responsible. The invitation and reminder procedures were the same as for the first survey.

Sample and response rate

Data was collected from Danish manufacturing firms. Firms were identified using Experian, a nation-wide data base of all publicly registered companies in Denmark. Secondary data was obtained from the database (age, size of firm and industry codes). 870 manufacturing firms were identified in the database according to the following selection rules: More than 50 employees, located in one of the five Danish regions and belonging to the manufacturing industry category C in the Danish NACE codes (Nomenclature Générale des Activités Économiques dans les Communautés Européennes).

The final sample consists of responses from 214 firms, which represents a response rate of 24.6% of the original sample. In supply chain research response rates below 20% are not uncommon (Trent, 2004). The final response rate is very satisfactory, especially considering that a multiple-informant design was used. Only 197 firms were included in the analysis because the control variables had missing values for some of the cases.

The participating manufacturing firms came from 20 different manufacturing industry groups in the Danish NACE codes between 10 and 33. These groups are: food manufacturing industry; drinks; textiles; clothing; tree, cork and straw (excl. furniture); paper; prints and media; chemical products; rubber and plastic; other non-metal minerals; metal; iron and metal (excl. 181
machinery); computers, electronics and optics; electrical equipment; machinery and equipment; motor vehicles; other transportation vehicles; furniture; miscellaneous manufacturing industries; and repair and installation of machinery and equipment.

Theoretical constructs and measurement items
Supplier evaluation and risk management were measured using a scale adopted from Vorhies and Morgan (2005) in the form of a five-point likert scale from “Much worse than our competitors” to “much better than our competitors”. Given the lack of a comprehensive body of literature on purchasing capabilities, the items to represent purchasing capabilities were drawn from a broader base of literature on purchasing and supply management. Items for supplier evaluation capability were based on Pressey, Winkelhofer, and Tzokas (2009) and Carr and Pearson (1999). Risk management capability was measured using items based on Ritchie and Brindley’s (2007) framework.

The dependent variable delivery performance and the environmental variables technological and demand uncertainty were measured using a standard 5 point likert scale from “Very much agree” to “Very much disagree”. Items reflecting demand uncertainty were adopted from Fynes, de Búrca, and Marshall (2004) and Paulraj and Chen (2007). Items reflecting technological uncertainty were adopted from Paulraj and Chen (2007). Items reflecting delivery performance were inspired by Sánchez-Rodríguez et al. (2006) and additional items were added. The construct delivery performance reflects the performance of the entire supply base. Capabilities
impact the organizational or functional level performance (Salvato and Rerup, 2011) for example through changing the resource base, the underlying capabilities, operating routines or a combination thereof (Barreto, 2010 p. 270), i.e. the supply base of the firm. The aggregated supply base has the ability to positively or negatively impact delivery performance (Monczka, Trent, and Callahan, 1993 p. 43).

*Control variables*

In addition to survey data on the capabilities, secondary data on each of the firms in the sample was also collected. The NACE industry codes were collected for each of the firms in the sample. This allowed controlling for industry specific effects that may influence strategic choices (Ward et al., 1995), as for example which capabilities to develop, and they may also influence performance levels (Ward et al., 1995). Industry effects may also impact firms because of the relative importance of purchasing in different industries due to different levels of relative purchasing expenditure (cf. Weber, Current, and Benton, 1991 p. 3). Further, age and size of the firm were also obtained from the database. The age of the firm was calculated by subtracting the year the firm was established from the present year (2013). Size was measured using the number of employees in the firm. Bigger firms may have more resources (e.g. human and financial) to develop their capabilities than smaller firms (Hoffmann, Schiele, and Krabbendam, 2013 p. 203). In a similar vein, older firms may have acquired more experience that could impact the level of their capabilities in the snapshot represented by the survey data.
The survey methodology made it possible to obtain measures from independent respondents to address common method variance concerns (c.f. Podsakoff and Organ, 1986; Podsakoff et al., 2003). Despite a number of obvious benefits, researchers have used multiple-respondent surveys only to a very limited extent (Kumar, Stern, and Anderson, 1993). Employing different respondents for the dependent and independent variables is the best way to address the concerns of common method bias (Podsakoff and Organ, 1986; Podsakoff et al., 2003). Common method variance may increase the likelihood of discovering significant relationships between variables that are not actually there because of the shared variance amongst constructs that is attributable to the measurement method rather than the underlying theoretical constructs and relationships represented in the model. Common method bias is caused by different things related to method effects such as rater effects, item characteristic effects, item or measurement context effects (Podsakoff et al., 2003). By using data from independent respondents, the researcher has an effective method of handling all these sources of common method bias at the same time. Further, multiple informants increases the reliability and validity of reports (Bagozzi, Yi, and Phillips, 1991; Kumar, Stern, and Anderson, 1993) and decrease the subjectivity in responses, and thus provide a more accurate view of the organization as a whole. Thus, using a multiple respondent survey design also increase external validity as called for by Zheng et al. (2007 p. 77).
**Analysis and results**

All analyses were carried out in SPSS 20 (Statistical Package for the Social Sciences) and AMOS Graphics 21 (Analysis of Moment Structures). Hypotheses were tested using linear regression with the hierarchical variable entry method.

**Non-response bias**

Before running the analysis, independent sample t-tests were conducted to assess the impact of non-response bias. Age and size of the firms who participated in the survey were compared between respondents and non-respondents. Levene’s test showed statistically significant differences in variances with respect to size for the two groups. The t-tests revealed a significant difference in means for size (number of employees) between respondents (µ=199, sd=14.2) and non-respondents (µ=697, sd=28.5). The mean age of the firms were not statistically different across the participating firms (µ=49.9, sd=32.5) and the non-respondents (µ=46.1, sd=34.4). This suggests caution in generalizing findings to the population sample, as the firms in the analysis are smaller than in the population sample.

**Confirmatory factor analysis**

The items included in the final model are available in Table 1 on the subsequent page. The adequacy of the model was determined using the three standard approaches: $\chi^2$, RMSEA and CFI. According to Hair (2006), the conventional cut-off points for models of similar size (214
observations, 16 observed variables) are: CFI>.95 and RMSEA<.08. The $\chi^2$ statistic was 151.426 (df=94, p=.000). The model achieved: RMSEA=.054 and CFI=.960 and thus the goodness-of-fit measures were deemed adequate.

All factor-loadings of the individual items were significantly associated with their corresponding measurement construct (p<.0001) suggesting convergent validity. The loadings ranged from .654-.942 (see Table 1 on the following page). Scale-reliabilities were above the minimum cut-off point of .5 and were close to or exceeding the ideal cut-off point of .7 (Hair et al., 2006 p. 777). Convergent validity was assessed by computing the average variance extracted (AVE) for all constructs. The minimum AVE was .521 supporting convergent validity. Discriminant validity was assessed using the Fornell and Larcker (1981) approach by comparing the AVE for each construct with the shared variance between the constructs (Hair et al., 2006 p. 777). The model showed no concerns in relation to discriminant validity. Overall, the measurement model showed adequate fit to the data.
Table 1: Measurement constructs and items

<table>
<thead>
<tr>
<th>Item</th>
<th>α</th>
<th>AVE</th>
<th>λ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier evaluation capability</td>
<td>.81</td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>SUP1: Formulate specific goals for supplier performance</td>
<td></td>
<td></td>
<td>.68</td>
</tr>
<tr>
<td>SUP2: Use forms or documented procedures to evaluate suppliers</td>
<td></td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>SUP3: Measure the performance of our suppliers</td>
<td></td>
<td></td>
<td>.85</td>
</tr>
<tr>
<td>Risk management capability</td>
<td>.81</td>
<td>.52</td>
<td></td>
</tr>
<tr>
<td>RIS1: Identify potential risks in our procurement (i.e. delays,</td>
<td></td>
<td></td>
<td>.66</td>
</tr>
<tr>
<td>supplier failures, delivery failures)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIS2: Estimate the likelihood of incurring procurement related risk</td>
<td></td>
<td></td>
<td>.65</td>
</tr>
<tr>
<td>RIS3: Mitigate potential risks that could happen to us</td>
<td></td>
<td></td>
<td>.75</td>
</tr>
<tr>
<td>RIS4: Survey the possible risk-scenarios in purchasing</td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>Demand uncertainty</td>
<td>.89</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>DEM1: Our demand fluctuates drastically from week to week</td>
<td></td>
<td></td>
<td>.94</td>
</tr>
<tr>
<td>DEM2: Our supply requirements vary drastically from week to week</td>
<td></td>
<td></td>
<td>.90</td>
</tr>
<tr>
<td>DEM3: It is difficult to predict our demand</td>
<td></td>
<td></td>
<td>.72</td>
</tr>
<tr>
<td>Technological uncertainty</td>
<td>.80</td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td>TEC1: The technology in our industry is changing rapidly.</td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>TEC2: It is very difficult to forecast where the technology in our</td>
<td></td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>industry will be in 3–5 years.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEC3: Our industry is characterized by rapidly changing technology</td>
<td></td>
<td></td>
<td>.72</td>
</tr>
<tr>
<td>Delivery performance</td>
<td>.80</td>
<td>.58</td>
<td></td>
</tr>
<tr>
<td>DEL1: We receive our orders on time</td>
<td></td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>DEL2: All materials and components arrive within the delivery date</td>
<td></td>
<td></td>
<td>.72</td>
</tr>
<tr>
<td>DEL3: The delivery time on goods ordered from suppliers is always</td>
<td></td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>satisfactory</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

α refers to scale reliabilities; AVE refers to average variance extracted; λ refers to the standardized factor loading. All factor loadings are significant at p<.001 (two-tailed).

Hypotheses testing

Regression analysis was used to test the eight hypotheses. Based on the factor loadings from the measurement model (see Table 1 above), new variables were created to represent each of the constructs using the weights (λ) reported. These variables were subsequently used in the regression analysis. Each of the variables was standardized prior to regression analysis to preempt effects of multicollinearity. In addition to standardizing the survey variables, the control variables size and age were logarithmically transformed.
Using the hierarchical entry method, the hypotheses were tested in three steps. First, only the control variables were entered into the model. Second, the direct effects were entered into the model. Third, the interaction product terms were entered into the model to test the moderation hypotheses. In order to assess the robustness of findings across different industries, each model was also run using industry dummies to control for industry specific effects. In total, the analysis yielded 6 models. The machine manufacturing industry was used as the hold-out sample because it constituted the largest group (NACE industry code 28) in our sample.

<table>
<thead>
<tr>
<th>Table 2: Table of correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1 Age</td>
</tr>
<tr>
<td>2 Size</td>
</tr>
<tr>
<td>3 Supplier evaluation capability</td>
</tr>
<tr>
<td>4 Risk management capability</td>
</tr>
<tr>
<td>5 Demand uncertainty</td>
</tr>
<tr>
<td>6 Technological uncertainty</td>
</tr>
<tr>
<td>7 Delivery performance</td>
</tr>
</tbody>
</table>

*) correlation is significant at p<0.05 (2-tailed)
**) correlation is significant at p<0.01 (2-tailed)
n=197

The table of correlations is shown in Table 2 above. High correlations between predictor variables could cause problems if multicollinearity is present, causing the interpretation of the regression coefficients to be more difficult, i.e. making it impossible to estimate the unique variance explained by each predictor variable. To assess if multicollinearity was an issue in the analysis, I consulted the VIF (Variance Inflation Factor) values.
VIF values explain to what extent the standard errors have been inflated due to the presence of high collinearity between variables (Hair et al., 2006). VIF factors below 10 are generally considered acceptable (Hair et al., 2006 p. 230). In this analysis, the VIF was consistently below 1.82 suggesting that multicollinearity was not an issue in the analysis.

In the following, the hypotheses are evaluated in numerical order. First Hypotheses 1, 2, 3, and 4 are evaluated by looking at model 3 in Table 3 below.

### Table 3: Linear regression analysis

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.05</td>
<td>.06</td>
<td>.02</td>
<td>.01</td>
<td>.01</td>
<td>.01</td>
</tr>
<tr>
<td>(t=.63)</td>
<td>(t=.87)</td>
<td>(t=.19)</td>
<td>(t=.21)</td>
<td>(t=.17)</td>
<td>(t=.10)</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>-.09</td>
<td>-.08</td>
<td>-.13</td>
<td>-.11</td>
<td>-.14</td>
<td>-.11</td>
</tr>
<tr>
<td>(t=-1.21)</td>
<td>(t=-1.07)</td>
<td>(t=-1.52)</td>
<td>(t=-1.85)</td>
<td>(t=-1.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry dummies</td>
<td>Not included</td>
<td>Included</td>
<td>Not included</td>
<td>Included</td>
<td>Not included</td>
<td>Included</td>
</tr>
<tr>
<td>Supplier evaluation capability</td>
<td>- .18*</td>
<td>-.14*</td>
<td>-.18*</td>
<td>-.14*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(t=-2.25)</td>
<td>(t=-1.73)</td>
<td>(t=-2.20)</td>
<td>(t=-1.74)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk management capability</td>
<td>.21*</td>
<td>.18*</td>
<td>.21*</td>
<td>.18*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(t=2.60)</td>
<td>(t=2.38)</td>
<td>(t=2.53)</td>
<td>(t=2.30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand uncertainty</td>
<td>-.24**</td>
<td>-.25**</td>
<td>-.24**</td>
<td>-.26**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(t=-3.39)</td>
<td>(t=-3.44)</td>
<td>(t=-3.36)</td>
<td>(t=-3.59)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological uncertainty</td>
<td>-.04</td>
<td>.00</td>
<td>.05</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(t=-.60)</td>
<td>(t=.02)</td>
<td>(t=.64)</td>
<td>(t=-.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand uncertainty x</td>
<td>.09</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier evaluation capability</td>
<td>(t=1.08)</td>
<td></td>
<td>(t=1.34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand uncertainty x</td>
<td>.02</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk management capability</td>
<td>(t=.26)</td>
<td></td>
<td>(t=1.23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological uncertainty x</td>
<td>.01</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier evaluation capability</td>
<td>(t=.16)</td>
<td></td>
<td>(t=1.39)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological uncertainty x</td>
<td>.07</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk management capability</td>
<td>(t=.82)</td>
<td></td>
<td>(t=.49)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.008</td>
<td>.238</td>
<td>.100</td>
<td>.310</td>
<td>.110</td>
<td>.327</td>
</tr>
<tr>
<td>BIC</td>
<td>6.993</td>
<td>55.549</td>
<td>8.917</td>
<td>56.947</td>
<td>27.988</td>
<td>73.204</td>
</tr>
</tbody>
</table>

Two-tailed t-tests for hypothesized effects: * p < 0.10; * p < 0.05; ** p<0.01
Direct effects

Supplier evaluation capability had a significant and negative effect on delivery performance ($\beta=\text{-.18, } p<.05$). It was hypothesized that supplier evaluation capability would improve delivery performance and therefore Hypothesis 1 is not supported.

Risk management capability had a significant and positive effect on delivery performance ($\beta=\text{.21, } p<.05$) providing support for Hypothesis 2.

Demand uncertainty had a significant and negative effect on delivery performance ($\beta=\text{-.24, } p<.01$) providing support for Hypothesis 3.

Technological uncertainty had no significant effect on delivery performance ($\beta=\text{-.04, } p>.10$) failing to provide support for Hypothesis 4.

Interaction effects

Next, the moderation hypotheses were tested by entering the interaction terms into the model following the Baron and Kenny (1986) approach. Hypotheses 3a, 3b, 4a and 4b were evaluated by looking at Model 5 in Table 3 on the previous page.

The interaction effect between supplier evaluation capability and demand uncertainty has an insignificant effect on delivery performance ($\beta=\text{-.09, } p>.10$) failing to provide support for Hypothesis 3a.
The interaction effect between risk management capability and demand uncertainty has an insignificant effect on delivery performance ($\beta=.02$, $p>.10$) failing to provide support for Hypothesis 3b.

The interaction effect between supplier evaluation capability and technological uncertainty has an insignificant effect on delivery performance ($\beta=-.01$, $p>.10$) failing to provide support for Hypothesis 4a.

The interaction effect between risk management capability and technological uncertainty has an insignificant effect on delivery performance ($\beta=-.07$, $p>.10$) failing to provide support for Hypothesis 4b.

**Robustness test**

To assess the robustness of the findings from Models 3 and 5, the regression analyses were rerun with the 19 industry dummies. These results are available in Models 4 and 6, respectively. The $R^2$-coefficient in Model 2 shows that the industry dummies accounted for a great part of the variance in delivery performance when none of the explanatory variables were entered into the model. The industry dummies are excluded for all models in Table 3, but it should be noted that several of the industry dummies did indicate significant differences across industries. This indicates that the level of delivery performance to be expected from suppliers may depend on what industry you are competing in.
Model 4 shows that the direct effects of supplier evaluation capability, risk management capability, demand uncertainty, and technological uncertainty remained significant when industry dummies were included in the analysis. Thus, the findings in regards to Hypotheses 1, 2, 3 and 4 are robust across all model specifications shown in Table 3. Hypothesis 1 was also not supported when accounting for industry differences, but a change in confidence level occurs when industry dummies were included. This is indicated by a change in the significance level for supplier evaluation capability in Model 4 above ($\beta=-.14$, $p<.10$).

In model 6, again Hypothesis 1 is not supported and all moderation hypotheses remain insignificant. The coefficient of determination ($R^2$) increases only slightly when the interaction variables are included in the model, indicating that the moderation effects do not add significantly to the explanatory power of the model. Akaike’s Information criterion (AIC) and the Bayesian Information Criterion (BIC) are also included in Table 3. AIC and BIC penalize the model when additional variables that do not contribute to the explanatory power of the model are entered. Comparing AIC and BIC for the models specifying only direct effects (Model 3 and Model 4) and the full models (Model 4 and Model 6) including interaction effects, AIC and BIC indicate that the direct-effects model is a better explanatory model than the interaction-effects model.

In addition to the models presented in Table 3, I also ran regression analyses where only one interaction hypothesis was tested at a time. The findings were consistent with the full model
specification. The models consistently showed that none of the interaction effects were significant. For the sake of brevity only the full interaction models are shown here.

Further, I also inspected visual diagrams of the interaction effects. Interaction effects should be significant in order to justify visual interpretation (Dawson, 2014). Because the low sample size may cause type II errors – i.e. producing a false negative – by not identifying significant interaction effects that actually exist, I decided to visually inspect graphical representations of interaction effects anyway. The slope diagrams using the tools provided by based on the Aiken and West (1991) approach. The slope diagrams confirmed the findings from Table 3 for all interaction effects. One of the slope diagrams gave a small indication that there could be a difference in slope. This slope diagram is presented on the following page:
Discussion and conclusion

The paper is a part of a current stream of literature focusing on purchasing and supply management capabilities. Using a capability-based framework, it identifies two capabilities which are expected to contribute to delivery performance. This way the paper attempts to contribute to the PSM literature by answering a call for more theoretical integration (Hitt, 2011) and also answers a call to identify other antecedents of delivery performance (Fawcett, Calantone, and Smith, 1997). In the following I will discuss the results in relation to the eight hypotheses proposed in the paper.
According to Hypothesis 1, supplier evaluation capability has a positive effect on delivery performance. The analysis showed a negative relationship between supplier evaluation capability and delivery performance. This negative and significant effect was robust across all model specifications. Thus, Hypothesis 1 was rejected. Previous research suggests that the buying firm can improve suppliers’ performance by communicating or sharing evaluations with its suppliers (eg. Ellegaard, 2006; Prahinski and Benton, 2004). Inemek and Tuna (2009) show that supplier evaluation and selection criteria improve suppliers’ performance. Thus it is surprising that having superior supplier evaluation capabilities lead to decreased performance from the supply base. Supplier evaluation capability is composed of measuring and documenting suppliers’ performance. The goal is to ensure that the firm ends up with the best possible supplier. Using the evaluations derived from the focal firm’s supplier evaluation capability, the firm is able to take actions to ensure that only the best suppliers compose the firm’s supplier portfolio. It is possible that superior supplier evaluation capabilities increase the firm’s awareness on supplier performance compared to firms with lower levels of supplier evaluation capability simply because having a superior supplier evaluation capability makes the firm more susceptible to discover changes in the suppliers’ performance. This awareness, if diffused through the organization, offers a possible mechanism to explain why firms who report higher levels of supplier evaluation capability also report increased dissatisfaction with delivery performance. In other words, firms with a low supplier evaluation capability will be less aware of possible shortfalls on part of their suppliers, take fewer actions to rectify poor performance and experience a sub-par performance with respect to deliveries from their supply base.
An alternative explanation is that supplier evaluation capability is developed as a reaction to poor delivery performance. Bode et al. (2011) proposed a similar mechanism where disruptions (such as delays in incoming goods) affect the dissatisfaction with suppliers and arouse the motivation to act. In other words, poor delivery performance could motivate managers decision to build even stronger supplier evaluation capabilities. If this explains the significant negative relationship between supplier evaluation capability and delivery performance, it suggests a feedback loop between performance and the development of capabilities that calls for more attention from researchers.

Hypothesis 2 proposes a positive relationship between risk management capability and delivery performance. Risk management capability was found to significantly improve delivery performance as expected. It therefore corroborates previous research in that risk management capabilities reduce the frequency of disturbances (Svensson, 2000) and help reduce, avoid or absorb the consequences (Pettit, Fiksel, and Croxton, 2010) thereby improving delivery performance. Several authors have indicated a relative lack of research in the supply risk management area and have called for more empirical research that links supply risk management to performance (Rao and Goldsby, 2009; Sodhi, Son, and Tang, 2012; Thun and Hoenig, 2011; Wieland and Wallenburg, 2012). This paper therefore adds to this theoretical area, and further advances the literature by employing two-respondent methodology which links supply risk management capabilities to delivery performance and moves beyond speculations of common method variance.
Demand uncertainty was found to decrease delivery performance as proposed by Hypothesis 3. Previous research has shown that demand uncertainty creates problems for the entire supply chain that may jeopardize delivery performance (e.g. Milgate, 2001). This paper confirms that when examining delivery performance as experienced by a specific focal firm in the supply chain, demand uncertainty also has a negative effect on delivery performance of the focal firm’s supply base.

Technological uncertainty had no significant impact on delivery performance contrary to what was expected in Hypothesis 4. Previous research has indicated that firms emphasize delivery performance as part of their operations strategy in the face of increased environmental dynamism (Ward et al., 1995), which would advocate a positive relationship. However, technological uncertainty also increases the likelihood that firms are caught by surprise and thus experience a greater number of delivery issues that affect performance. This paper is unable to corroborate any of these findings as the analysis in this paper finds no effect of technological uncertainty on delivery performance.

The four hypotheses regarding the moderation effects of environmental uncertainty are all rejected. Demand uncertainty has a direct and negative effect on delivery performance; but neither of the capabilities studied had improved levels of performance under increased uncertainty. Thus, demand uncertainty does not have a moderating effect on the relationship between supplier evaluation capability and delivery performance (Hypothesis 3a) nor does it have a moderating effect on the relationship between risk management capability and delivery performance.
performance (Hypothesis 3b). The same is true for technological uncertainty, which is not found to be a moderator of the relationship between supplier evaluation capability and delivery performance (Hypothesis 4a) and the relationship between risk management capability and delivery performance (Hypothesis 3b). Demand uncertainty has previously been shown to be a moderator of the relationship between risk management capability and performance (e.g. Hoffmann, Schiele, and Krabbendam, 2013). Hoffmann, Schiele, and Krabbendam’s (2013) measure of performance reflects the frequency of disturbances which is inherently a part of delivery performance. The findings in this paper are unable to confirm aspects of environmental uncertainty as moderator variables between the purchasing capabilities studied and delivery performance. The graphical depiction of the interaction terms in Figure 2-5 corroborated the findings from the linear regression model in Table 3. There was a slight difference in slope for the effect of supplier evaluation capability on delivery performance for different levels of demand uncertainty. However, as the results also show in the linear regression analysis, the difference in slope was not enough to yield significant effects on the product term (the p-value of the interaction is .283). Thus, the graphical inspections of the interaction terms confirmed the findings from the hypotheses tests.

Despite disconfirming the hypotheses, these findings still contribute to the call for research examining the moderators of risk management (Manuj and Mentzer, 2008), because the paper is able to explore moderating effects in an empirical setting that accounts for both common method variance and ensures external validity on the constructs examined.
Capability-based theory attenuates the development of dynamic capabilities to address environmental change. Proponents of the dynamic capability-based view argue that firms need dynamic capabilities to face the changing business environment. This suggests to some authors a moderation relationship where superior capabilities will have a stronger link with performance outcomes given high uncertainty (e.g. Aragon-Correa and Sharma, 2003). Against this backdrop, the paper questions to what extent purchasing capabilities become more valuable under increased levels of uncertainty. In the present analysis, no evidence was found to support that risk management capabilities and supplier evaluation capabilities are more important under higher demand and technological uncertainty. Thus, the specific context of capabilities (Barreto, 2010) may be irrelevant for the type of capabilities studied here. Previous research has suggested that environmental uncertainty may be an important moderator for other aspects of supply management – e.g. relationship quality (Fynes, de Búrca, and Marshall, 2004), and thus the research presented here is only a partial view.

An important merit of this paper is the use of a multiple respondent survey design. This type of research design is novel within the purchasing and supply management literature. Despite the field’s growing maturity in other aspects of research design and analytic procedures, multiple respondent designs spanning business functions do not have widespread use in the PSM literature. Researchers in purchasing and supply chain management have requested the use of more advanced data analysis techniques and of larger sample sizes (Carter and Ellram, 2003; Giunipero et al., 2008). The research methodology used addresses both concerns.
Managerial implications

It is important for purchasing managers to consider how to allocate resources and time into developing the capabilities that best serve their goals. This paper considered how to improve delivery performance through risk management capability and supplier evaluation capability. It also considered the effect of the environmental uncertainty composed of demand and technological uncertainty. Based on the findings in the preceding sections, purchasing managers might be tempted to abandon efforts to further develop evaluation capabilities since they are found to have a negative effect on delivery performance. Managers should exude caution in taking this path, since supplier evaluation capability may positively impact on other criteria – e.g. quality, cost etc. (Araz and Ozkarahan, 2007; Teng and Jaramillo, 2005). The negative relationship may be caused by factors specific to the sample as discussed in the previous section.

Risk management capability was found to significantly improve delivery performance, suggesting that this is the most important capability to enhance and build upon to secure an effective flow of goods for production in manufacturing firms. This means that to increase the delivery performance, purchasing managers must be able to identify, assess, and manage risks related to supply chain disruptions. In order to strengthen risk management capabilities, it has been suggested that managers should stress test the supply chain in role-playing exercises by asking a series of “what if” questions to increase awareness and tailor strategies (Chopra and Sodhi, 2004).
The present study does not support the notion that the effect of having purchasing capabilities improves under increased levels of environmental uncertainty. Purchasing managers can therefore consider which capabilities to develop without considering the level of technological and demand uncertainty they are facing. Therefore managers can look to other firms who are not facing technologically similar markets or similar demand patterns to find best-practice examples of how to improve their purchasing capabilities.

Limitations and future studies

The following section presents some of the caveats of the study. First, delivery performance was measured using items reflecting the performance of the entire supply base. Obviously this reflects the aggregate of a number of individual suppliers and therefore ignores factors that could be relevant to the individual suppliers (e.g. location, experience with the buyer, component complexity, product complexity, etc.). Studying delivery performance at the level of each individual supplier would entail other difficulties in terms of data access, confidentiality etc., and maintaining a multiple-informant research design would greatly increase the costs and time consumed in the study. Also, the capability-based view may be a less ideal lens for this type of study since capabilities exercise their effects at an organizational or functional level (Salvato and Rerup, 2011) on the resources (Barreto, 2010), internal and external competencies (Teece, Pisano, and Shuen, 1997).
The paper also has some limitations with respect to the operationalization of the theoretical constructs. Delivery performance was measured using a three item construct. Future studies may consider examining it as a second-order construct representing both reliability and speed dimensions. Future studies should also consider using a mixed methods research design to further validate the constructs and thereby improve the validity of the findings.

The negative impact of supplier evaluation capabilities on delivery performance calls for a deeper investigation. Future studies should seek to explain to what extent supplier evaluation capability negatively affects delivery performance.

The analysis in the paper did not confirm any of the interaction effects any of the capabilities or the environmental uncertainty variables. However, the small sample size in the paper may give cause for concern in regards to type II errors and therefore future research may consider a replicative study with a larger sample size, perhaps focusing on explaining the possible interactions between demand uncertainty and supplier evaluation capabilities.

Finally, this paper only looked at two capabilities that were proposed to improve delivery performance: supplier evaluation capability and risk management capability. The benefits of these two capabilities are that they address both supply-base specific and supply non-specific variability in delivery performance (cf. Talluri, Narasimhan, and Nair, 2006). However, other capabilities may also impact delivery performance. This is left for future research to explore. In this respect it would be especially interesting to look at supplier development capabilities. Supplier development has been shown to improve delivery performance (Wagner, 2010).
Further, it would be interesting to consider possible interaction effects between environmental uncertainty and supplier development, as well as to look at other factors that may influence delivery performance such as supply chain complexity (Milgate, 2001; Vachon and Klassen, 2002).
References


*Organization Science* 13 (3): 339-351.


Paper 3

Building risk management capability
Building risk management capability

Astrid Hanghøj

Department of Economics and Business, Aarhus University, Aarhus V, Denmark

Ram Narasimhan

Department of Supply Chain Management, Michigan State University, Michigan, USA

Abstract

This paper adopts a capability-based approach to purchasing and supply management (PSM). The paper examines how firms can improve their risk management capability. This framework classifies capabilities as either inside-out, outside-in or spanning capabilities according to Day’s (1994) classification of capabilities. In this paper, these classifications are used to identify the role of intelligence capability (outside-in), negotiation capability, and contract design capability (spanning capabilities) in improving a firm’s risk management capability (inside-out capability). The analysis is carried out using structural equation modeling based on data from a survey of purchasing managers in 699 Danish manufacturing and non-manufacturing companies. The results show that intelligence capability improves risk management capability. The study further finds that negotiation and contract design capabilities significantly mediate the relationship between intelligence capability and risk management capability. The implications of the findings are discussed in the concluding sections of the paper.
Keywords: Purchasing, risk management capability, negotiation capability, intelligence capability, structural equation modeling.
Introduction

In 2011 a tsunami hit the coasts of Japan and severely damaged the production facilities of many suppliers of the world’s automotive industry. The 2011 tsunami was not the first time global supply chains were disrupted due to forces beyond the control of the affected companies. Other recent examples include the Hurricane Katrina in 2005 or most recently the pirating activities off the coast of Somalia (Tummala and Schoenherr, 2011). However, the Japanese tsunami revealed something remarkable: an entire industry’s ability to quickly recover and return to the same lean production schedule that had characterized the supply chains before the incident in March of 2011 (Olcott and Oliver, 2011). The ability of certain firms to bounce back and return to normal operations was outstanding. Japanese IT-company Hitachi, for example, was fully functional by the end of the same month (Olcott and Oliver, 2011). This illustrates the notion that some firms are better able to withstand the occurrence of hazardous events (Jüttner and Maklan, 2011) due to extraordinary capabilities in risk management.

Firms are competing in increasingly globalized marketplaces, and outsourcing parts of their production to suppliers has become a de facto standard for most businesses. As supply chains become globally dispersed and firms rely on several tiers of suppliers to bring the final product to the consumer, they must increasingly focus on assurance of supply. Facing complex and dynamic environments, a firm’s ability to integrate external knowledge may hold a key to managing supply related risks. However, purchasing and supply management scholars have only to a very limited extent focused on the firm’s capabilities (Spina et al., 2013). In fact, the researchers have called for better theoretical integration (Quintens, Pauwels, and MatthysSENS,
2006b) and a strengthening of the theoretical base by integrating theoretical perspectives from the strategic management literature (Hitt, 2011). In this respect purchasing capabilities remain an underutilized perspective compared to some of the more prominent theories like the resource-based view or transaction economics (cf. Spina et al., 2013). The capability-based focus the researcher’s attention on internal capabilities. Specifically, how to integrate suppliers with internal resources and to leverage and deploy the ensuing benefits to the market (Hitt, 2011). The adoption of the capability-based view follows a period of increasing strategic emphasis on the purchasing function. This shift has led to emphasizing the role of purchasing in ensuring competitiveness and profitability. In this paper, we focus on how firms can develop their risk management capability (an inside-out capability) through building stronger inside-out capabilities to integrate external knowledge on supply markets, and by improving their spanning capabilities. More specifically, we investigate the mediation effects of firm’s negotiation and contract design capabilities (spanning capabilities) on the relationship between intelligence and risk management capabilities.

The remainder of the paper is structured as follows: First, we conduct a literature review on purchasing and supply management capabilities. Second, we develop our conceptual model based on existing theory. Third, we present the data collection and methodology. Fourth, we present the analysis and results. Finally, the paper ends with a discussion of the results and a conclusion.
Purchasing capabilities

The capability-based view has only been used to a very limited extent in the purchasing and supply management literature (Spina et al., 2013), despite its promise of delivering a better theoretical integration (Hitt, 2011). Several definitions of capabilities exist in the strategic management literature, with the following being the most commonly cited: “bundles of skills and accumulated knowledge, exercised through organizational processes that enable firms to coordinate activities and make use of their assets” (Day, 1994 p. 38); “[an] ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result” (Helfat and Peteraf, 2003 p. 999); “an ability to perform repeatedly a productive task which relates either directly or indirectly to a firm’s capacity for creating value through effecting the transformation of inputs into outputs” (Grant, 1996; Huo, 2012); and finally the definition from Teece, Pisano, and Shuen (1997) seminal work; a “firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano, and Shuen, 1997 p. 516). Central to all of these definitions is the notion that capabilities enable firms to carry out activities to create value. Capabilities are path dependent and specific to the individual firm, however some commonalities exist across firms (Eisenhardt and Martin, 2000). Day (1994) proposes that firms develop their own configuration of capabilities in congruence with each firm’s unique position in relation to the competitive market, past commitments, and anticipated business requirements. However, the author also claims that certain types of capabilities can be
recognized in all firms, namely those responsible for supporting the core processes to create economic value (Day, 1994 p. 40).

In a recent review of literature, Spina (2013) identified only one paper with a theoretical departure point in the capability-based perspective in their review of articles published in the leading purchasing and supply management (PSM) journals between 2002 and 2010. In our review of literature, we found more papers researching capabilities in the broader context of supply chain management. Examples of this include, but are not limited to Ziggers and Henseler’s (2009) study of inter-firm network capability and Lado, Paulraj, and Chen’s (2011) study of supply chain relational capabilities. These are examples of researchers who have focused on a narrow set of capabilities. We also found a couple of theoretical frameworks that have attempted a broader set of classifications. One example Svahn and Westerlund’s (2007) purely theoretical framework that classifies supply chain management capabilities into four modes of management in supply networks: influencing, controlling and monitoring, coordinating, and integrating. Each classification is represented by four to five different capabilities responsible for supporting each mode of management. Quintens, Pauwels, and Matthyssens (2006a) distinguish between two types of purchase-related capabilities. The first capability is “related to the assimilation and dissemination of information on suppliers and markets” (Quintens, Pauwels, and Matthyssens, 2006a, p.888). The second type is relationship-building capabilities. In Quintens, Pauwels, and Matthyssens (2006a) framework, firm performance is a result of purchasing performance and positional advantages. Purchase-related capabilities have an indirect effect on firm performance by improving the efficiency, cost and
product/technological advantages. Finally, Tracey, Lim, and Vonderembse (2005) classified supply chain management capabilities as outside-in, inside-out and spanning capabilities. Outside-in capabilities were composed of inbound transportation, material warehousing, inventory control (inbound), and production support. Inside-out capabilities included packaging, finished goods, warehousing, inventory control (outbound), and outbound transportation. Spanning capabilities were composed of purchasing, customer order processing, strategy development, and information dissemination. This classification was adopted from Day’s (1994) seminal paper in the marketing literature on the capabilities of market-driven organizations. In the following section we elaborate on the framework by Day (1994) and apply it to categorize four distinct purchasing capabilities in a purchasing context.

**Conceptual framework**

Day’s (1994) framework was developed at a time when the capability-based view was still in its infancy, yet the framework has received wide-spread use in the marketing literature and has been diffused to other fields as well, including supply chain management (e.g. Tracey, Lim, and Vonderembse, 2005), logistics (e.g. Waller, Dabholkar, and Gentry, 2000) and information system research (Wade and Hulland, 2004). However, the framework has never been applied in the purchasing field. In his original framework, Day (1994) proposed that capabilities can be divided into three clusters of capabilities: inside-out, outside-in and spanning capabilities. In Day’s (1994) framework, purchasing is placed as a spanning capability. However, we argue that
reducing purchasing to a single capability itself represents a far too simplified account of the purchasing function.

Day’s (1994) framework is developed to describe the capabilities of market-driven firms. According to Day (1994) market-driven firms have superior capabilities that enable them to anticipate changes in the market. Thus, they derive their competitive advantages from being better able to foresee and respond to changes than competitors. In the context of risk management, superior market-based advantages are likely to arise from foreseeing possible risk scenarios and rapidly adjusting to changes in market conditions, to ensure uninterrupted flow of goods and services. Understanding the external environment is a key to maximizing the value of a firm’s resources in relation to organizational objectives, and functions as an input to organizational operations (Fawcett, Calantone, and Roath, 2000). Truly distinctive competencies are hard to develop and the firm’s ability to capture information is critical to selecting and developing appropriate competencies (Fawcett, Calantone, and Roath, 2000 p. 475). This notion is supported by Day (1994) who argues that market-driven firms are superior in both their sensing and linking capabilities and therefore are better able to anticipate changing market requirements.

Day’s (1994) framework consists of three types of capabilities. Outside-in capabilities enable the company to forecast and act on market changes (Tracey, Lim, and Vonderembse, 2005). They bring in key information to allow for increased responsiveness (Di Benedetto and Song, 2003 p. 518). They have external emphasis (Day, 1994). According to Day (1994) outside-in
capabilities are composed of market-sensing, customer linking, channel bonding and technology monitoring processes. Day (1994) proceeds to elaborate on the capabilities in the framework and emphasizes market sensing, from which he draws heavily on the market-orientation construct by Kohli and Jaworski (1990). Market sensing, which receives the most emphasis, enables firms to learn about customers, competitions, and channel members. It enables the processes of gathering, interpreting and using market information systematically, thoughtfully, and anticipatorily (Day, 1994 p. 43) to perform better than competitors. Spanning capabilities have neither an external emphasis nor an internal emphasis. They are responsible for fulfilling the anticipated needs of clients, which is done primarily by linking outside-in and inside-out capabilities (Tracey, Lim, and Vonderembse, 2005). Inside-out capabilities have an internal emphasis. They facilitate the firm’s ability to act on information acquired through outside-in capabilities in a manner that brings value to clients (Tracey, Lim, and Vonderembse, 2005 p. 180). They are activated by market requirements, competitive challenges and external opportunities (Day, 1994 p. 41). Inside-out capabilities are those that allow the firm to keep costs down (Di Benedetto and Song, 2003 p. 518), and allow the firm to be more effective in exploiting its inside-out capabilities. Inside-out capabilities lead to greater efficiency, cost reductions, consistency in delivery, and greater competitiveness (Di Benedetto and Song, 2003 p. 522).

Day’s (1994) seminal paper does not propose the causal paths between the variables in the model, but merely proposes that adapting the three types of capabilities will lead to superior
performance. Later adaptations of the model have proposed causality between the capabilities and performance, and amongst the capabilities themselves. In the following sections, we briefly review some of this work.

Hooley et al. (1999) have proposed that outside-in and spanning capabilities are more strongly associated with superior performance than inside-out capabilities (Hooley et al., 1999 p. 267) because they are less imitable than inside-out capabilities, as they rely on advantages build over time with a greater degree of path-dependency. Hooley et al. (1999) proposes that spanning capabilities affect both inside-out and outside-in capabilities (p. 262). The authors proceed to test their hypotheses using regression analysis. In the regression analysis however, they only test the direct effects of the capability groups on performance. The effects of spanning capabilities on outside-in and inside-out capabilities are therefore not tested empirically.

Wade and Hulland (2004), in their purely theoretical paper, argue that outside-in and spanning capabilities have fewer strategic substitutes, are rarer and less imitable and thus more strongly associated with long-term competitive advantages compared to inside-out capabilities.

The resource-based view offers an alternative perspective; inside-out capabilities are internally focused, reside and operate within in the firm. This makes them less obvious to competitors who may only see the outcome of a capability and not its constituents. That entails that they are harder to discover by competitors seeking to replicate a certain capability configuration. In other words, inside-out capabilities may be harder to imitate (Barney and Hesterly, 2006), which contributes to creating competitive advantages.
Di Benedetto and Song (2003) propose that a firm’s level of inside-out, outside-in and spanning capabilities may depend on their strategic type. The authors rely on Day’s (1994) classification of capabilities, but do not include spanning capabilities. Instead, they add two other categories of capabilities: marketing and information technology capabilities. The authors develop propositions relating the capabilities to the three strategic types: analyzer, defender and prospectors. In developing their propositions, the authors propose that outside-in capabilities improve the effectiveness of inside-out capabilities (Di Benedetto and Song, 2003 p. 518). The authors find that prospectors had relatively stronger inside-out capabilities than any of the other types, and outside-in capabilities were relatively stronger in the analyzers and defenders.

Finally, as mentioned earlier Tracey, Lim, and Vonderembse’s (2005) adapted the framework to study supply chain capabilities. They propose that outside-in and inside-out capabilities impact and improve upon inside-out capabilities. Further, spanning capabilities have a mediated effect on inside-out capabilities through outside-in capabilities. Both spanning capabilities and inside-out capabilities are proposed to impact performance in terms of perceived product value, customer loyalty, market performance, and financial performance. They derive their hypotheses from a literature review on supply chain management research focusing on different aspects each classified according to the framework by Day (1994). These aspects are inbound transportation, material warehousing, inbound inventory control, production support (outside-in capabilities), packaging, finished goods warehousing, inventory control for output, outbound transportation (inside-out capabilities), purchasing, customer order processing, strategy development, and information dissemination (spanning capabilities).
All the papers reviewed here agree, at least theoretically, that higher levels of the three types of capabilities should lead to higher levels of performance. However, only few of the papers have touched upon the relationship between the categories of capabilities. Only Tracey, Lim, and Vonderembse (2005) have proceeded to test these relationships empirically. In terms of the relationship amongst the capabilities, both Tracey, Lim, and Vonderembse (2005) and Di Benedotto and Song (2003) agree that outside-in capabilities improve inside-out capabilities. In the following sections we use the classification of capabilities explored above and derive our Hypotheses. We adapt the classification of capabilities from the framework provided by Day (1994). Recall that Teece, Pisano, and Shuen’s (1997) definition of capabilities propose a relationship between capabilities, as they highlight a firm’s ability to change its competence base. In relation to the classification proposed by Day (1994), Tracey, Lim, and Vonderembse (2005) and Di Benedotto and Song (2003) are the only papers that have addressed how these capabilities types relate to each other. In the following section, we classify our capabilities using the framework by Day (1994) and use existing theory in the PSM field relating to the capabilities in to support the directional Hypotheses.
Hypotheses development

Figure 1: Theoretical model

Figure 1 above shows the theoretical model applied in this paper. The dotted lines represent the groups of capabilities according to the classification in the framework by Day (1994).

Risk management capability

Risk management capability refers to the ability to identify, assess and manage risks related to supply chain disruptions. Risk management capability enables the firm to operate in an uncertain environment by reducing the consequences of risk and militating against potential disruptions. Jüttner, Peck, and Christopher (2003 p. 201) define supply chain risk management
as “the identification of potential sources of risk and implementation of appropriate strategies through a coordinated approach among supply chain members, to reduce supply chain vulnerability”. The concept is related to supply chain resilience, which has been defined as “the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function” (Jüttner and Maklan, 2011; Ponomarlov and Holcomb, 2009). Elkins et al. (2007) propose that risk management capability is composed of: screening and monitoring, detailing critical supplier’s disruption awareness, estimating expected costs of disruptions and requiring timely information for suppliers. The authors assess the state of supply risk management capabilities by benchmarking best-in-class companies. The best companies proactively seek to build responsive supply chains that are resilient against disruptions and catastrophes thus as to mitigate any impact to the end customer and avoid excessive costs (Elkins et al., 2007 p. 4). Zou, Chen, and Chan (2010) propose that risk management capabilities are comprised of the management (people and leadership), risk culture, ability to identify risks, ability to analyze risks, and the development and application of standardized risk management processes and are demonstrated by the firm’s “ability to properly and systematically address arising issues while taking into account possible risk factors, constraints and magnitudes of risks” (Zou, Chen, and Chan, 2010 p. 855). Pettit, Fiksel, and Croxton (2010, p. 6) define supply chain capabilities as “attributes that enable an enterprise to anticipate and overcome disruptions” and present a number of theoretical propositions in relation to the performance outcomes of the capabilities. Förstl et al. (2011)
propose that risk management should be considered a complex capability, but offers no
definition of supply risk management capabilities. Alinaghian (2012 p. 31) defines supply risk
management as the “capability to assess and manage the trade-offs between supply security,
quality, cost, and long term network”.

Firms develop and maintain capabilities to compete. As previously discussed, the increasing
complexity and uncertainty in today’s supply chains lead to increasing emphasis on purchasing’s
strategic contribution. It is reasonable to assume that firms who develop and invest in supply
risk management capabilities will outperform those that do not (Förstl et al., 2011 p. 269),
because these firms will be more resilient and able to withstand changes and disruptions in
increasingly more volatile and competitive environments. Risk management capability is in this
paper classified as an inside-out capability, because it facilitates acting on information acquired
to ensure the company against outside risks. Inside-out capabilities are activated by market
requirements in the market and use external information and allow the firm to act on this
information to bring value to clients (Day, 1994). Risk management capabilities take into
account available information enabling the firm to identify potential sources of risks (Jüttner,
Peck, and Christopher, 2003) and mitigate risks to reduce cost and thereby increase the value
delivered to the end customer. Risk management capabilities have an internal focus in ensuring
the company against disruptions by tailoring a strategy specific to the firm (e.g. Chopra and
Sodhi, 2004).
Intelligence capability

Day (1994) emphasize market sensing as a distinctive and important outside-in capability. Relying heavily on Kohli and Jaworski (1990), Day (1994) elaborates how these capabilities allow the firm to compete ahead of competitors by linking it to the external environment. This ability relates to market intelligence, which encompasses both considerations of market factors such as competition and regulations as well as the future needs of customers (Kohli and Jaworski, 1990). In the purchasing and supply management literature, market intelligence has often been studied only as one item reflecting a larger construct. For example, Pearson (1999) had a single-item construct labeled “Gathering market information” in his assessment of the level of responsibility of various purchasing activities. Pearson (1999) distinguished between the roles with internal and external emphasis. Gathering market information was classified as a planning and strategic role which had neither an internal nor an external emphasis. Pearson’s study (1999) found that the percentage of purchasing professionals who indicated that they had some degree of responsibility for gathering market information had increased over the five-year period. Information gathering was also included in Cousins, Lawson, and Squire (2006) construct “Purchasing skills”. Purchasing skills measure the ability to “monitor changes in the supplier market; the depth of technical capabilities; the ability to reduce total costs of business; and interpersonal skills” (Cousins, Lawson, and Squire, 2006 p. 781). In their paper, purchasing skills were shown to be a precondition to exert influence within the organization. In both papers by Pearson (1999) and Cousins, Lawson, and Squire (2006), market intelligence was only included as a single item and both studies were very explorative in nature. Pearson (1999) rely on
descriptive data and Cousins, Lawson, and Squire (2006) on cluster-analysis. More recently, Handfield et al. (2009) used supply market intelligence as a full-fledged construct and tested it using quantitative methods. They argue that supply market intelligence builds on purchasing managers ability to scan supply markets. The author’s market intelligence construct consists of purchasing managers skills in: monitoring and interpreting market changes, helping suppliers improve processes, and improving the costs associated with suppliers. Handfield et al. (2009) rely on the entrepreneurship literature and argue that the supply market intelligence construct can be equated with that of environmental scanning, opportunity identification and entrepreneurial orientation, thus emphasizing the external-oriented aspect of the construct. In this paper, intelligence capability is classified as an outside-in capability in Day’s (1994) framework in accordance with Day (1994) who emphasize market sensing as the most distinctive form for outside-in capabilities.

The increasing environmental complexity including the increasing availability of information enhances the difficulties in specifying the problem situation with respect to supply chain risks (Ritchie and Brindley, 2007a p. 1398). A firm’s intelligence capability may provide fodder for input for what Chopra and Sodhi (2004) call stress testing the supply chain; a scenario where managers survey the supply environment and try to discover the likely causes of risks (Chopra and Sodhi, 2004 p. 59). Because stress testing the supply chain is a part of risk management, the ability to foresee market changes more rapidly should enable the firm to also become better at risk management, simply by enabling identification of latent risk factors. Intelligence capability may improve the risk management capability by being more sensitive to discovering changes in
the market that may impact their purchasing arrangements. For example Trim and Lee (2008 p. 733) propose that marketing intelligence can help firms identify new opportunities to reduce the risks associated with geographical reach. The supply chain is composed of separate organizational entities that do not share organizational affiliation and may have conflicting goals. For example, it may be in the interest of the buying firm that the supplier carries excess inventory of finished goods to mitigate risks related to demand forecasting, whereas the supplier may be interested in holding less inventory of finished goods to improve flexibility. Intelligence capabilities may enable the firm to discover information about the supplier that the supplier would not otherwise be willing to share. Thus, intelligence capability may help overcome the possible adverse effects by integrating knowledge not only from potential and existing suppliers, but also from other agents in the market. Supply market intelligence leads to higher levels of both cross-enterprise integration and supplier integration (Handfield et al., 2009). Higher levels of integration could lead to improved information sharing with both internal and external parties and form the basis of improved risk management. Improved information sharing has been argued to reduce the risks of moral hazards (Zsidisin and Ellram, 2003), which increases the likelihood of risks due to conflicting goals between supply chain members. Handfield et al. (2009 p. 102) argues that the entrepreneurial role – in part represented by intelligence capability – becomes increasingly important as firms confronted with the challenges of risk management. Thus, the following hypothesis is proposed:

*Hypothesis 1: Intelligence capability is positively related to risk management capability.*
Firms with superior intelligence capability may be more likely to discover problems with suppliers ahead of competitors. Superior market intelligence capabilities are more sensitive in terms of being better able to sense changes in the market, and thereby serve to provide the firm with more timely market-based information ahead of competitors. This market based information may strengthen a firm’s spanning capabilities by informing the firm on key aspects relevant to both contract design and negotiation capabilities.

Understanding supplier markets may improve the best alternative to negotiation (BATNA), because it leads to an improved bargaining position (Lewicki et al., 2007). As the firm’s bargaining position improves, the firm will be better able to negotiate lower prices and better terms with suppliers. Perdue and Summers (1991) explain how sales people may prepare for negotiations that are likely to involve manipulative tactics about perception of competition. Sales people should prepare by collecting data on the level of competition, the capacity and reputation of competing vendors. Similarly, the buying firm may also prepare to meet such tactics by improving their knowledge about the reputation, quality, price and capacity of alternative vendors to improve their negotiation outcome. The possession of information increases the likelihood of effective problem-solving efforts in negotiating with suppliers (Perdue and Summers, 1991). This supports our hypothesis that negotiation capability is a mediator of intelligence capability on risk management capability (cf. Baron and Kenny, 1986).

The ability to negotiate with suppliers improves problem-solving (i.e. determining how to share risk among supply chain members). Therefore, negotiation capability may explain why there is
an effect of intelligence capability on risk management capability. The most important step in successful negotiations is the preparation. Industry and market analysis are central to determining each party’s power base (Smeltzer, Manship, and Rossetti, 2003 p. 17) and thus capabilities to support market-based learning in a broad sense may feed into a firm's negotiation capability by improving preparation on key issues such as analyzing the power base of other firms and develop supporting arguments. Following the theoretical framework by Day (1994) and the arguments presented above, we hypothesize that:

**Hypothesis 2: Intelligence capability is positively related to negotiation capability.**

The transaction-cost theory emphasizes the importance of the attributes of the transaction in order to design the optimal contracts e.g. size, asset specificity and task complexity as well as partner characteristics such as power and competition (Anderson and Dekker, 2005 p. 1738). Purchasing managers may be able to assess the level and nature of transaction-specific characteristics without conducting supply market analysis. In fact, often they may rely on other repositories within the firm such as engineers or lawyers when contracting on transaction-specific characteristics with respect to designating roles and responsibilities (Argyres and Mayer, 2007 p. 1066). However research indicates that there is a relationship between the competitive nature of supplier markets and the use of different contractual specifications (Anderson and Dekker, 2005 p. 1735). This means that in order to estimate partner-specific characteristics they need knowledge about the market in which the supplier operates. For example, a firm may be
interested in estimating the power of a particular supplier before entering into a contractual agreement. Such knowledge may be gained through supply market analyses, and thus we speculate that there is a positive relationship between a firm’s intelligence capability and their contract design capability:

*Hypothesis 3: Intelligence capability is positively related to contract design capability.*

**Negotiation capability**

Negotiations can be defined as the “process by which two or more people make a joint decision with regard to an issue about which there are initial differences in preference” (Carnevale and Isen, 1986 p. 1). Thus negotiations take place only when there is a difference of interest (Ramsay, 2004 p. 223). Negotiators have both internal and external ties, and it’s important for them to balance both internal and external considerations (Doctorof, 1998). This bridging role of the negotiator suggests that negotiation is best classified as a spanning capability in Day’s (1994) framework. Negotiations, albeit a central part of purchasing, have only received scant interest in the PSM literature with as few as sixteen papers touching upon the subject having been published in the ten leading journals (Zachariassen, 2008). The research on negotiations in a PSM setting is at best very explorative and has focused on the strategies used. Zachariassen (2008) examined four different negotiation strategies in a large manufacturing company: exploitation, alignment, ritual and manipulation. Smeltzer, Manship, and Rossetti (2003) examined and classified the steps completed in 29 different negotiations and Ramsay (2004)
focused on the resistance to co-operative bargaining situations. In the negotiation literature, negotiations have become almost synonymous with BATNA (Fisher, Ury, and Patton, 2011). BATNA, Best Alternative to Negotiated Agreement, is also a key component of the negotiation capability proposed by Ertel (1999). Ertel (1999) adopts an institutional view to corporate negotiation capabilities. Ertel (1999) argues that the situational view on negotiation activities may be substituted by systematically thinking about how all of a firm’s negotiations activities impact the bottom line. This should be sought by changing the mindset of the negotiators from a case-by-case perspective to viewing each negotiation as tied to corporate goals. He suggests that negotiators should always be aware of their best alternative to negotiated agreement as a way to improve negotiation outcomes. Ertel (1999) does not offer a definition of negotiation capability. Metty et al. (2005) outline the negotiation capability at Motorola. Motorola’s negotiation capability relies on an e-bid system and each negotiation has 6 steps: communicate requirements, develop a sourcing strategy, collaborate with suppliers, negotiation, bid optimization, and awarding of business. The authors here also do not provide a definition of negotiation capability. Thus, mirroring the sparse research on negotiations in the purchasing and the broader field of supply chain management, no definition exists of negotiation capability and only a few studies (e.g. Ertel, 1999; Metty et al., 2005) have studied negotiation as a distinctive capability. Here we refer to negotiation capability as the ability of a firm to negotiate with its suppliers to make decisions. Firms with a superior negotiating capability may be better equipped to bridge internal and external considerations to manage risks (cf. Doctorof, 1998). Negotiating with suppliers may reveal supply-chain-wide vulnerabilities and thus help a firm to
actively manage risk. Ottesen and Grønhaug (2002) propose that negotiating prices with a supplier may reveal other issues of interest for example by signaling that there are new favorable contract terms upstream in the supply chain that make it possible to sell at lower prices (Ottesen and Grønhaug, 2002 p. 216) and thus insulate the buying firm against risks associated with higher costs. Wakolbinger and Cruz (2011) argue that information sharing in negotiations promotes the opportunity for joint problem solving. Supplier negotiations provide opportunity for the identification and quantification of potential disruptions, which may support a firm’s risk management capability. Firms negotiate to reduce the probability of occurrences and the detrimental impact supply risk events have on the firm (Zsidisin and Ellram, 2003 p. 16). These arguments suggest that superior negotiation capability may lead to a likewise superior risk management capability. According to Winter and colleagues capabilities are developed through conscious effort (Winter, 2000; Zollo and Winter, 2002). Thus, as firms perceive the likelihood and detrimental effects of supply risk events to be great, they may decide to develop risk management capability. Because perceived risk on the part of the buyer may increase buyer preparedness in negotiations (Perdue and Summers, 1991), one may argue that risk management capabilities could also lead to the development of a superior negotiation capability through improved preparedness. Based on these arguments and in line with the framework by Day (1994), we hypothesize that:

*Hypothesis 4: Negotiation capability is positively related to risk management capability.*
Contract design capability

Argyres and Mayer (2007) outline contract design as a firm’s capability. They assert that contract capabilities are composed of defining roles, allocating rights and responsibilities, communication, contingency planning and dispute resolution. Contract design capability is not a trivial capability, and may be improved through firm-specific knowledge and may improve relational rents (Argyres and Mayer, 2007 p. 1072). Argyres and Mayer (2007) explicitly state that contracting capability is a dispersed capability with loci of controls e.g. managers, engineers, and lawyers. Contract design capabilities operate to solve problems that require combing the knowledge sets of both contracting firms (Argyres and Mayer, 2007 p. 1061). Buyers rely on governance mechanisms to mitigate risks (Lee and Cavusgil, 2006). Contractual governance mitigates conflict and promotes cooperation between trading partners (Lumineau and Henderson, 2012 p. 383). Contract design capabilities aid the governance of interorganizational relationships (Argyres and Mayer, 2007 p. 1061) between trading partners, and we might infer that contract design capabilities are likewise related to the mitigation of risk.

Contracts work to reduce supply chain risk by sharing the risk with the supplier as designated in the contract. For example, contracts may be used to secure against sudden price increases from suppliers (Chopra and Sodhi, 2004). Contract design capability may help companies seeking to transfer, eliminate or reduce risks by facilitating the ability to safeguard against risk through contractual means. Well-specified contracts narrow the domain and severity of risks (Lumineau and Henderson, 2012 p. 384) and thus contract design capability supports and facilitates superior risk management capability. Firms may prefer contractual arrangements to govern
supplier relationships through arm’s-length agreements to control the type and amount of information shared to reduce risks associated with knowledge transfers. Contract design capability helps firms to share the cost of risk with suppliers. We hypothesize that contract design capability to improve a firm’s risk management capability and formulate the last hypothesis:

_Hypothesis 5: Contract design capability is positively related to risk management capability._

**Data and methodology**

*Data collection and procedure*

The survey data were collected as a part of a larger research project at Aarhus University. Firms were identified using a nation-wide database of all publicly registered companies in Denmark. 2256 firms were identified across 9 different industry sections in the five Danish regions according to the Danish NACE industry codes (Nomenclature generale des Activites economiques dans les Communautes europeennes). The NACE industry groups that were included in this analysis were the main groups between 1-63 represented by the following industries: agriculture, forestry and fishing; mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage and waste management; construction; wholesale and retail trade; accommodation and food service activities; and finally the information and communication industry.
Only firms with more than 50 employees were included in the sample. The questionnaire was targeted at the manager with responsibility for purchasing in each of the firms. Respondents were asked to assess their firm’s purchasing capabilities. The survey was pretested for clarity prior to data collection and attention was paid to the design of the survey to increase participation. Respondents were offered a composite summary of the results to entice them to participate.

Data were collected between October 2011 and January 2012. A telemarketing company was hired to enlist participants in the study. The telemarketing company was instructed to call each firm in the sample and identify the purchasing responsible in each firm. The respondents had titles such as director of procurement, vice president of purchasing, purchasing and logistic director, etc. After the initial telephone calls, 1332 respondents agreed to receive an e-mail invitation to participate in the survey, which is equal to 59% of the initial sample. The purchasing manager would then receive an e-mail with a link to fill out the self-administered online questionnaire within 24 hours of agreeing to participate. If the respondents did not reply to the questionnaire, they would receive a reminder email. Two reminder emails were sent out. The first was sent after one week of receiving the original invitation and the second was sent three weeks following the original email if they had still not replied. After deleting cases with missing values for any of the items used in the analysis, we achieved 699 usable responses. This resulted in an effective response rate of 30.9%, which was deemed quite satisfactory since response rates below twenty percent are not uncommon in empirical research within the domain of purchasing and supply management (Trent, 2004).
Measurement constructs and scales

The capability constructs were measured on the following scale: 1 = Much worse than our competitors, 2 = Worse than our competitors, 3 = We are equally good as our competitors, 4 = Better than our competitors, and 5 = Much better than our competitors. This scale was adopted from Morgan, Vorhies, and Mason (2009) and Vorhies and Morgan (2005). In the absence of any well-established measurement constructs, we developed our constructs and survey items from other sources. Intelligence capability was measured using two items based on Jaworski and Kohli (1993). Negotiation capability was measured using three items that were developed for this study. These three items were based on feedback from practitioners. The contract management construct was based on Argures and Mayer (2007) and was composed of four items formulated for this study. The five items for risk management capability were based on Ritchie and Brindley (2007a). Items used to represent our theoretical constructs are shown in Table 2 in the appendix.

Control variables

The age and size of the firm are de facto standard control variables and were thus included in the analysis. Age was measured using the year the firm was established subtracted from the present year (2013). Size was measured using the number of employees in the firm. Both variables were logarithmically transformed before being included in the analysis. Jüttner and Maklan’s (2011) case study showed that the three firms studied shared many commonalities in relation to their supply chain strategies (Jüttner and Maklan, 2011 p. 250) and thus suggested
that firms have many commonalities in relation to their supply chain strategies across different industries and even for companies of different sizes. On the other hand, the organization’s size may impact the techniques available to the supplier for reducing the likelihood of risks because they often require significant human and financial resources (Zsidisin and Ellram, 2003 p. 20). Larger firms may have a higher level of risk management maturity (Elkins et al., 2007; Zou, Chen, and Chan, 2010) which could impact the level of risk management capability that the firms have developed. Larger firms may be more likely to succeed in their risk management efforts because they build experience faster because they purchase more (Hoffmann, Schiele, and Krabbendam, 2013 p. 203). In a similar vein, older firms may have acquired more experience that may increase the level of their capabilities. In addition to size, firm age has also been linked to higher levels of risk management maturity (Zou, Chen, and Chan, 2010 p. 862).

Tracey, Lim, and Vonderembse (2005) took Day’s (1994) notion of the distinctive capabilities of market-driven firms to mean that all firms should develop the same capabilities regardless of the industry in which they compete (Tracey, Lim, and Vonderembse, 2005 p. 180). Tracey, Lim, and Vonderembse (2005) compare the average scores on the constructs across four production-based industries, but do not elaborate on the differences across industries and do not test if there are significant differences between the means of the groups. The authors assert that their findings provide strong support for the notion that firms must sustain certain types of capabilities regardless of the industry in which they compete (Tracey, Lim, and Vonderembse, 2005 p. 186), however later in their paper they propose that an interpretation of the findings should exude caution “due to the nature of the sample drawn from four SIC codes” (Tracey, Lim,
We thus extend upon Tracey, Lim, and Vonderembse (2005) and Day (1994) by controlling for industry specific effects. Industry may affect the capabilities that firms choose to develop by means of competitive positioning (Quintens, Pauwels, and MatthysSENS, 2006b) and through the diverse business practices involved in the different industries. Further, industry characteristics may affect the risks experienced by organizations depending on the environment they operate in (Ritchie and Brindley, 2007b). Thus, if capabilities are developed following a satisficing principle (Winter, 2000), firms in industries where risks are perceived as great may develop risk management capabilities to a higher level than firms in industries where risk is perceived as a lesser threat. On the other hand, firms may also exhibit commonalities in relation to supply risk management that cross industry differences (Jüttner and Maklan, 2011).

The firms in our sample represent too many industry sub-groups and there are too few firms in each industry group industry group to be meaningfully included in our analysis as dummy variables. Thus, in order to explore the industry effects we constructed a dummy variable to represent manufacturing and non-manufacturing firms as different groups. This dummy was coded 1 for manufacturing firms (NACE 10 -33) and 0 for non-manufacturing firms. The procedure of creating these dummy variables to represent the two groups is in accordance with previous literature, as manufacturing and non-manufacturing firms are often treated as distinctive categories with in the purchasing and supply management literature. For example, researchers have shown that manufacturing and non-manufacturing firms vary in their strategic priorities (Ellram and Krause, 1994), their supplier partnerships (Ellram and Krause, 1994), their
adoption of specific supply risk management strategies (Zsidisin and Ellram, 2003), and in their adoption of e-procurement (Batenburg, 2007).
Analysis and results

The analysis procedure follows a two-step approach. First the measurement model was used to evaluate the convergent and discriminant validity of the model, second the full structural model was used to test the four hypotheses. The analyses were carried out using SPSS (Statistical Package for the Social Sciences) 20 and AMOS (Analysis of Moment Structures) 21.

Measurement model

First, we conducted a confirmatory factor analysis of the first-order latent variable constructs. Model adequacy was assessed based on three different fit indices: Chi-square ($\chi^2$), Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI). Hair et al. (2006) suggest conventional cut-off points for models of varying size. For our model the suggested cut-off points are CFI greater than .92 and RMSEA smaller than .07. Significant p-values of the $\chi^2$ statistic are to be expected.

The resulting fit indices of the measurement models are $\chi^2 = 224.988$ (df=84); RMSEA=.047; CFI=.974. Based on these values, we deemed the model to have adequate fit to the data. In order to achieve adequate model fit, some items were dropped during scale-purification. Items shown in Table 2 are items that are included in the final model. Table 2 also reports Cronbach alphas ($\alpha$) and average variance extracted for each of the constructs in addition to factor loadings ($\lambda$) for each of the items in the measurement model.

Convergent validity was assessed by evaluating the loadings of each of the scale items on their latent construct. All loadings were significant ($p<.001$) and ranged from .70 - .90 (see Table 2 in
the appendix) suggesting convergent validity (Anderson and Gerbing, 1988). Average variance extracted for all constructs were above the suggested cut-off point of .5 further supporting convergent validity in the measurement model (Hair et al., 2006). Furthermore, Cronbach alphas were used to assess the reliability of the individual measures. All scale reliabilities were above the suggested cut-off point of .7 (Hair et al., 2006).

Discriminant validity was assessed by evaluating the variance extracted for any two constructs against the squared correlation estimate between the two constructs. None of the constructs had a larger variance extracted than the maximum shared variance. This indicates that there are no concerns with respect to discriminant validity (Fornell and Larcker, 1981) in our model. Table 1 below provides correlations between the theoretical constructs and the control variables age and size.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Age</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Size</td>
<td>.22**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Risk management capability</td>
<td>-.05</td>
<td>.08*</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Intelligence capability</td>
<td>-.02</td>
<td>.04</td>
<td>.34**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5 Negotiation capability</td>
<td>.00</td>
<td>.15**</td>
<td>.38**</td>
<td>.42**</td>
<td>-</td>
</tr>
<tr>
<td>6 Contract design capability</td>
<td>.01</td>
<td>.18**</td>
<td>.35**</td>
<td>.33**</td>
<td>.40**</td>
</tr>
</tbody>
</table>

***) correlation is significant at p<.01 (2-tailed)
*) correlation is significant at p<.05 (2-tailed)

n=699

Multicollinearity is often a concern when there are high correlations between constructs. Table 1 above shows that there are significant correlations between constructs that could give cause
for concern with regards to misspecifications due to multicollinearity. However, good measure reliability, discriminant validity, and large sample sizes have been shown to be an effective way to deal with model multicollinearity concerns in structural equation modeling (Grewal, Cote, and Baumgartner, 2004). The measurement model showed both good scale reliabilities and discriminant validity amongst constructs, and the sample size is large.

Path model and hypotheses testing

Hypotheses tests were carried out based on the structural model depicted in Figure 2 on the following page. The path coefficients in the model are the standardized $\beta$ coefficients, estimated by using the maximum likelihood estimation method in AMOS. The fit indices for our model are as follows: $\chi^2 = 354.815$ (df=130); RMSEA=.050; CFI=.956. The fit indices are well above the conventional cut-off points and we can therefore assume that the model fits our data adequately. The predictors in the model explain 28.2% of the variance in the dependent variable, the risk management capability (cf. Jöreskog, 1999).
In Figure 2 above, we see intelligence has a significant effect on risk management capability ($\beta=.24, p<.001$), which provides support for Hypothesis 1.

The path from intelligence capability to negotiation capability is significant and positive ($\beta=.62, p<.001$), providing support for Hypothesis 2, which asserts a positive relationship between the two constructs.

The results from the structural model supports Hypothesis 3, with a statistically significant path leading from intelligence capability to contract design capability ($\beta=.48, p<.001$).
The path between the negotiation capability and risk management capability is also positive and statistically significant ($\beta=.22, p<.001$), providing support for Hypothesis 4.

Contract design capability has a statistically significant effect on risk management capability ($\beta=.19, p<.001$). Therefore, Hypothesis 5 is supported.

The indirect effect of intelligence capability on risk management capability mediated through negotiation capability is .14. The indirect effect is computed as the product of the two path coefficients in Table 2 and yields .14 (the product of .62 and .22). The indirect effect of intelligence capability mediated through contract design capability is .09 (the product of .48 and .19). The total indirect effect can be computed as the cumulative effect of all indirect effects. The total indirect effect of intelligence on risk management capability is .23 (.09+.14). Sobel’s test for significance of mediation effects confirmed that both negotiation and contract design capabilities were significant mediators of intelligence as the two-tailed tests were significant at $p<.001$ (Preacher and Kelley, 2011; Soper, 2013). The mediation effect was partial, since intelligence capability also has a direct impact on the risk management capability. The indirect effects show that intelligence capability impact risk management capability through both negotiation capability and contract design capability. The total effect of intelligence is .47, which was computed by adding the total direct effect (.24) and the total indirect effect (.23).
Control variables

The control variables age and size had no significant effect on our dependent variable. However, the industry dummy used to represent manufacturing versus non-manufacturing firms indicated that there was a significant difference between manufacturing and non-manufacturing firms. Manufacturing firms reported lower levels of risk management capability than non-manufacturing firms.

In addition to the model presented in Figure 2, we also ran a model excluding our control variables. All paths remained significant and with highly similar $\beta$-coefficients. Further, we tested the model controlling for industry effects on all predictor variables. The paths represented in the theoretical model (Figure 1) remained significant. This supports the robustness of the findings.

Post-hoc power analysis

The procedure outlined by MacCallum, Browne, and Sugawara (1996) was used to compute the statistical power of the model. Cohen (1992) suggests that power should not be below .80. To conduct post-hoc power analysis, we used G*Power 3.1.5 (Faul et al., 2007). Using $\alpha=.05$ and null-RMSEA=0, the power of the model is 1 which is above the suggested cut-off level. Overall, this instills confidence that the model should be able to detect misspecifications.
Discussion and conclusion

The purchasing and supply management literature has been transitioning from an operational/tactical paradigm towards a more strategic view on purchasing. In lieu of this, it is stressed that purchasing managers should develop new skills and competencies (Carr and Smeltzer, 2000) to deal with the changing environment. Despite the capability-based view’s increasing prominence in the general management literature, there has been a surprising dearth of its use within purchasing and supply management. In this stream of literature a sweeping majority has favored transaction cost theory as the dominant theoretical lens (Spina et al., 2013). While this paper in itself is not exhaustive in terms of the capabilities that may be relevant for purchasing managers, we do believe it represents an important step towards further advancement of capabilities as a theoretical lens in PSM research (Hitt, 2011). In the following we discuss our findings in light of the individual Hypotheses and towards the end we reflect on the framework used in this paper.

We show that intelligence capability is positively related to risk management capability. This confers the important role of market-based learning in purchasing (Handfield et al., 2009) with respect to shielding the firm from supply risks.

Purchasing managers with a high level of supply market intelligence are more proactive and entrepreneurial (Handfield et al., 2009), and this proactiveness has been equated with risk management (Smeltzer and Siferd, 1998; Zsidisin et al., 2004). This research confirms that purchasing managers who are better able to analyze and collect supply market information in
fact increase their capabilities in risk management, which further supports the notion that supply market intelligence is an important source of proactively creating market-based advantages in purchasing. Purchasing’s increased sensitivity to market changes may yield other important benefits than only increasing their risk management capability - for example improved relationships, cycle time, quality and increased integration and performance (Handfield et al., 2009; Hult, 2002).

Since market-based information is a prerequisite for establishing a firm’s best outside-option, increased market sensitivity feeds into a firms’ negotiation capability. Likewise, the ability to collect and analyze market-based information strengthens a firm’s contract design capability by improving the knowledge on supply markets and suppliers available to managers. Intelligence capabilities thus act as an important means of receiving signals from markets and suppliers that may increase the buyers’ preparedness in both contract and negotiation situations. Firms with superior negotiation capabilities may receive signals about the market (Ottesen and Grønhaug, 2002) and be better able to identify and quantify supply risks.

A firm’s contract design capability improves the firm’s ability to use contractual mechanisms to mitigate risks. Previous research has indicated that contractual governance improves cooperation between partners and mitigates conflict (Lumineau and Henderson, 2012). We add to this that contractual capabilities enable firms to mitigate supply risks. Using Sobel’s test, we were able to show that negotiation and contract design capabilities were significant mediators of the relationship between intelligence capability and risk management capability. The total
indirect effect of intelligence capability on risk management capability is roughly equal in magnitude to the total direct effect. In other words, this means that if a purchasing manager develops intelligence capabilities, he will improve his risk management capability at the same time. However, failing to consider the two spanning capabilities negotiation and contract design, will lead to missing out on the indirect effect achieved through these capabilities on risk management capability.

This finding underpins the importance of considering how a firm’s purchasing and supply management capabilities support each other. Full mediation would have made a stronger case for the strategic alignment of purchasing capabilities. However, partial mediation means that intelligence capability’s effect on risk management capability is amplified through having the two spanning capabilities studied. Therefore, firms who seek to reap the full benefits of intelligence capability on risk management capability need to consider how they can combine them with the appropriate spanning capabilities.

In conclusion, we have shown that the market-driven perspective offered in Day’s (1994) seminal paper offers insight into how to further strengthen the firm’s risk management capabilities by developing capabilities to create market-based advantages in purchasing. Our results offer a framework for analyzing risk management from a capability-based perspective and advance theory by identifying and analyzing mediation effects. Despite the widespread use of Day (1994) framework in the marketing literature, it has only been used in a PSM and SCM
context to a very limited extent. This paper is the first to apply Day’s (1994) framework to a purchasing context and is among the first papers in purchasing and supply management to depart from a capability-based perspective (cf. Spina et al., 2013). Building on previous research, we argued that there is a relationship between the three types of capabilities, and that both spanning capabilities and outside-in capabilities can help improve inside-out capabilities. The framework by Day (1994) and later adaptations only to a limited extent discuss the relationship between the capability types and more research needs to be done in this area. There is an ongoing discussion in the capability-based literature about to what makes certain capabilities valuable. Extending from Teece, Pisano, and Shuen’s (1997) seminal work, the ability to change a firm’s competence base is highlighted as an important aspect of dynamic capabilities – i.e. that is to be able to change one’s capability configuration through dynamic capabilities. Day’s (1994) work predates Teece, Pisano, and Shuen’s (1997) work and has not been influenced by this discussion to the same extent. Therefore the discussion of interactions between the capability types is mostly absent in research utilizing the Day (1994) framework. The discussion of relationships between the capability-configurations in Day’s (1994) is somewhat limited. Hooley (1999) proceeded to test the effects on performance, ignoring their interdependencies in his empirical work. Wade and Holland (2004) argue that outside-in and spanning capabilities are more valuable than inside-out capabilities. Di Benedetto and Song (2003) propose that the type of capabilities may depend on the firm’s strategic type. As such, we have seen arguments for how the capabilities impact performance or how contingencies (such as strategic type) affect the capabilities developed. Very little research citing Day’s (1994)
framework has been concerned with how the capability types affect each other. The exception being Tracey, Lim, and Vonderembse (2005) who argued that spanning capabilities improve upon both inside-out and outside-in capabilities. In this paper we argue for the relationships between the capability types by utilizing research within the PSM literature. In doing so we integrate Day’s (1994) framework into the PSM literature and discuss the relationship between the capability-types. The results show that there are in fact positive relationships between the capabilities. However given the limited research focusing on the interaction or mediation between Day’s (1994) capability types, further research needs to be done to validate our findings.

Limitations and future research

This research is subject to a number of limitations. The scale purification step of our analysis led to reducing the number of items for each capability. For instance, the intelligence capability was reduced to only two items. Despite having only two items for the construct, we were able to obtain sufficient discriminant and convergent validity in our analysis. However, with only two items for the construct we recognize that we may not have captured the underlying concept in its entirety. Future research may consider expanding the number of items to capture the whole spectrum of this capability. This may further validate the construct. The research on negotiations in purchasing and supply management is in a very early stage of development, and some authors have argued that the theoretical development and development of operational
measures is still too premature for to measure for quantitative use (Smeltzer, Manship, and Rossetti, 2003 p. 18). While the measurement constructs in this study are limited as discussed above and thus inherently is a limitation of the study, they are also a contribution because only very few studies have sought to test this using quantitative methods.

The analysis was based on a large sample of 699 Danish, firms which contributes to the generalizability of our findings. Further, it allowed us to look at differences between manufacturing and non-manufacturing firms. According to Day (1994) and Tracey, Lim, and Vonderembse (2005), firms should develop outside-in, inside-out, and spanning capabilities regardless of the industry in which they compete. We find that industry effects may influence the level of the capabilities, firms chose to develop. Our findings indicate that firms in different industry sectors may develop their risk management capabilities to different levels. It is possible that industry sector impacts the threshold for capability learning, leading to firms in different industry sectors reaching the point of satisficing at different levels of capabilities (Winter, 2000).

Lastly, our findings suggest that simply considering purchasing as a spanning capability (cf. Day, 1994) represents a far too simplified account of the competencies used to create market-driven advantages in purchasing. Our results stress the importance of developing purchasing competencies to clasp all aspects of market-driven firms.
Second, future research should be encouraged to expand upon this model by adding performance metrics. Day (1994) suggests that the three capability clusters inside-out, outside-in and spanning capabilities are related to positional advantage and thus performance outcomes. Future research should test this link, preferably with data from independent sources to overcome problems related to common method bias (Podsakoff and Organ, 1986; Podsakoff et al., 2003). Researchers have used data from multiple respondents only to a very limited extent (Kumar, Stern, and Anderson, 1993) and even less so in purchasing and supply management research, despite the field’s growing maturity in other aspects of research design and analytic procedures. Multiple respondents increase the reliability and validity of reports (Bagozzi, Yi, and Phillips, 1991; Kumar, Stern, and Anderson, 1993) and decrease the subjectivity in responses, and thus provide a more accurate view of organizational phenomena as a whole. Third, the adoption of the capability-based view in purchasing and supply management is still at a very early stage. There is still significant room for advancement along this theoretical dimension with identification, conceptualization and empirical testing of purchasing and supply management capabilities. Finally, our results indicate that there are differences between manufacturing and non-manufacturing firms, so future research may consider exploring this further by looking at patterns unique to the industry or sector, as first suggested by Ellram and Carr (1994, p. 18) and Zheng et al. (2007).
Managerial implications

The results show that firms with a higher level of intelligence capabilities are able to identify and exploit information to improve their risk management capabilities better than firms who are less able to do so. The integration of supply market intelligence into the purchasing function can yield insights on market trends and capacity problems, which can aid managers when stress-testing supply chains and tailoring risk mitigation strategies. One executive noted that in the future, supply market intelligence will become the only form of strategic advantage (Handfield et al., 2009).
## Appendix

<table>
<thead>
<tr>
<th>Items</th>
<th>α</th>
<th>AVE</th>
<th>λ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intelligence capability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT1: Analyze our supply markets</td>
<td>.716</td>
<td>.558</td>
<td></td>
</tr>
<tr>
<td>INT2: Detect changes in our suppliers’ products and services</td>
<td></td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td><strong>Risk management capability</strong></td>
<td>.801</td>
<td>.503</td>
<td></td>
</tr>
<tr>
<td>RIS1: Identify potential risks in our procurement (for example delays, supplier failures, delivery failures)</td>
<td></td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>RIS2: Estimate the likelihood of incurring procurement related risk</td>
<td></td>
<td></td>
<td>.73</td>
</tr>
<tr>
<td>RIS3: Estimate the magnitude of possible problems related to risks in purchasing</td>
<td></td>
<td></td>
<td>.71</td>
</tr>
<tr>
<td>RIS4: Mitigate potential risks that could happen to us</td>
<td></td>
<td></td>
<td>.76</td>
</tr>
<tr>
<td>RIS5: Survey the possible risk-scenarios in purchasing</td>
<td></td>
<td></td>
<td>.75</td>
</tr>
<tr>
<td><strong>Negotiation capability</strong></td>
<td>.792</td>
<td>.560</td>
<td></td>
</tr>
<tr>
<td>NEG1: Prepare negotiations with suppliers</td>
<td></td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>NEG2: Negotiate lower prices with suppliers</td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>NEG3: Use knowledge on alternative suppliers/products to improve the outcome of our negotiations</td>
<td></td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td><strong>Contract design capability</strong></td>
<td>.895</td>
<td>.631</td>
<td></td>
</tr>
<tr>
<td>CON1: Adapt contracts to specific supplier relationships</td>
<td></td>
<td></td>
<td>.73</td>
</tr>
<tr>
<td>CON2: Involve legal and technical experts, when it is necessary for contract design</td>
<td></td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>CON3: Identify important issues in contract design</td>
<td></td>
<td></td>
<td>.90</td>
</tr>
<tr>
<td>CON4: Consider possible scenarios in contract design</td>
<td></td>
<td></td>
<td>.84</td>
</tr>
<tr>
<td>CON5: Describe our rights and obligations in contracts with suppliers</td>
<td></td>
<td></td>
<td>.80</td>
</tr>
</tbody>
</table>

α refers to scale reliabilities; AVE refers to average variance extracted; λ refers to the standardized factor loading. All factor loadings are significant at p<.001 (two-tailed)
References


Dansk resumé


Det første papir er motiveret af ideen om, at indkøb kan være mere end strategisk, men også bidrage til at skabe fornyelse af virksomheden gennem innovativt indkøb. Udgangspunktet for

Afhandlingens andet papir fokuserer på leveringsperformance fra leverandørbasen i produktionsvirksomheder. Papiret identificerer risikohåndtering og leverandørevaluering som vigtige kapabiliteter til at forbedre leveringsperformance fra virksomhedernes leverandørbase. Leveringsperformance påvirkes negativt af udefrakommende usikkerhed, hvorfor dette papir med udgangspunkt i kapabilitetsteorien tester hypoteserne om, at både risikohåndtering og leverandørevalueringkapabiliteterne udviser en stærkere positiv effekt under øget usikkerhed i omgivelserne. Papirets resultater viser, at virksomheder kan forbedre deres leveringsperformance fra leverandørbasen ved at forbedre deres evner inden for risikohåndtering. Hvis virksomheder øger deres evalueringskapabilitet vil de derimod opleve forringet leveringsperformance. Papiret diskuterer, hvorvidt denne effekt kan skyldes, at hvis
evalueringskapabiliteten øges, så øges viden omkring leverandørers performance tilsvarende. Denne effekt kan medføre det kontra-intuitive resultat. Analysen giver ikke støtte til papirets forventninger om, at effekten af at have risikohåndterings- og leverandørevalueringsskapabiliteter er stærkere under mere usikre omgivelser.

øger risikohåndteringskapabiliteten gennem indkøbskapabiliteter inden for forhandling og kontraktdesign.

Teoretisk bidrager hvert enkelt papir på dets egen måde. Papir 1 bidrager til litteraturen omkring innovationsdrevne indkøb og er blandt de første til samtidig at teste forskellige teoretiske perspektiver omkring kapabiliteter. Papir 2 bidrager ved at identificere forudsætnings-kapabiliteter for leveringsperformance, og undersøger deres effekt under forskellige markedsvilkår. Metodisk er papiret på forkant og bidrager ved at anvende et two-respondent design, der dermed sikrer ekstern validitet og adresserer metodiske problemer som f.eks. common method bias. Det sidste papir bidrager ved at være det første til at integrere et teoretisk framework omkring markedsdrevne virksomheders kapabiliteter i indkøbslitteraturen.
PhD Theses since 1 July 2011

2011-4  Anders Bredahl Kock: Forecasting and Oracle Efficient Econometrics
2011-5  Christian Bach: The Game of Risk
2011-6  Stefan Holst Bache: Quantile Regression: Three Econometric Studies
2011:12 Bisheng Du: Essays on Advance Demand Information, Prioritization and Real Options in Inventory Management
2011:13 Christian Gormsen Schmidt: Exploring the Barriers to Globalization
2011:16 Dewi Fitriasari: Analyses of Social and Environmental Reporting as a Practice of Accountability to Stakeholders
2011:22 Sanne Hiller: Essays on International Trade and Migration: Firm Behavior, Networks and Barriers to Trade
2012-1 Johannes Tang Kristensen: From Determinants of Low Birthweight to Factor-Based Macroeconomic Forecasting
2012-2 Karina Hjortshøj Kjeldsen: Routing and Scheduling in Liner Shipping
2012-3 Soheil Abginehchi: Essays on Inventory Control in Presence of Multiple Sourcing
2012-4 Zhenjiang Qin: Essays on Heterogeneous Beliefs, Public Information, and Asset Pricing
2012-5 Lasse Frisgaard Gunnersen: Income Redistribution Policies
2012-6 Miriam Wüst: Essays on early investments in child health
2012-7 Yukai Yang: Modelling Nonlinear Vector Economic Time Series
2012-9 Henrik Nørholm: Structured Retail Products and Return Predictability
2012-10 Signe Frederiksen: Empirical Essays on Placements in Outside Home Care
2012-11 Mateusz P. Dziubinski: Essays on Financial Econometrics and Derivatives Pricing
2012-12 Jens Riis Andersen: Option Games under Incomplete Information
2012-13 Margit Malmmose: The Role of Management Accounting in New Public Management Reforms: Implications in a Socio-Political Health Care Context
2012-14 Laurent Callot: Large Panels and High-dimensional VAR
2012-15 Christian Rix-Nielsen: Strategic Investment
2013-1 Kenneth Lykke Sørensen: Essays on Wage Determination
2013-2 Tue Rauff Lind Christensen: Network Design Problems with Piecewise Linear Cost Functions
2013-4 Rune Bysted: Essays on Innovative Work Behavior
2013-5 Mikkel Nørlem Hermansen: Longer Human Lifespan and the Retirement Decision
2013-7 Mark Strøm Kristoffersen: Essays on Economic Policies over the Business Cycle
2013-8 Philipp Meinen: Essays on Firms in International Trade
2013-9 Cédric Gorinas: Essays on Marginalization and Integration of Immigrants and Young Criminals – A Labour Economics Perspective
2013-12 Paola Andrea Barrientos Quiroga: Essays on Development Economics
2013-13 Peter Bodnar: Essays on Warehouse Operations
2013-14 Rune Vammen Lesner: Essays on Determinants of Inequality
2013-15 Peter Arendorf Bache: Firms and International Trade
2013-16 Anders Laugesen: On Complementarities, Heterogeneous Firms, and International Trade
2013-17  Anders Bruun Jonassen: Regression Discontinuity Analyses of the Disincentive Effects of Increasing Social Assistance

2014-1  David Sloth Pedersen: A Journey into the Dark Arts of Quantitative Finance


2014-3  Lukas Bach: Routing and Scheduling Problems - Optimization using Exact and Heuristic Methods

2014-4  Tanja Groth: Regulatory impacts in relation to a renewable fuel CHP technology: A financial and socioeconomic analysis

2014-5  Niels Strange Hansen: Forecasting Based on Unobserved Variables

2014-6  Ritwik Banerjee: Economics of Misbehavior

2014-7  Christina Annette Gravert: Giving and Taking – Essays in Experimental Economics

2014-8  Astrid Hanghøj: Papers in purchasing and supply management: A capability-based perspective