Innovative Supply Risk Management

The Development of a Comprehensive
Supply Risk Management System

Petra Hoffmann

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INNOVATIVE SUPPLY RISK MANAGEMENT

THE DEVELOPMENT OF A COMPREHENSIVE SUPPLY RISK MANAGEMENT SYSTEM

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Hengelo, oktober 2011

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Chapter 1

Introduction

1 Introduction

Outsourcing is one of the major business trends of the last decades (Doig et al., 2001; Kakabadse and Kakabadse, 2005). Because of that, companies become increasingly dependent on their suppliers to build and maintain competitive advantage. Together with globalization, this led to the emergence of more complex and volatile supply chains (Braunscheidel and Suresh, 2009; Tang and Tomlin, 2008). In such a world, supply risk management is of vital importance for a company's survival/performance. This research focuses on the antecedents of successful supply risk management and the development of an effective supply risk management system.

2 Supply risk management

In the last decade supply risk management received growing attention both from the academic society as from industry. Recent crises and catastrophes, globalization, rising market volatility, shorter product-life cycles, reduction of supplier bases, shorter technology clock speeds, emergence of information technologies that enable coordination of extended and more complex supply chains: they all lead to more vulnerable supply chains and an increased exposure to supply risks (Harland et al., 2003; Jüttner et al., 2003; Kleindorfer and Saad, 2005; Norrman and Jansson, 2004; Pfohl et al., 2010; Trkman and McCormack, 2009). Given the fact that these supply risks can affect operational, market, and financial performance of companies –as for instance shown by Hendricks and Singhal (2005) who demonstrate that supply chain disruptions negatively affect the financial performance of firms- supply risk management today is regarded as being of strategic importance (Narasimhan and Talluri, 2009).

Based on the work of Zsidisin (2003), and Manuj and Mentzer (2008), we define supply risk as "*the chance of undesired events associated with the inbound supply of goods and/or services which have a detrimental effect on the purchasing firm and prevent it from meeting customers' demand within anticipated cost and time*". Supply risk management is about the minimization of such risks while exploiting opportunities by aligning organizational processes and decisions (Narasimhan and Talluri, 2009).

In general, supply risk management consists of the following stages: risk identification, risk assessment, risk monitoring and risk mitigation (Berg et al., 2008; Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad, 2005; Mullai, 2009). Most of the past research attention has been directed at the first two stages of risk identification and risk assessment (Hallikas et al., 2004; Jüttner and Ziegenbein, 2009; Moder, 2008; Norrman and Jansson, 2004; Schoenherr et al., 2008; Zsidisin et al., 2000; Zsidisin et al., 2008). The stage of risk monitoring however, has been largely neglected. Few authors stress the importance of monitoring risk proactively and on

a regular basis (Dani, 2009; Hallikas et al., 2004; Norrman and Jansson, 2004), but as far as we are aware, only Blackhurst, Scheibe and Johnson (2008) made a start in developing indicators for regular risk measurement. Being aware of potential risk sources and measuring their incidence with indicators sets the foundation for the last risk management phase: taking action to mitigate these risks (the complete risk management model is depicted in figure 1). These mitigation strategies can be either proactive -avoiding the risk source (i.e. the undesired event)- or reactive -mitigating the risk outcome (i.e. the detrimental effect). Supply risks can be diminished, counteracted, eliminated or accepted (Hallikas et al., 2004; Norrman and Jansson, 2004; Schoenherr et al., 2008).

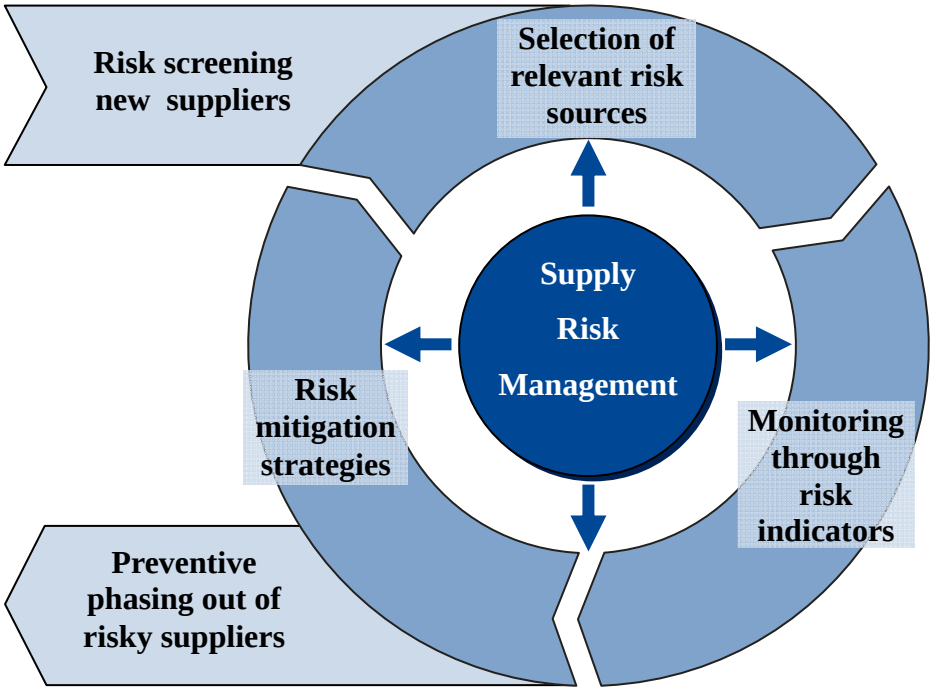


Figure 1 Supply risk management model

Albeit the recent attention to supply risk management research, knowledge on this topic is still summarily and more work is needed (Jüttner et al., 2003; Zsidisin and Ritchie, 2009). For instance, more knowledge should be developed on the origination, characteristics and causal pathways of risks (Ritchie and Brindley, 2007; Tang and Nurmaya Musa, 2010). As already indicated, most research attention has been given to particular concepts in supply risk management such as risk identification or risk assessment, whereas others such as risk monitoring are largely ignored. The more comprehensive models that do exist either lack theoretical grounding and/or are not empirically tested (Wagner and Bode, 2008). Integrated systems in which multiple management stages and their practical interpretations (i.e. which tools

to use) are researched in conjunction are scarce. In addition, although several scholars discovered a negative relationship between various supply risks and performance (Hendricks and Singhal, 2003, 2005; Wagner and Bode, 2008), there is a strong need to (empirically) examine the impact of supply risk management processes and strategies on (the relationship between supply risks and) supply chain performance (Berg et al., 2008; Ritchie and Brindley, 2007; Wagner and Bode, 2008). Finally, most studies address attention either to explaining the existence of supply risks and their effect on firms ("what causes supply risk?", see for instance Hallikas et al., 2002b; Wagner and Bode, 2006), or to management issues ("what can be done about it?", see for instance Braunscheidel and Suresh, 2009; Kleindorfer and Saad, 2005; Neiger et al., 2009). We are not aware of any literature discussing research on the interaction between these issues (i.e. are certain management principles indeed “changing” diminishing the effect of contextual factors that cause risk?)

This thesis aims at filling the above mentioned gaps of knowledge on risk origination, risk monitoring, comprehensive risk management models and their influence on performance, by exploring the contextual factors that influence supply risk management from a transaction cost theory perspective, and building a comprehensive and empirically tested supply risk management model.

3 Focus of this research and key research question

The supply risk management issues in this research are regarded from an organization theory perspective. The goal of organization science is not only to understand the existence and functioning of organizations, but also to design the organization and its management (De Leeuw, 1990). Organization science should be practically relevant, it should not only aim at discovering the form and content of thinking and acting in practical situations, but also at the improvement of that acting (De Leeuw, 1990; Rumelt et al., 1991; Whitley, 1984). Therefore, the goal if this research is twofold: first we will examine the existence and influence of certain contextual factors on supply risk management performance; second we will build a comprehensive supply risk management system that companies can use to improve their supply risk management performance. Our main research question is as follows:

Which contextual factors and supply risk management activities influence supply risk management performance?

Guided by the risk management model as depicted in figure 1, we can formulate the following sub-questions to this research question:

1) What are risk sources that should be regarded on a regular basis?
2) Which indicators can be used for monitoring these supply risks?
3) Which mitigation strategies can be used to manage these supply risk?

4 Research approach and thesis structure

The methodology used for this research is speed consortium benchmarking (see chapter 2), which uses a consortium benchmark approach (Schiele and Krummaker, 2011) in combination with an exploratory world café discussion method (Brown and Isaacs, 2005). We complemented this speed consortium benchmarking with a survey to validate our research findings on a larger scale. Supply risk management is a research topic with both a strong academic and practical orientation. Due to the worldwide economic downturn in 2009 the topic gained an even stronger practical interest: companies suffered from supplier failures such as bankruptcy, which nourished a strong desire to be relieved from surprising supplier breakdowns as soon as possible. As academic research tends to have a slow clockspeed and supply risk management is still an underexplored topic in academia, this poses a problem both for these afflicted companies as for the sought for relevance of our research. To overcome this problem we designed speed consortium benchmarking as a research method, in which the clockspeed of data gathering and disseminating the first results is strongly shortened. **Chapter 2** addresses the clockspeed difference between academia and practice and proposes the used speed consortium benchmarking method as a possible solution for this clockspeed problem.

The remainder of this thesis consists of four consecutive research papers and a concluding discussion chapter which reflects upon the results of the research papers.

Chapter 3 explores the concept of strategic supply risk management. Within supply risk management, the risk category of strategic supply risk is largely neglected. We define strategic supply risk as the risk that a supplier is able but not willing to deliver this particular customer according to agreed upon specifications. Based on the transcripts of several world café discussion rounds, we explore possible causes of strategic supply risk, define potential indicators that can be used to monitor strategic supply risk, and identify several management tools that can be used to manage strategic supply risk.

Chapter 4 approaches supply risk management from a quantitative perspective. For four defined risk categories (environmental, financial, operational and strategic), a risk management system is developed based on the survey findings. Different risk management phases (risk

identification, risk monitoring and risk mitigation) are developed based on practical tools, and the effect of these different phases on supply risk management performance is determined for each of the risk categories.

Chapter 5 approaches supply risk management from a more theoretical perspective. This paper uses concepts of the transaction cost theory to explain the existence of supply risks and show the effect of the different constructs (asset specificity, environmental uncertainty, behavioral uncertainty) on supply risk management performance. In addition, social exchange theory concepts (dependency and preferential customer treatment) are included as antecedents of the transaction cost constructs to obtain a more comprehensive picture of the elements influencing supply risk management performance in exchange relationships.

Chapter 6 determines the interaction between the contextual factor of uncertainty (chapter 5) and the practical risk management principles (chapter 4). This paper shows that a good risk management system is able to diminish the effect of uncertainty on supply risk management performance. Furthermore, this paper shows that process maturity in risk management explains supply risk management performance to a large extend.

Figure 2 depicts the different research themes described above.

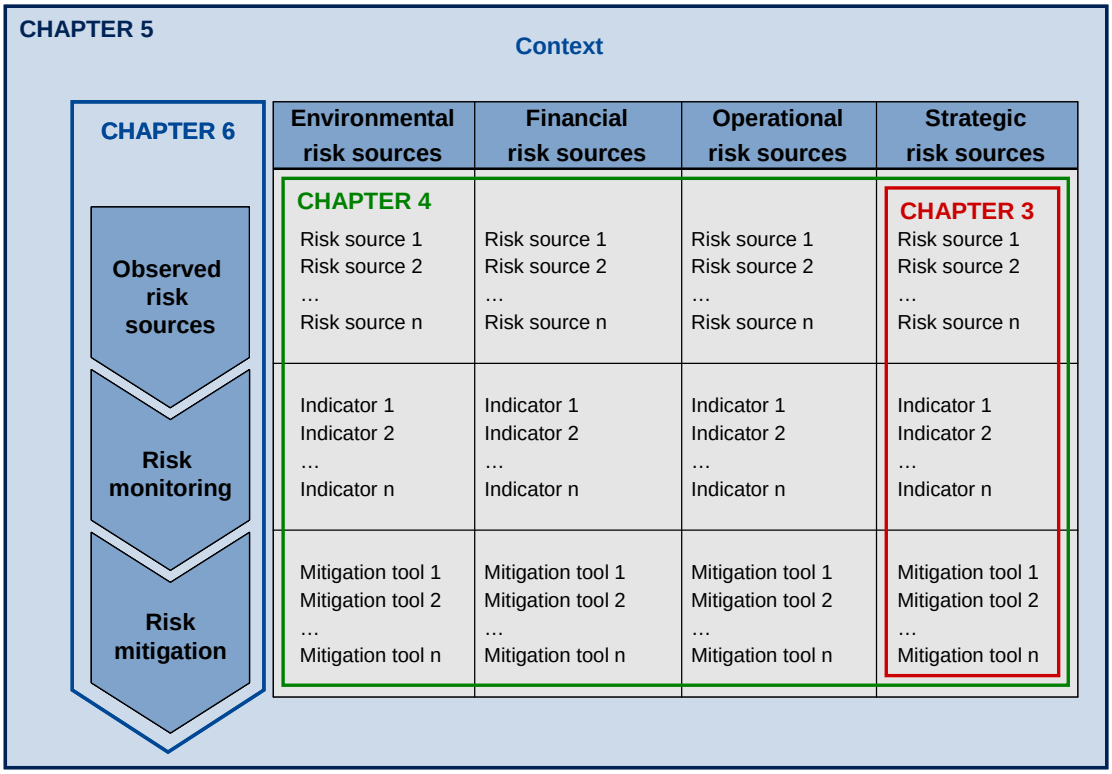


Figure 2 Supply risk management research themes

5 Research contribution

This thesis has made a contribution to supply risk management theory as well as practice. The development of a comprehensive supply risk management model strongly contributes to supply risk management knowledge, as we were able to explain approximately 50 % of supply risk management performance; an increase of 15 % when compared to already existing models (Moder, 2008). Furthermore, we identified and explored the new concept of strategic supply risk, a type of risk that tends to appear during economic boom times, when suppliers can choose which customers to supply first. We discovered why strategic supply risks exist as well as give possible solutions for monitoring and managing situations of strategic supply risk. The same holds true for the neglected phenomena of supply risk monitoring. We gave an interpretation of what risk monitoring implies by discovering practical indicators that can be used to monitor different types of supply risk over time. Additionally we show the direct and indirect impact risk monitoring can have on supply risk management performance, demonstrating the importance of further research on this topic. Besides treating different specific risk sources, indicators and risk management tools, our inquiry depicts the strong relation between supply risk management process maturity and performance: above all, the development and improvement of general risk management processes seems to contribute strongly to supply risk management success. Furthermore, our research shows the suitability of transaction cost theory in explaining supply risk management performance. Although –contrary to former research that regards asset specificity as the most important transaction cost construct (Carter and Hodgson, 2006; McIvor, 2009)- our findings show that from a risk management perspective behavioral uncertainty is by far the most important transaction cost concept. Moreover, we enhance theory building by developing a conjugated framework that contains both the transaction cost theory and social exchange theory, thereby joining the emerging belief that transactional and relational governance mechanisms should be used in conjunction to effectively management supply chain relationships (Lui et al., 2009; Power and Singh, 2007). On a conceptual level these two theories complement each other very well, a notion that should be extended beyond the field of supply risk management research. Finally, we contribute to research practice by highlighting the problem of speed in the rigor versus relevance discussion. To address this problem we propose a novel method for collaborative research: speed consortium benchmarking. With this method academia may be able to touch upon a part of the business practice reality that would otherwise be left untouched (Hughes et al., 2011).

Chapter 2

Accelerating scholar-practitioner collaborative research through speed consortium benchmarking

Using the world café as a form of academic enquiry

1. Introduction: Differences in clockspeed as a problem in academic-practitioner interaction

The perception of a considerable divide between management research and management practice by both scholars and practitioners has been a subject of debate for decades (Hodgkinson et al., 2001; Huff, 2000; Pasmore et al., 2008a; Shapiro et al., 2007). For instance, Rynes et al. (2002) asked almost one thousand human resource managers to rate the relevance of sources of information; they gave the Academy of Management Journal – arguably one of the academic community's most quoted journals – a 1.11 on a scale from 1 (low) to 5 (high). Not very surprisingly, in this same survey, the managers ranked academics last as sources for help for solving problems. Also in other domains such as business-to-business research, the "search for relevance" has been an ongoing concern (Hatchuel, 2001; Tranfield et al., 2004; Trim and Lee, 2004). During an IMP conference (Industrial Marketing and Purchasing Group), 93% of participants surveyed claimed that their own current research had a substantial value to managers. At the same time, respondents made the same claim about only 41% of their colleagues. Cross-checking these data with practitioners' claims revealed an even larger gap (Brennan and Ankers, 2004). The discussion has become more intense in recent times (Hughes et al., 2011), with one reason being that academics are increasingly finding it difficult to follow business developments' accelerating path.

Scholars and practitioners have developed valuable ideas, approaches and methods to address the scholar-practitioner gap, such as discussing alternatives of knowledge production (Gibbons et al., 1994; Huff, 2000), conducting "inclusive research", like academic-practitioner collaborative research (Shani et al., 2004), and suggesting changes of academics' self-image towards engaged scholarship (Van de Ven, 2007). However, one antecedent to the academic-practitioner divide has received considerably less attention: speed. This paper argues that next to rigor and relevance, the debate profits when extended to include speed issues.

Even though it has already been argued years ago that the difference in "clockspeed" in which the academic and practitioner "worlds" operate is a fundamental problem of scholar-practitioner exchange (e.g. Nyden and Wiewel, 1992), it is surprising that the divide debate has largely neglected time. However, if a new question or phenomenon arises in practice, firms seek inspiration and possible answers within a short time, sometimes within a few months. This holds especially true for companies operating in what Bourgeois and Eisenhardt (1988, p. 816) call high-velocity environments, characterized by "*rapid and discontinuous change in demand, competitors, technology and/or regulation such that information is often inaccurate, unavailable, or obsolete*".

Conversely, to fulfill rigor requirements, explorative academic research on new questions frequently operates at a much slower clockspeed, taking years rather than months to complete. As a result, practitioners frequently feel that academics' discussions about possible ways to react are too late to matter. Because of these different time horizons, practitioners may not raise many questions with academics, choosing instead to race from "guru to guru" (Weick, 2001, p. S72) to find solutions for their specific current problems. The guru's answers, though, may be a "laundry list" of solutions with only a low level of scientific grounding, if at all, or even re-enforcing stories of management that reframe and reinterpret reality (Clark and Salaman, 1998). Even if those solutions appear promising at first sight, they ultimately may not effectively help or even provide misguiding recommendations.

The phenomenon of different clockspeeds in academia and practice leads to the issue if time-critical questions qualify for academic inquiry, at all. If not, academic inquiry would have to leave a multitude of questions yielded in high velocity environments for practitioners or consultants to answer. One might also speculate if in that case academic research would be limited to "slow clockspeed industries," the industries which do not change very quickly (Nadkarni and Narayanan, 2007). With clockspeed increasing in many industries, the academics could contribute to always fewer subjects. Similarly, Hughes et al. (2011, p. 40) just recently raised the question "*if exchanges are limited to a small proportion of the academic and practitioner communities, how are academics in general meant to keep in touch with the reality of business practice?*" Thus, avoiding the study of questions and phenomena in high-velocity environments would most likely widen the gap between academia and practice even further. Also the justification for governments to fund universities may decline. Thus, research methods are needed which satisfy rigor, relevance and speed criteria at the same time.

We suggest to address the clockspeed issue by combining two inclusive research methods, consortium benchmarking (Schiele and Krummaker, 2011) and the world café method (Brown and Isaacs, 2005), a special form of focus group research (Brennan and Ritch, 2010; While et al., 2006). We refer to this combination as "speed consortium benchmarking".

Consortium benchmarking is a collaborative research method where practitioners and academic researchers form a research consortium and together benchmark best-practices. Consortium benchmarking is highly interactive, facilitating both knowledge production and knowledge transfer between academics and practitioners. However, while addressing rigor and relevance criteria (Schiele and Krummaker, 2011) the method has one disadvantage: organizing and evaluating visits to half a dozen best practice firms is very time consuming. In contrast, the world café is a flexible and time-efficient method for fostering collaborative conversations and

sharing knowledge. In a world café, which usually takes no more than one day, a series of parallel conversations occur which participants help document in the moment. Participants sequentially rotate between tables in several rounds of discussion, thus building upon each other's observations (Brown and Isaacs, 2005). We propose replacing the benchmarking visits to third party firms typical of consortium benchmarking, with a world café, thus allowing the consortium members to benchmark themselves. While the world café is a method which originated in practice, this paper makes suggestions for modifications to also satisfy criteria of rigor in research.

We suggest that the world café parallelizes the knowledge capturing process and saves time, addressing the clockspeed issues in academic-practitioner collaborative research. Moreover, a world café may not only replace consortium benchmarking firm visits, but researchers could also use it to replace many of the sequentially conducted interviews that academics typically used to explore a topic, such as in a classical multi-case study setting.

In sum, this paper argues expanding the rigor and relevance debate to include a third dimension, speed. It contributes to the literature in several ways: 1) it introduces the academic-practitioner collaborative research method speed consortium benchmarking; 2.) it provides a way to adapt the world café method to accelerate data collection and analysis in academic research; and 3.) by suggesting a novel collaborative research method, it also provides another way to bridge the scholar-practitioner gap by meeting the academic research's need for rigor and the practitioner's need to accelerate sharing best business practices across organizations. The paper also provides an example from our own research collaboration with practitioners that illustrates the application and benefits of speed consortium benchmarking for both scholars and practitioners.

In the next section, we will define the three requirements for successful academic-practitioner collaborative research: relevance, rigor and speed. Subsequently this paper introduces speed consortium benchmarking, illustrating its application with an example. A comparison of this method to conventional focus group research and mirroring the process on rigor criteria of academic research concludes the paper along with a review of the study's contributions and limitations.

2. Academic-practitioner collaborations and the clockspeed challenge

2.1 Challenges in scholar-practitioner collaboration: the quest for relevance

From a practitioner perspective, research's key requirement is its relevance, with studies leading to concrete consequences and addressing variables under management control

(Shrivastava, 1987). A key obstacle in academic-practitioner interaction is academic research's lack of relevance (Starkey and Madan, 2001, p. S3).

Management literature has suggested different explanations and avenues of framing the academic-practitioner gap. Van de Ven and Johnson (2006), for example, stated that the gap is typically viewed as (1) a result of theory and practice representing different kinds of knowledge; (2) a knowledge transfer problem; and/or (3) a knowledge production problem. Each view reflects a certain ontology and epistemology as well as provides inherent challenges for scholar-practitioner collaborations.

Theory and practice as distinct forms of knowledge. This view understands academia and practice as two separate worlds with different aims, modes of operation and communication (Kieser and Nicolai, 2005), hence producing distinct forms of knowledge at a different clockspeed. While practical knowledge mostly aims at knowing how to deal with a certain problem or question in a specific situation or industry context (Beckman and Sinha, 2005), academic knowledge strives for generalization in terms of building theories to explain why something happens or works (Van de Ven, 2007).

In this view, both worlds tend to be insular, self-referential and operate in closed loops (Hambrick, 1994; Weick, 2001), creating a wide, (nearly) unbridgeable gap between them. Fruitful academic-practitioner exchanges, if any, require "bilingual facilitators" who speak the language of both academia and practice and are able to transfer concepts between the two worlds (Kieser and Leiner, 2009). In a stricter interpretation, it could be argued that such collaboration is hardly possible. In fact, it could further be argued that academic research's target is not to solve practitioners' pressing problems, but rather to provide generalizable and enduring knowledge which could give general orientation to practitioners. This would help them to eventually address operational problems, but leave the "last mile" to practice alone. In this view, academic-practitioner collaborative research, such as proposed here, would not be considered a prioritized path.

The assumption of the presence of a *knowledge production problem* understands that the academic-practitioner divide is less a fundamental mismatch, but rather as one rooted in the scholarly knowledge production process. Academics typically go it alone neither integrating practitioners when defining research questions nor in the context of interpreting findings (Van de Ven, 2007). As a result, theory regularly talks to theory (Siggelkow, 2007) and researchers contribute trivial advancement to science widening the perceived academic-practitioner gap (Van de Ven, 2007). Since practitioners do not regard the knowledge produced as relevant, they decouple even more from academia. Left on their own, practitioners might develop local

solutions for their problems not drawing upon the vast amount of existing academic knowledge on these particular issues. They might reinvent the wheel, using their organizational resources inefficiently or achieving slower progress (Pasmore et al., 2008b).

The knowledge transfer problem perspective, finally, understands the academia-practice gap as a knowledge translation problem: "*It is crystal clear that current praxes of research disseminations are not fully consistent with the way managers update their knowledge*" (Visconti, 2010, p. 34). The key assumption is that practical knowledge derives from academic knowledge. Van de Ven and Johnson (2006, p. 805) note that "*many academics have been socialized in a 'trickle down' view of the knowledge supply chain: knowledge is created by and tested by academic researchers, taught to students by instructors, adopted and diffused by consultants, and practiced by practitioners.*" Though academic articles frequently discuss research implications for practice, this section is often brief leaving the practitioner to interpret how to implement the research findings, resulting in research that as Shapiro et al. (2007, p. 249) call is "lost in translation". It takes considerable time for new concepts or theories to get in contact with practice and translated into the practitioners' language. One may think about the resource based view of the firm; while researchers published the main pieces of theory through the mid 1980's, practice really did not notice them for almost another decade (Wernerfelt, 1995).

To address the knowledge production and the knowledge transfer problems, it becomes evident that "inclusive research" in terms of research involving practitioners in the process of scientific inquiry is essential to address the problem of knowledge production and knowledge transfer, eventually generating relevant research (Hatchuel, 2001; Starkey and Madan, 2001; Tranfield et al., 2004; Trim and Lee, 2004; Visconti, 2010).

Admittedly, academic-practitioner collaboration is a challenging endeavor. There is extensive work acknowledging the tensions surrounding not just the quality and rigor of work, but also stemming from the personal interactions, power and politics occurring when different organization, disciplines and professions work together on a research project (Fiore, 2008; Stokols, 2006). Another problem is the difference in clockspeed in which the two worlds operate. Practitioners often may only be interested in joining research activities, if researchers present results within a specific, short timeframe. The "clockspeed" problem involves these differences in the speed of acting.

2.2 The clockspeed of a firm's environment: Concept and potentials of including academics

Environmental velocity defines the "need for speed" for firms operating in this environment (McCarthy et al., 2010). Researchers frequently refer to this speed as "clockspeed", i.e. the speed

of change in an industry (e.g., Fine et al., 2002; Nadkarni and Narayanan, 2007). Today, most firms work in what Fine et al. (2002, p. 75) call “fast clockspeed-environments” that demand rapid responses to environmental shifts.

By introducing a multidimensional view on environmental velocity, McCarthy et al. (2010) just recently proposed a fine-grain view of clockspeed. They argue that even different subdimensions of a firm’s environment such as the technological, product, demand, regulatory, and competitive context each have its own pace. This conceptual understanding of clockspeed supports a more detailed analysis of change’s scope and pace for each of the knowledge creating system’s different areas.

Similar to different industries, which operate at different clockspeeds (Souza et al., 2004), very different clockspeeds also separate academics and practitioners. Companies operating in fast clockspeed environments typically have questions or issues that need short time frame studies (Nyden and Wiewel, 1992). Conversely to fulfill rigor requirements, academic knowledge production frequently operates at a much slower, potentially “practice incompatible” clockspeed.

We propose that collaborations in management research on time-critical questions are possible and beneficial for both academics and practitioners. Rynes et al. (1999) found evidence that the intensity of exposure of the academics to firms was significantly related to the their scholarly contributions’ success, too. The challenge is to analyze the collaborative research process for acceleration potentials and for avenues to synchronize the different clockspeeds as the project progresses, and to develop a method that allows acceleration of the research process without scarifying rigor for velocity.

While practitioners view relevance and speed as conditions for joining collaborative investigations, for academics, rigor is the necessary condition for joining collaborative investigations and differentiating it from consulting.

2.3 Research discipline of joint academic-practitioner research on time-critical aspects

Although there are differences among disciplines and epistemic approaches to research, “good research” requires adherence to standards for the research methods employed (Denzin and Lincoln, 2005). There is an ongoing debate whether the relevance that practitioners require, and the rigor academic researchers require, are able to exist in a single piece of research. Recently some authors have emphasized the need for merging scholarly research quality and practitioner relevance in a “pragmatic science” approach high in both rigor and relevance (Tushman et al., 2007). They do this by re-aligning stakeholders in the research process (Hodgkinson et al., 2001;

Starkey and Madan, 2001), thus bridging the rigor-relevance gap in management research (Hodgkinson & Rousseau, 2009). From an academic perspective, the key to such "bridge building" is to ensure rigor in research.

Though rigor has been defined in many ways (Gulati, 2007), it could be characterized as the soundness or exactness "*in theoretical and conceptual development, its methodological design and execution, its interpretation of findings, and its use of these findings in extending theory or developing new theory*" (Zmud and Ives, 1996, p. xxxvii). Since this article focuses on empirical methods for conducting rigorous research, it emphasizes what Shrivastava (1987) calls methodological rigor. As speed consortium benchmarking is a qualitative research method to operationalize methodological rigor, we introduce the criteria of suggested by Yin (2009), which are not uncontested but remain the usual starting point (Beverland and Lindgreen, 2010; Piekkari et al., 2010), namely

(1) construct validity: establishing proper operational measures for the concept being studied;

(2) internal validity: establishing robust causal relationships;

(3) external validity: establishing a domain in which the study's findings can be generalized; and

(4) reliability: demonstrating that the operations of the study can be repeated with the same results.

Academically rigorous research benefits from following these criteria. It could be concluded that successful academic-practitioner collaborative research works if satisfying the practitioners' requirements of (1.) relevant research questions being studied in (2.) a timely manner, while at the same time fulfilling the academic requirement of (3.) rigor in analysis. Thus, it adds to the debate speed as another requirement for consideration. The next section discusses a model that can help to produce relevant and rigorous research in a short period of time: speed consortium benchmarking.

3. Speed consortium benchmarking: accelerating consortium benchmarking through a world café

3.1 Consortium benchmarking and world café: complementary methods for enquiry

Consortium benchmarking comes into mind, when looking for a method ensuring relevance and rigor criteria (Fahrni et al., 2002; Puschmann and Alt, 2005; Schiele and Krummaker, 2011; Schweikert, 2000). Consortium benchmarking uses an academic-practitioner consortium to discuss a research question by jointly visiting best practice firms. In a consortium benchmarking

project, a research consortium consisting of practitioners and academics defines the research questions. Then, the entire group, typically comprising a dozen academic and practitioner researchers, visits third party firms and benchmarks their experiences. Immediately after each visit, the entire academic-practitioner research consortium synthesizes the findings and discusses the implications of the results through both a practical lens and a theoretical lens.

In their recent paper on consortium benchmarking Schiele and Krummaker (2011) explicitly analyze the method's contribution to rigorous research. Referring to the before mentioned criteria of qualitative research that Yin (2009) suggested, Schiele and Krummaker (2011) show that consortium benchmarking encompasses different tactics ensuring both reliability and validity. For example, since collaborative research is a collective process capturing academic and practitioner perspectives, the joint enquiry is based upon multi-sources of evidence. Yin (2009) argues that such a research feature enhances the construct validity of the findings that emerge.

While reducing the relevance and rigor problems of traditional case study research, consortium benchmark has one property which makes its application in a high clockspeed environment difficult; consortium benchmarking projects that usually involve six to eight best practice firms often take a year time or more to organize and complete (Schiele and Krummaker, 2011). Often this time-span is acceptable for practitioners, but sometimes it is not. Thus, studying issues and questions originating from fast clockspeed environment frequently demand a denser and faster research process.

Replacing the benchmarking visits typical to a consortium benchmarking with a world café addresses the time problem, since instead of visiting third parties, those involved meet together and using a systematic process pools and benchmarks their own knowledge. The world café can be regarded as a special form of focus group research (Brennan and Ritch, 2010; While et al., 2006). In the next section we will next briefly discuss the world café before describing the adaptations we are suggesting.

3.2 The world café as method of inquiry

The world café process has several characteristics: 1) it uses dialogue during which "*intimate conversations at small café-style tables or in small conversation groups link and build on each other as people move between groups, cross pollinate ideas, and make new connections around questions that really matter in their life, work or community*" (Tan and Brown, 2005, p . 85); 2) it is a visual process during which participants record their ideas in pictures, on flip-charts and – in the original setting – also on table cloths (Brown and Isaacs, 2005), thus, allowing them to see their conversations as they occur; 3) it is also a social process, since groups change

through several rounds of conversation and participants deliberately move and join new table discussions; and, 4) because conversations build and link, participants begin to notice themes, patterns and new questions emerge that benefit from the different experiences and backgrounds of all involved.

The world café method has found wide application in diverse settings. For instance, in order to explore "unofficial" stories in an academic environment subject to profound changes (Churchman and King, 2009), to bring together very diverse stakeholders of a child health service (While et al., 2006), to bridge hierarchical and generational levels in Singapore (Tan and Brown, 2005), to involve CEOs and members of pressure groups in a constructive conversation (Steier et al. 2008), or to create a conversation in the work environment (Hess et al., 2006). Latham (2008) also used the world café, which he calls "knowledge café", to bring together members of organizations that had won a Balridge award with academic researchers.

Encouraged by these reports, we successfully organized an Academy of Management Professional Development Workshop dealing with academic-practitioner collaborative researcher. Our "pre-test" of the World Café to help bring academics and practitioners together helped us learn how quickly it allowed a diverse group to engage in rich, concrete discussions.

The world café is rarely used as a method of scientific enquiry. Since it is helpful to find a way to foster academic-practitioner discussions leading to output practitioners appreciate, Latham (2008) did use the world café method to generate questions for further inquiry. This is the path we also chose to explore. In the next section, we will explain how the world café can be embedded in a consortium benchmarking project. After illustrating the application of speed consortium benchmarking we will subsequently discuss how it can meet rigorous academic criteria.

3.3 Designing a speed consortium benchmarking project

The speed consortium benchmarking method builds on the idea of consortium benchmarking; it requires forming a research consortium comprised of academics and practitioners. It replaces the usual visits to firms with a joint world café, accelerating data collection. While Latham (2008) used data collected to identify areas for future research, in our proposal, the researcher has the option to subsequently test the knowledge gained through a confirmatory survey.

The following are the steps to use to organize a speed consortium benchmarking as an academic-practitioner research project:

1. *Problem definition.* The academic researchers define the original research problem, because of the importance of having deep, state-of-the art knowledge of theoretical concepts. The project's time constraints do not allow a long period for literature review once the collective inquiry has started. In this step, there are no time compression savings as compared to traditional research approaches.
2. *Set-up research consortium.* The researchers need to build a sound research consortium, comprised of academics who reviewed the literature and the firms interested in the topic. The participating firms should have a good understanding of the topics of interest. The firms also should represent the full range of companies for which the topic is relevant, i.e. do not represent a convenience sample, but are reflecting the population. A certain level of group homogeneity is preferable, since discussions will flourish more likely if participants speak the same "language."
3. *World café workshop process.* The academic researchers first present the theoretical frameworks from their literature research which should provide an analysis framework to structure the world café. This foundational research distinguishes our proposed adaptation for the world café with those that only practitioners convene. Four to six participants sit at a table. Each table discusses a particular aspect of the research problem. After about 30 to 40 minutes, the moderators ask the participants to change to a different table. They can freely choose the table, however may not return to the same table. This allows each discussion round to bring together a new group.

   Each table has a moderator, or host, who in our design never leaves and is member of the organizing committee, rather than being an arbitrary chosen participant, as the original world café design suggests. The moderator reviews the previous discussion for the new guests. In a strictly explorative setting, the moderator does not influence the discussion, so as to ensure validity of findings. The moderator, though, does intervene if the discussion deviates from the topic.

   Each participant visits every table during the workshop to ensure that all have an input. This provides a faster way to gather data from all participants. If one considers the time spent on organizing and conducting individual site visits, the data collection time saved is considerable. The method also permits in-the-moment interaction among experts, allowing for immediate idea and concept clarification.

   One of the challenges of the world café method is the storage of data and the subsequent analysis of the respective data (Steier et al., 2008). The researcher can, in

addition to the notes the tables generated, record the conversations as well as conduct post- café analysis. Transcribed notes help increase the reliability of findings.

A concluding plenary session adds to validity, since it allows all of the participants to respond to data from all the discussions. For example, the participants may assign points to the findings recorded on the flip-charts from the table discussions. By allowing the participants to rate the findings of the workshop, the process includes elements of a Delphi, although as opposed to a Delphi the target is not necessarily to reach consensus (Morgan, 1988).

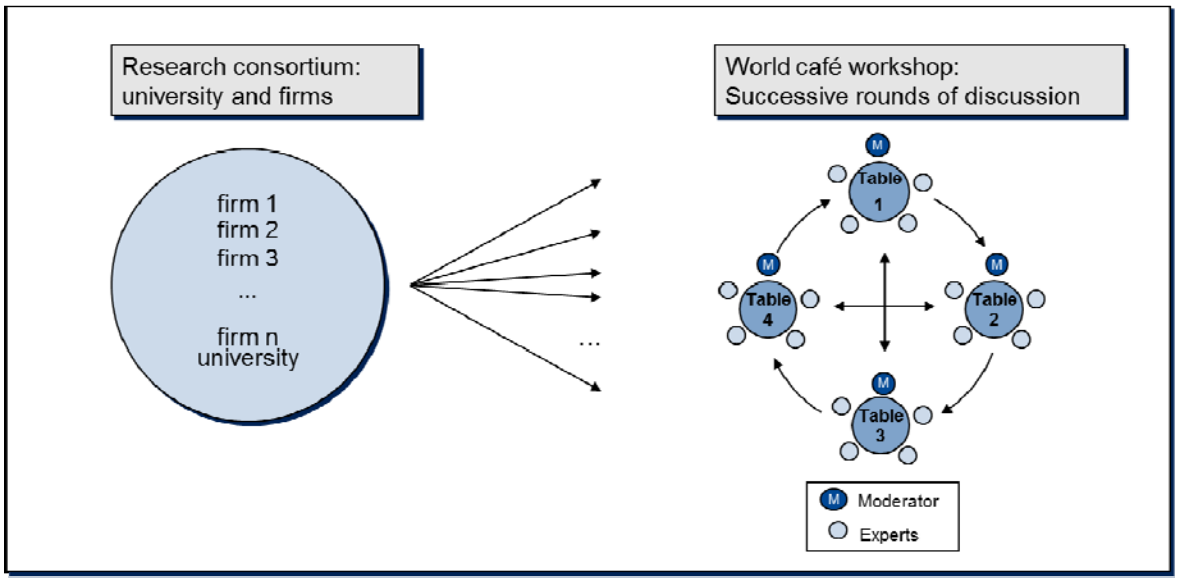


Figure 1 World café layout

4. *Optional validating survey.* After the actual world café workshop has finished, the researcher may add a broad scale survey to further enhance the findings' validity, as Pasmore et al. (2008c) demanded, and as recommended in the focus group research literature (Morgan, 1988) and with Delphi studies, that are not meant to replace quantitative testing (Grisham, 2009). Also Aguinis et al. (2010) in their proposal on how to conduct "customer centric" science strongly advocate the combination of quantitative with qualitative research, because the qualitative part allows to gather information on the practical significance of the issue conferred in the survey. However, the quantitative step is optional, since – depending on the research topic – the study may only have an explorative-qualitative phase. In the case of a purely explorative study speed consortium benchmarking ends after step 3.

Deciding to conduct a follow-up survey depends upon researchers determining if a saturation point is reached, which is not unlike the decision faced in a multi-case study design. Has the café generated all possible data, or are more world cafés needed before starting a quantitative research phase? If the decision is to proceed with a survey, researchers include workshop data in the survey. In a fast clockspeed environment there may be little time in between a first, knowledge updating workshop and a second, result presenting workshop so the survey needs to be run on a short notice. In this situation, the researcher must identify in advance possible survey respondents. Without a proper database to allow for an adequate sample size, the researchers will be unable to use the survey to timely validate world café findings.

5. *Discussion of findings.* If the researcher opts to conduct a survey, a second workshop to present and discuss findings would follow. As a feedback session for the consortium firms, its main intention is to make participation more attractive and provide swift feedback on the research findings. Normal academic clockspeed would resume as the researchers continue analysis. Acceleration occurs primarily during the world café stage, replacing the site visits to best practice firms common in consortium benchmarking or, replacing the multitude of explorative interviews that traditional multi-case study requires.

Next, we illustrate this method's application by describing the development of supply risk management practices using a speed consortium benchmark approach. This case, rather than intending to "prove" the method's quality, serves to create a better understanding of the method's application with the aim to contribute to its spread and replication.

3.4 Illustrative case: developing a tool to identify antecedents to supplier failure in a cyclical downturn as an example of speed consortium benchmarking

Our research goal was to identify antecedents of supply risk management performance - to answer the research question on how firms could identify supplier failure at an early stage so the firms would be able to take efficient counter-actions. The research project was run during a cyclical economic downturn. Participating firms were actively suffering from supplier failure and strongly desired relief from the problem of being surprised by supplier breakdowns.

Since supply chain risk management is a fairly new research topic and especially the fields of supply risk monitoring and the effect of supply risk actions on performance are still largely underdeveloped (Blackhurst et al., 2008; Ritchie and Brindley, 2007), we needed an exploratory

research design. The topic's strong practical orientation coincided with a lack of academic research and a pressure to quickly provide results. The combination fit an academic-practitioner collaborative research approach. We applied a speed consortium benchmarking approach that illustrates the five steps just described:

1. *Problem definition*. Two years before the speed consortium benchmark, we had conducted a research study on supply risk management; therefore, our research had positioned to quickly react once the environmental situation opened a "window of opportunity."
2. *Set-up consortium*. We formed a research consortium of 16 participants. For that, we counted on the support of an industry association, which allowed using their channels to announce the project. The network of the university and of h&z consulting, which supported the project, provided the participants. We also actively reached out to several participants to ensure a representative industry mix. We excluded service firms to guarantee a minimum level of homogeneity to meet a "medium variation" sampling plan (Punch, 2005).
3. *World café workshop*. For the one-day workshop discussions, we used a list of risk sources derived from literature. We asked participants to comment on these risk sources and discuss possible indicators and mitigation strategies to manage the risks. We had moderators host each of the four discussion tables. Moderators were trained before. For that purpose, a handbook was written. During the four, 40-minute discussion rounds, each participant successively discussed four risk types (environmental, financial, operational and strategic risks). Each participant sat at each discussion table once, but not in a pre-specified order, allowing the group compositions to change for each round. One member of the organizing committee was responsible for time keeping. We used flip charts to visualize the discussions at each table. At the end, participants reviewed all the charts, assigning points to indicate importance by fixing stickers to the listed risk sources, indicators, and mitigation strategies. Participants were able to distribute as many points as they thought necessary. For all risk types they produced a list of the most important risks sources (20), indicators (21), and mitigation strategies (22) that the subsequent survey addressed. The researchers also taped and transcribed the discussions to ensure reliability and gain further insights of the questions/phenomena being studied and check for potential biases through the moderator.

4. *Optional validating survey.* In addition to the risk sources, indicators and mitigation strategies, the survey also included "supply risk management performance" as a dependent variable, general company data, and data about the respondent's position in the firm, following the typical approach recommended for survey based research (Fowler, 2009). We mailed the survey to employees responsible for supply management in several German speaking countries, yielding responses from Germany, Austria, Switzerland and Luxembourg. We collected data within one week. The method that involved consortium participants added to its relevance, and probably led to the excellent survey rate of return not typical in the German language area. The speed of the process made it possible to address an interesting topic at the right time. Several firms actively complained about the survey closing too quickly which prevented them from participation and automatically receiving the report.
5. *Discussion of findings.* We conducted a second workshop for the participants of the first workshop during which we presented survey results. From the original 63 factors, we found 24 as empirically-based recommendation needed for an efficient supply risk management system. We also invited several best practice firms, those who applied most of the survey factors, to talk about their supply risk management system. This not only provided a way to illustrate survey findings, but also allowed the practitioners to not only know what successful firms did, but to see how real life firms have operationalized the findings. We were able to conduct the second workshop and prepare a practitioner's report three months after the project started.

This effort demonstrated that speed consortium benchmarking can serve to increase the research clockspeed during a phase in which academic – practitioner collaboration is most fruitful. This was important, because we did not want to sacrifice rigor to accelerate the literature reviews and conceptualizing research phases. Based on our experience with previous collaborative research, where it took up to three years to publish "A-journal" academic output based on data collected in a consortium benchmark, we expect the academic papers published in academic clockspeed again.

4. Comparing speed consortium benchmarking with focus group research and analyzing speed consortium bench marking's contribution to rigorous and relevant research

4.1 Comparison with focus group research

The world café method is a special kind of focus group research (Brennan and Ritch, 2010; While et al., 2006). Focus group refers to a group interview in which the interaction of the group

participants leads to the development of knowledge (Kitzinger, 1995; Morgan, 1988; Myers, 2009), which is what the world café element of a consortium benchmarking project aims to achieve. The researchers act as moderators, supplying a literature-based research topic to discuss. In general, researchers use focus groups as an exploratory technique in developing into on a new research area, as a source for generating hypotheses, or as a way to interpret previous studies' findings (Merton and Kendall, 1946). Focus groups can also help evaluate different research sites and populations, or help develop interview schedules and questionnaires (Morgan, 1988).

Effective focus groups need group homogeneity, allowing for discussion in a familiar and shared language (Morrison, 1998). Researchers may use focus groups with other data collection methods like surveys or observations (Morgan, 1988), which Kidd and Parshall (2000) strongly recommend, as this will enhance confidence in the research findings.

While the world café also shares the focus group characteristics just described, there are several distinguishing differences. In a speed consortium benchmarking, the practitioners are not interview objects, but are co-researchers, which is why a research consortium forms and runs the world café providing more of an opportunity for free and open discussions.

Further, the ideal group size for focus groups is 8 till 12 participants (Morrison, 1998). In the world café method, group size is more flexible. The ideal group size on one discussion table is approximately four to six participants, but for a world café the organizer can adjust the amount of tables. There is a minimum; if there are less than a dozen participants the world café may not be effective (Brown and Isaacs, 2005).

The world café's iterative process is another difference. Focus groups are usually one-time meetings, generating all data in one session lasting about two hours; however, sometimes, to increase data stability and reliability, a researcher may want to schedule reoccurring focus group sessions (Kidd and Parshall, 2000). While a study may include discussions with the same group over time, or different groups at other sites, this is a time-consuming process. If several sessions are held for the same group, the inability of participants to attend all of the sessions may cause problems. The world café method, on the other hand, embeds a strong iterative process in a one-time session, thus keeping the beneficial characteristic of iteration, and simultaneously avoiding the disadvantage of needing multiple sessions. This iterative process has another beneficial characteristic not found in classical focus groups - the discussion groups' changing composition. This allows for cross-pollination of ideas, leading to richer data collection (Fouché and Light, 2011).

Focus groups became an accepted research tool. The world café variant may also fulfill the necessary criteria for rigorous research, if applied taking into consideration the following

adaptations: if available, including literature findings as a starting point for discussions; employing a fixed and well trained moderator for table discussion; taping and analyzing the discussions; and providing the participants the opportunity to view all the final results, in order to respond to and evaluate them.

4.2 Speed consortium benchmarking in the mirror of rigorous research

Speed consortium benchmarking encompasses a wealth of tactics to improve construct validity, internal validity, external validity and reliability of research (Yin, 2009). These quality criteria are recommended to be discussed, though they are surprisingly often at least partially ignored in qualitative research (Beverland and Lindgreen, 2010). Since Schiele and Krummaker (2011) already analyzed consortium benchmarking's contributions to rigorous research, we subsequently primarily concentrate on the world café element of speed consortium benchmarking.

1. *Construct validity*: A world café may achieve a high level of construct validity because participants discuss the constructs which evolve during successive rounds. After each round, the moderator summarizes the findings from the first table discussion for the next group(s) of participants, who can amend or challenge the construct. In this way, constructs get successively more precise, eventually leading to a logical chain of evidence. One challenge of focus group research, namely to repeat the focus group interview to confront the experts with previous results (Kidd and Parshall, 2000), is automatically overcome through using several discussion rounds. To ensure construct validity, Yin (2009) asks researchers to let key informants review results to ensure construct validity. Our proposed design uses a final reviewing check at its end. During the concluding plenary session, all participants indicate the importance of the findings using the ranking process previously described. Those constructs which "survived" discussions rounds and which participants finally select as the most important passed many checks fostering construct validity.
2. *Internal validity*: As constructs pass through discussion rounds, relationships emerge, or are discarded. Some maintain that the world café method encourages systemic thinking, allowing the participants to recognize patterns and linkages between the topics (Steier et al., 2008). This allows the early identification of potential inconsistencies. The researchers, working with the transcripts, are further able to use qualitative data for ex-post analysis. Coding of the transcripts and pattern matching

by the researcher establish internal validity, and add analytical rigor not normally associated with the world café, though this process has to take place after the actual workshop. Transcripts also allow to identify a possible undesired intervention by the moderator.

3. *External validity*: Since each participant co-researcher has a somewhat different background, a potential for generalizability of findings is given. Furthermore, the process helps to avoid interviewer biases, because as opposed to typical focus group interviews or semi-structured research interviews, the method encourages the participants' full engagement. The moderating, but not facilitating, table host adds to ensuring full knowledge capture. The world café's physical design is a particular strength, since the small tables limit the group size and provide an opportunity for hearing all of the participants' ideas and voices (Brown and Isaacs, 2005). Accessing the full knowledge of all participants to a larger extent contributes to external validity. In this context it is important to stress the need to carefully select world café participants and use the sampling techniques similar to those recommended for multiple case studies (Punch, 2005). Involving about 16 experts in a world café exercise, which is a number that has proven operational in our experience of several world café projects, makes it possible to avoid strongly biased samples. It goes without saying that the usual limitations of generalizability which apply to qualitative research in general also apply to world café results. If the researcher uses the optional survey in the speed consortium benchmarking process, it will enhance the further generalizability of results.
4. *Reliability*: Since there are multiple rounds of discussions involving all participants and the proposed method includes a final evaluation check, the opportunity for increased reliability exists. The method requires documenting all steps and findings. Discussion transcripts and their analysis document results in a systematic way and help to prevent moderator bias. Since participants have multiple chances to voice their views using this method, the probability that they would reach different conclusions if the workshop was repeated again might be reduced.

5. Conclusion: Parallelization in the explorative research phase as a means to handle the clockspeed problem

5.1 Contribution to research practice

This paper discussed the problem of academic-practitioner collaboration, highlighting not only rigor versus relevance, but also speed. We propose a novel method of collaborative research called speed consortium benchmarking that integrates a world café into consortium benchmarking, thus suggesting a method that enables relevant and rigorous research in a high clockspeed environment. Through it, academia may be able to keep in touch with a larger part of the business practice reality (Hughes et al., 2011).

This paper contributes to literature in at least eight ways:

1. It broadens rigor-relevance debate to focus upon the clockspeed problem, speed being one previously neglected antecedent for problems associated with academic-practitioner collaborative research. Collaborative research benefits from being framed in a triangle consisting of rigor, relevance and speed. We explicitly move from a double (rigor-relevance) to a triple requirement (rigor-relevance-speed) in scholar-practitioner collaboration.
2. Integrating the world café into a consortium benchmarking helps to overcome one of the consortium benchmarking method's shortcomings by reducing the data collection time.
3. It advances the use of the world café from the practitioner world into the academic world by its demonstration of how the world café can serve as a rigorous scientific tool for enquiry, and by adapting modifications from more traditional methods that help improve data quality. These include a) introducing a permanent table moderator who is a member of the organizing committee, b) involving all participants in a final findings' evaluation, and c) taping the discussion for further analysis and verification. It is worth stressing that without these changes, the world café might not fulfill all methodological requirements for rigorous research.
4. Replacing a series of interviews in a multi-case study setting with a well-organized world café offers new perspectives for qualitative research, especially in an explorative environment. A world café not only collects data more quickly and in a more comprehensive way, but due to the repeated discussion rounds also expands knowledge through inter-expert discussion that is not possible in classical researcher-practitioner interview settings.

5. Introducing the novel method of speed consortium benchmarking and illustrating its application provides an actionable tool for researchers wanting to start more fruitful academic-practitioner collaborative research. Speed consortium benchmarking allows for an active participation of practitioners, increasing their acceptance of the method and their trust in the findings.
6. Proposing a novel method of research suited for a high clockspeed environment offers a chance for academic research to access this growing field, which otherwise would remain only partially accessible to academic research. With the increasing clockspeed in many industries, this is an important step preventing academic researchers from being marginalized in high speed environments. At the same time, firms can benefit from getting well-grounded recommendations more quickly.
7. This paper expands the literature on the focus group method by discussing the world café as a special form of focus group research, exposing similarities and differences.
8. Finally, this paper contributes to reducing the academic-practitioner divide again by demonstrating a way to accelerate the academic research process, without sacrificing rigor.

5.2 Limitations

Despite is potential, speed consortium benchmarking has limitations. First of all, we acknowledge that the entire approach of academic-practitioner collaboration in general and the attempt to also collaborate in high clockspeed environments in particular is only of interest to those scholars, who conceive business administration as an applied science (Rumelt et al., 1991; Schmalenbach, 1911; Whitley, 1984). Within this frame, the application of the world café is mainly focused on explorative research. If sufficient theory is already available, a confirmatory research approach can readily be taken. In terms of acceleration, we acknowledge that there are some academic research phases that the integration of the world café method cannot accelerate. In particular, researchers need to formulate the research question so that it reflects the body of scholarly knowledge on the issue. Acquiring this body of knowledge and developing an initial research framework continues to take the same amount of time. The same is true for the data analysis and the sharing of the gained knowledge into the academic community that occurs during such events as conference discussions and the peer-reviewed journal publication process. The acceleration mainly refers the data collection phase. Finally, to ensure rigor in research, the speed consortium benchmarking requires a very disciplined execution. It is important to understand its origins and uses in the practitioner world. Starting a world café without doing a

sufficient literature research, first, might not yield the best results and just replicate findings already known. Also, those using this method must carefully define and execute the role of the moderators at the world café tables. Likewise, there is a need to carefully plan and organize the consortium. A convenience sample may not generate generalizable new insides.

Despite these limitations, the integration of the world café into the process does accelerate the data collection part of the explorative research phase. In this way, researchers might feel encouraged to employ that method as a tool for purposeful academic research – in particular when studying firms operating in high velocity environments.

Chapter 3

Managing strategic supply risk: a preferred customer perspective

1. Strategic supply risk: an increasingly important, yet largely unknown phenomenon

With mounting pressure to specialize in order to be competitive, outsourcing the production of goods and the provision of services has become the major business trend of recent decades (Kakabadse and Kakabadse, 2005). Designing and managing a company's supply chain has become a crucial factor in economic success or failure (Carr and Pearson, 1999; Dyer and Singh, 1998). The shift from in-house production to outsourcing to suppliers has far-reaching consequences, not all of them positive (Gilley and Rasheed, 2000; Gorg et al., 2008; Jiang et al., 2006; Mol et al., 2005). As a consequence, supply risk management has increasingly entered the company agenda.

One particular issue arising from the trend towards outsourcing and reducing the depth of production is the increasing competition between firms for the most promising outsourcing partners (Rothaermel et al., 2006). Cordón and Vollmann (2008) highlight the problem of finding suitable business partners in global supply markets and note that the "really good" suppliers are in demand. Thus, firms not only compete on the sales market, but also on the supply market. The ability to establish and maintain relationships with suppliers can serve as a source of competitive advantage (Gold, 2010; Lewis, 1995). If customers of a given supplier are not all treated equally, being a preferred customer of that supplier can contribute to establishing a competitive advantage over the other customers of that supplier. "*A firm has preferred customer status with a supplier, if the supplier offers the buyer preferential resource allocation*" (Steinle and Schiele, 2008, p. 11) Conversely, the customer of a good supplier, that is being treated less favorably than its competitors, suffers from a novel type of supply risk, which this paper calls "strategic supply risk". Strategic supply risk arises when a buyer is of less importance to a supplier than that supplier's other customers, thus effectively leading to a strategic disadvantage *vis à vis* the other customers competing for the shared supplier's limited resources. Strategic supply risk can translate into problems in collaboration in new product development (Steinle and Schiele, 2008), less benevolent pricing behavior (Schiele et al., 2011) and – in the worst case – can limit access to varieties of goods in short supply (Williamson, 1991b). As opposed to other types of supply risk, such as supply disruptions caused by natural disasters or supplier failure, strategic supply risk does not affect all customers of a supplier equally: some buyers get the goods requested, some do not. In order to avoid detrimental effects, firms would benefit from explicitly including strategic supply risk in their supply risk management system.

Holistic supply risk management systems identify the risk sources, develop risk indicators and subsequently create tactics for managing the risk (Blackhurst et al., 2008; Harland et al., 2003; Kleindorfer and Saad, 2005; Knemeyer et al., 2009; Mullai, 2009; Neiger et al., 2009;

Pavlou and Manthou, 2008; Schoenherr et al., 2008). A vast amount of research dealing with diverse supply risk types such as financial and operational risk has been carried out in recent years (Chopra and Sodhi, 2004; Hallikas et al., 2005; Johnson, 2001; Jüttner et al., 2003; Manuj, 2008). However, scholars often understand supply risk as situations in which detrimental effects result from the supplier not being able to deliver properly. Existing supply risk literature fails to describe a situation in which a supplier, although able to, decides not to deliver to a particular customer or performs below its optimum level. Such supplier behavior has been observed especially during boom times of overflowing order books when suppliers can choose who to supply.

In relation to the customer attractiveness perspective, ample research has been conducted on how suppliers can attract and retain their customers (Evans and Laskin, 1994; Hanssen-Bauer and Snow, 1996; Morgan and Hunt, 1999; Morgan and Hunt, 1994; Palmatier et al., 2006; Wong and Chan, 1999). In contrast, the issue of preferential resource allocation in buyer-supplier relationships from the buyer's perspective has received little attention, even given the recently emerging literature on buyer attractiveness (Christiansen and Maltz, 2002; Ellegaard et al., 2003; Essig and Amann, 2009; Hald et al., 2009; Mortensen et al., 2008; Nyaga et al., 2010; Ramsay and Wagner, 2009). Again, this literature does not address strategic supply risk.

Following the reasoning that firms can benefit from embedding strategic supply risk in their supply risk management systems as it is a specific type of relevant supply risk, the research question this study addresses is as follows:

What are the sources of strategic supply risk, which indicators are there and how can companies mitigate strategic supply risk?

Using a qualitative and exploratory approach, the researchers organized a world café workshop with 16 supply managers for their data collection.

This study adds to the growing literature on supply risk management research. It introduces the concept of strategic supply risk, explores the concept through applying a preferred customer perspective, and sketches a holistic supply risk management system to handle such risk. In this way, the current research not only enhances the existing supply risk management knowledge but, further, adds a risk component to the customer attractiveness literature.

This paper is organized as follows: to begin with, the concepts of risk and supply risk are discussed, followed by a literature review on existing supply risk classifications and a short description of supply risk management systems. The nature of strategic supply risk is then

elaborated upon in detail. Subsequently, the data collection and the applied qualitative methods are explained. An inductive approach reveals strategic supply risk sources, indicators and tools. The paper concludes by discussing the managerial implications of the study results. Last but not least, the study's limitations as well as suggestions for further research are outlined.

2. The growing importance of strategic supply risk

2.1 Risk in the supplier-buyer context, supply risk classifications and supply risk management systems

In line with Harland et al. (2003, p. 52), risk is defined as "*a chance of danger, damage, loss, injury or any other undesired consequences*". Risk can be expressed as the product of the significance of the loss entailed by a particular undesired event and its probability (Mitchell, 1995). In the context of buyer-supplier relationships and building upon the work of Zsidisin (2003) we define supply risk as *the chance of the occurrence of undesired events associated with the inbound supply of goods and/or services, which have detrimental effects on the purchasing firm and prevents it from meeting customers' demand within anticipated costs and time.*

This definition is precise for it contains all the elements associated with supply risk – namely, probability, loss, and inbound supply of goods and services. Yet it is broad enough because the term 'detrimental effects' covers a wide range of phenomena. Literature descriptions range, for example, from financial loss through health and safety concerns to reputation damage and supply chain interruption (Chopra and Sodhi, 2004; Goldberg et al., 1999; Harland et al., 2003).

In order to make risk manageable, the literature contains many very different categorization schemes for supply risk. Johnson (2001), for instance, differentiates between risks related to fluctuating product demand and risks related to product supply which refers to capacity limitations and supply chain disruption. In similar fashion, Hallikas et al. (2005) devise a threefold supply risk classification: demand risk, hold-up risk and replaceability risk. With their outcome focus, Chopra and Sodhi (2004) take a different approach. They differentiate supply risk according to the type of loss, that is, the detrimental impact on the purchasing organization. Jüttner et al. (2003) argue that supply risk can be classified into organizational, environmental and network risk. These supply risk classifications share one common feature: they all fail to include strategic supply risk – the risk of not being treated as a preferred customer. The purpose of this research is to present initial guidelines for managers on how to set up an effective strategic supply risk management system.

The literature essentially identifies three main principles of managing supply risk. These are (1) risk identification (identify the risk sources affecting and originating from inbound supply), (2) risk assessment (risk indicators for monitoring the respective risks), and (3) risk mitigation/reduction (Blackhurst et al., 2008; Harland et al., 2003; Kleindorfer and Saad, 2005; Knemeyer et al., 2009; Mullai, 2009; Neiger et al., 2009; Pavlou and Manthou, 2008; Schoenherr et al., 2008). Hence, a supply risk management system is a recurring process consisting of three steps (Kleindorfer and Saad, 2005; Mullai, 2009).

To date, scholars have focused mainly on parts of or aspects related to supply risk management systems, rather than discussing a holistic approach. Hallikas, for instance, analyzes risks vested in buyer-supplier relationships (Hallikas et al., 2005) as well as risk management processes in supply networks (Hallikas et al., 2004), whereas Wu (2006) focuses on developing an inbound risk analysis model. Others shed light on measuring supply risk management performance (Otto, 2003; Ritchie and Brindley, 2007) and its connection to the financial performance of the company (Carr and Pearson, 1999), on ranking suppliers based on risk (Levary, 2007), on assessing/identifying supply risks (Adhitya et al., 2009; Zsidisin, 2004; Zsidisin et al., 2000), on mitigating supply risk (Kull and Talluri, 2008; Reiner et al., 2009; Wang et al., 2010), as well as on how to successfully manage risks in supply chains, networks and partnerships (Chopra and Sodhi, 2004; Das and Teng, 1999; Ellegaard, 2008; Singh et al., 2005; Wagner and Johnson, 2004).

However, in order to thoroughly explore the phenomenon of strategic supply risk, all three aspects of supply risk management systems have to be scrutinized. Buyers will not be able to deal successfully with strategic supply risk unless they can identify its sources and monitor them. Therefore, this exploratory study analyzes the sources and the indicators of strategic supply risk and the tools available to counter it by coding for each separately. First, this requires a thorough conceptualization of strategic supply risk.

2.2 Strategic supply risk: the risk of not being treated as a preferred customer

As early as 1970, Hottenstein (1970, p. 46) noted that "*most businesses have preferred customer's lists, which may be based on past orders or expectations of future business.*" Williamson (1991b) describes preferred customers as customers important to the supplier and argues that a supplier generally "*responds first to the needs of his preferred customers*" (p. 83) with less preferred customers being "*forced to wait in a queue*" (p. 81). In case of doubt, the supplier first supplies its strategically important preferred customers and only then its standard

customers. The supplier may on occasion choose not to supply any customers other than its preferred set. For customers deprived of adequate supply, a "strategic" supply risk materializes.

It has been argued that strategic supply risk is latently present and is likely to become virulent during economic upswings, when suppliers' order books are full or overflowing. In these circumstances, suppliers are forced to choose who to supply with what amount and when (Levitt, 1980; Williamson, 1991b). Moreover, it seems that preferred customer status also appears in times of limited availability of supply due to, for example, resource shortages (Lewin and Johnston, 1997). It might be added that, in oligopolistic supply situations, strategic supply risk is present almost by definition.

High strategic supply risk might entail a supplier being slack in meeting the agreed requirements of the buyer and, despite being technically able to supply at the stipulated specifications, deciding to comply with them only partially or not at all. Also, non-preferred customers will not be able to benefit from potential preferred customer benefits such as special services (Gwinner et al., 1998), lower prices and higher supplier innovativeness (Schiele et al., 2011). Further conceivable detrimental effects of strategic supply risk for the buyer are not being supplied on time, with the correct amount, with the appropriate quality or not at all. Other possible consequences for not having preferred customer status are that it proves to be cumbersome to engage in long-term planning or development projects with the supplier, and that the supplier does not stick to informal agreements such as verbal promises to respond to a request for a quote within a certain period of time.

In summary, the main characterizing difference between strategic supply risk and other types of supply risk is that the strategic supply risk only affects some customers of the supplier, whereas traditional risks affect all the troubled supplier's customers equally, for instance, because of the bankruptcy of the supplier or environmental or political problems impeding delivery. The risk of not being a preferred customer is, consequently, a distinct type of supply risk requiring a distinct management approach. A proposal for how to expand a firm's supply risk management system by integrating strategic risk is developed below.

3. Empirical data collection and analysis

3.1 The world café method: idea, structure and realization of a supply risk workshop

Due to the challenge of exploring a previously neglected type of supply risk and in order to obtain the qualitative data to answer our research question, a two-day supply risk workshop was organized by our university and a consulting company. Sixteen purchasing managers from Germany, Austria, and Luxembourg employed at 13 different companies from a diverse range of

industries such as pharmaceuticals, electronics, construction, and fashion attended the workshops (see Figure 1).

Company	Industry	Location	Turnover
1	aerospace	Germany	42 billion
2	blast furnace	Luxembourg	668 million
3	braking systems	Germany	3.7 billion
4	communication, energy, transportation	Germany	75.9 billion
5	construction	Germany	18.1 billion
6	packaging	Austria	1.7 billion
7	electronics	Austria	372 million
8	fashion	Germany	205 million
9	home appliances	Germany	411 million
10	machine tools	Germany	1.3 billion
11	pharmaceuticals	Germany	7.7 billion
12	precious metals	Germany	16.2 billion
13	printing machines	Germany	2.3 billion

Figure 1 Workshop participants

First, four supply risk categories (environmental, financial, operational and strategic supply risk) were introduced and explained to the participants. The first three risk categories reflect common supply risk classification schemes found in the literature (Chopra and Sodhi, 2004; Hallikas et al., 2005; Johnson, 2001; Manuj, 2008; Zsidisin, 2003), with environmental supply risk being associated with external events such as earthquakes, financial risk referring to financial problems of the supplier, and operational risk denoting operational troubles such as quality problems at the supplier. Strategic supply risk was introduced to the purchasing managers as ‘the risk of not being a preferred customer’, when a supplier is able, but unwilling to deliver as requested to that particular customer. This paper elaborates on the findings concerning the discussion on strategic supply risks.

The workshop was organized according to the world café method, which gathers experts around small discussion tables and successively moves them between the tables after some time (Brown and Isaacs, 2005). The world café can be thought of as an organizational or social design process for enhancing “*the human capacity for collaborative thought*” (Schieffer et al., 2004a, p.

2) and "*stimulating scholarly dialogue*" (Delaney et al., 2006, p. 46). Since there are multiple discussion rounds and the participants are moving randomly from table to table, "*knowledge-sharing grows*" and "*cross-pollination of ideas*" (Schieffer et al., 2004b, p. 3) can be achieved. In applying this method, the goal was to initiate open, yet topic-focused discussions with each person participating. It is an especially fruitful method for exploring a new concept such as strategic supply risk.

In total, there were four tables – one for each supply risk category. In addition, a moderator was assigned to each table, leading the discussion groups consisting of three to five workshop participants. The moderator's task was to note down the main discussion points, ensure the discussion would not diverge from the subject, and summarize the thoughts of the previous discussion group(s) to the one following it. Aside from that function, the moderator did not interfere in the open discussion. After approximately 40 minutes, the discussions were interrupted and each participant had to switch to a new table of choice at which a different type of supply risk would be debated. This process was repeated four times so that each participant had discussed each supply risk type.

Each of the discussions was recorded and subsequently transcribed. This study uses the transcriptions of the four discussion rounds at the strategic supply risk table which was moderated by one of the authors of this paper. The following chapter will elaborate on which methods were followed for coding and analyzing the qualitative data.

3.2 Qualitative data analysis: codes evolve inductively from collected data

Since the data collected and analyzed for this study is qualitative in nature, the research applies qualitative research methods which are "*best understood as data enhancers. When data are enhanced [through qualitative date methods], it is possible to see key aspects of cases more clearly*" (Ragin, 1994, p. 92). Since the aim is to 'enhance' the transcriptions of the four discussion rounds and to discover which sources, indicators and tools are available to counter strategic supply risk, the qualitative data was analyzed by coding it. Coding refers to attributing codes to data chunks (Neuman, 2003) with a good code being one which "*captures the qualitative richness of the phenomenon*" (Boyatzis, 1998, p. 31). Coding means carrying out "*two simultaneous activities: mechanical data reduction and analytic categorization of data into themes*" (Neuman, 2003, p. 442).

To answer the research question, the study applies the method of inductive coding. The inductive approach "*begins with concrete empirical details, [and] then works toward abstract ideas or general principles*" (Neuman, 2003, p. 537). Therefore, inductive coding, or "*data-*

driven and qualitative coding" (Richards, 2010) as it is also called, implies that codes evolve from the data while coding. Instead of using predefined codes, the codes are amended continuously during the coding process as the researchers see fit. After the coding, codes were grouped into categories in order to reveal underlying themes and connections between them. The results of this process are presented in the following chapter.

4. Analyzing the strategic supply risk discussion rounds

4.1 The supplier as the main source of strategic supply risk

An effective supply risk management system involves identifying sources, indicators and methods/tools to mitigate risk. First, we tackle sources of strategic risk. A total of 18 different sources of strategic supply risk falling into four categories were identified. Ranked from high to low according to the number of sources devoted to the respective category, these categories are supplier-based, buyer-based, buyer-supplier relationship-based and external sources.

A prevailing theme among the supplier-based sources relates to the strategy/market behavior of the supplier. The discussants repeatedly maintained that a supplier switching its business strategy, for example by becoming a competitor, constitutes a threat to being a preferred customer. Moreover, high staff turnover at the supplier was also seen as a source of strategic supply risk because of the potential change of a supplier's attitude towards the buyer associated with loss of contacts. Finally, capacity constraints at the supplier were also identified as frequent sources of strategic supply risk.

The majority of the buyer-based sources of strategic supply risk revolve around the buyer's contribution to the supplier's turnover. If the buyer contributes only a minor share of the supplier's turnover, strategic supply risk is high. In addition, the analysis revealed that unfair treatment of the supplier by the buyer, for instance by disregarding intellectual property rights, can have a high level of strategic supply risk as a consequence. A further insight is that the platitude 'birds of a feather flock together' appears to hold true for supplier-buyer relationships. The analysis indicates that considerable discrepancies between the buyer and supplier with respect to size, strategy and roadmap increase strategic supply risk and render becoming a preferred customer less likely. Another source vested in the buyer-supplier relationship is the 'chemistry' between the sales agent and the purchasing agent. Thus, not only company strategies and interests have to match, but also attitudes on an individual level. External factors such as capacity constraints in the industry also negatively affect a company's strategic supply risk but played a minor role. This could be interpreted as capacity constraints making strategic supply

risk visible with the underlying causes being such things as a strategy mismatch and small purchasing volumes.

In conclusion, the inductive coding revealed the supplier to be the main source of strategic supply risk, followed by the buyer, their relationship and external factors. More precisely, the most important sources of strategic supply risk were seen as unfair treatment of the supplier by the buyer, the buyer's purchases being too small compared to the supplier's overall turnover, and differences in the interests/ strategies of the buyer and the supplier (see Figure 2). The next step is to identify key performance indicators in order to measure the increase of the described sources of risk, which may eventually lead to the need for action.

4.2 Supplier's attitude and turnover indices as primary indicators of strategic supply risk

The second step in building a supply risk management system is to discuss indicators of strategic supply risk in order to be able to detect arising strategic supply risks. Overall, the analysis culminated in 24 risk indicators which were classified into qualitative and quantitative indicators. About two-thirds of the indicators mentioned were qualitative in nature.

The results suggest that the most important indicator of strategic supply risk is the supplier's attitude towards the buyer. Supplier attitude appears to consist of two aspects: responsiveness and cooperation. Responsiveness is, for instance, indicated by the time it takes a supplier to respond to a buyer's requests for quotes. In addition, the reaction of a supplier when a buyer offers suggestions for improvement provides information about the supplier's general responsiveness. It has to be pointed out that purchasing companies would be wise to evaluate not only the current level of supplier responsiveness but to pay careful attention to its development. Suppliers show different 'genuine' levels of responsiveness depending, for example, on the organizational structure. Therefore, deteriorating responsiveness can be seen as the clearest sign of a supplier not being interested in retaining the buyer as its customer. Declining supplier responsiveness can manifest itself as prices not geared to market requirements, little reaction or time lags when receiving requests from buyers, and not meeting the delivery deadline.

The supplier's attitude towards the buyer is also apparent in its interest in cooperating; for example, by accepting or rejecting an exclusive contract. The analysis revealed that buyers have to assess the supplier's attitude to cooperation: that is, the supplier's general interest in the buyer, its goals and strategy. The idea is that the supplier is more likely to express an interest in a lasting business relationship if the buyer is a preferred customer. Since congruent buyer and supplier interests facilitate a successful business relationship, the supplier should be interested in matching those. This finding correlates with the finding that a mismatch between the

strategies/roadmaps of the buyer and the supplier is a major source of strategic supply risk. Another qualitative strategic supply risk indicator identified through the study is the supplier's formal treatment of the buyer. This treatment may be apparent, for example, in the organizational rank of the contact that the supplier assigns to the buyer.

Next to these qualitative indicators, important quantitative indicators of strategic supply risk could also be identified. Corresponding to the finding that a minor purchasing volume can be a source of strategic supply risk, it was found that the share of supplier's turnover that the buyer contributes is a good indicator for determining a possible preferred customer status. Buyers should consider how much of the supplier's turnover they contribute, how their purchasing volumes compare to those of other buyers, and how much the supplier delivers to their competitors. The discussants agreed that a purchasing volume accounting for ten percent of a supplier's turnover is critical for a preferred customer and, if possible, action should be taken to maintain that level. Next to share of turnover, the pricing level should be taken into account when assessing strategic supply risk. Prices that were but are suddenly no longer geared to market requirements indicate that the buyer may have lost preferred customer status.

To sum up, the most helpful indicators of strategic supply risk were noted as the share of turnover and the supplier's attitude towards the buyer, which in turn is manifested in responsiveness and interest in cooperation (see Figure 2). This finding also corresponds to the identified risk sources in section 4.1. What has to be taken into consideration, however, is that the indicators found are inverse indicators: the higher the share of turnover, for example, the lower the strategic supply risk. Based on the results of the applied indicators, the task falling to companies is to handle their strategic supply risk, by specifying the tactics that can be applied if someone in the firm notices an emerging supply risk.

4.3 Cooperation, detailed contracts and strategy alignment as tools to counter strategic supply risk

In order to determine how to handle strategic supply risk, tactics available to mitigate strategic supply risk were also discussed during the workshop. Coding of tactics for counteracting strategic supply risk revealed that the general approach is to reduce the sources of strategic supply risk rather than to mitigate its detrimental effects. Moreover, simply accepting strategic supply risk was not regarded as an appropriate response.

The one tool identified that targets mitigation of risk effects is to qualify one or more alternative sources of supply. This does not decrease a company's strategic supply risk with a particular supplier, but it can alleviate the negative impact of not being a preferred customer.

However, we can imagine a possible indirect impact on strategic supply risk: if the supplier is aware that the buyer has (introduced) alternative sources of supply and that switching suppliers for the buyer is easy, the supplier might increase its customer retention effort. All other risk tools disclosed through the data analysis are risk reduction strategies and revolve around five distinct themes.

One way of tackling strategic supply risk is to collaborate with the supplier in order to create an interdependence situation with mutual benefits. Examples of this strategy are engaging in reference projects, establishing a purchasing cooperation, creating a connection between supplier and buyer through a joint supervisory body, and embarking on joint development projects.

Another grand theme deals with contract design. According to the analysis, reduction of strategic supply risk can be achieved through the application of watertight contracts. The underlying logic is that unclear formulations or contracts, leaving important aspects unregulated, are prone to increase opportunism and therefore the buyer's strategic supply risk. Therefore, buyers should, for example, strive to conclude partnership contracts including the right of first refusal, outline agreements including price guarantee, and exclusive contracts. Admittedly, this might not increase the buyer's attractiveness, but it may ensure preferential treatment.

In addition, the results show that a good working personal relationship between the buyer's and the supplier's staff is essential for successful management of strategic supply risk. This can be achieved by ensuring a good match between the supplier's sales agent and the buyer's purchasing agent, and communicating intensively with the senior management of the supplier, among others.

The fourth risk reduction tool found is to ensure a match between the roadmaps/strategies of buyer and supplier. The reasoning is that similar roadmaps/strategies indicate similar corporate interests and courses of action. Suppliers will treat like-minded buyers preferentially, as a conflict of interest is less likely. The first step for buyers in applying this tool would be to compare their own roadmap/strategy to the supplier's and check if their strategies are a potential source of strategic supply risk. Subsequently, the results have to be discussed with the supplier in order to match interests and resolve potential future conflicts. An annual meeting with senior supplier management is an example of how this could be accomplished. If the supplier is not interested in cooperating, it might be a sign of high strategic supply risk as shown in the previous chapter. In the best case, roadmap compatibility would be considered a supplier selection criterion.

Since a low buyer contribution to a supplier's turnover has been identified as an indicative source of risk, it is not surprising that increasing the purchasing volume is the fifth risk reduction tool noted. Increasing the volume with one supplier makes single source strategies more likely. In addition, bundling purchasing volume is a promising method for becoming a preferred customer.

To sum up, the data analysis revealed one method for mitigating risk (qualifying alternative sources) and five methods for reducing strategic supply risk: increase of purchasing volume, matching business strategies, functioning inter-personal relationships, watertight contracts and cooperation/ interdependence.

5. Discussion and literature contribution: sketch of a strategic supply risk management system

The present paper introduces the concept of strategic supply risk, the risk of not being supplied as well as other customers of a particular supplier or not being supplied at all. In an explorative workshop with 13 firms and employing the world café method the first draft of a supply risk management system to handle strategic supply risks was developed.

What then might a holistic strategic supply risk management system look like? More precisely, (1) What are the main sources of strategic supply risks, (2) how can they be monitored, and (3) which tactics can help to mitigate strategic supply risks?

1. Since differences in the strategic orientations of the buyer and supplier were considered a major source of strategic supply risk, managers would benefit from focusing on the compatibility of the buyer's and supplier's goals and interests, even at the point of selecting potential suppliers. It goes without saying that to do so buyers would need to have a clear strategy themselves, as only then could differences in strategy be identified. Second, buyers would benefit from analyzing their treatment of the supplier by asking themselves: is the supplier treated fairly and as a partner or is it squeezed for profits?
2. When it comes to indicators, buyer monitoring and assessment efforts should be concentrated on the supplier's responsiveness, cooperation, treatment and turnover. Lengthening response times, little reaction to suggestions for improvement and diminishing service quality would all seem to be indicators of low responsiveness and, therefore, of strategic supply risk. Moreover, the supplier's formal treatment of the buyer has to be assessed, for example by evaluating the contact person's position in the supplier organization. Finally, buyers could monitor whether their share of the supplier's turnover

drops below ten percent and should compare their turnover share to that of their competitors.

3. Risk can be mitigated by identifying alternative sources of supply. With respect to the risk reduction tools, the study provides managers with five important tools: contract design, cooperation, strategy alignment, relationship development and purchasing volume. Detailed, long-term and exclusive contracts would seem to potentially reduce strategic supply risk. Moreover, joint development projects, reference projects and reverse rating can strengthen cooperation between buyer and supplier. Establishing strategy compatibility as a criterion for supplier selection, engaging in joint roadmap/strategy development with the supplier and scheduling meetings to discuss strategic issues can be considered promising tools. Further, buyers should work on the personal relationships between their staff and the supplier's staff. Finally, increasing the purchasing volume offers another tool to counteract strategic supply risk.

As a managerial conclusion, an effective strategic supply risk management system as depicted below in Figure 2 could be designed. It should be borne in mind that supply risk management is to be understood as a recurring process, and that awareness not only of the indicators themselves, but changes to those indicators is important for managing strategic supply risks, as changes indicate increasing or decreasing risks.

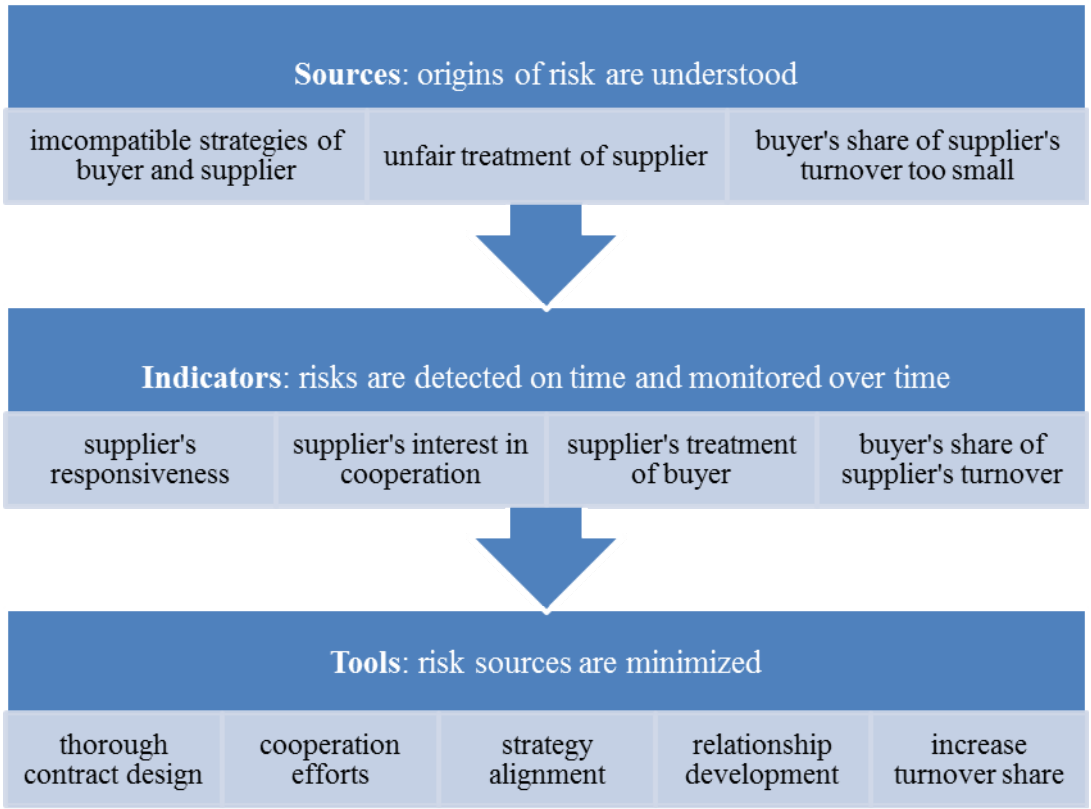


Figure 2 Draft of a strategic supply risk management system

Being sensitive to strategic supply risks may also require a change in attitude towards suppliers, with buyers thinking in terms of customer attractiveness and supplier satisfaction and picking up the idea of "reverse marketing" (Leenders and Blenkhorn, 1988). Finally, purchasing managers may have to know more about their suppliers; for instance, in order to be able to estimate their share of supplier turnover and understanding which of their firm's competitors share a supplier.

Through introducing strategic supply risk and developing a corresponding risk management system, this paper contributes in at least six ways to the extant literature:

1. To the best of our knowledge it is the first time that the risk of a buying firm not being treated as well as its competitors by shared suppliers is treated as a distinct type of supply risk. More specifically, this study enriches the literature on supply risk management by being the first to approach risk management from a preferred customer perspective.
2. Further, this research adds to the literature on supply risk management by embedding strategic supply risk into a holistic supply risk management system consisting of the three steps for identification of risk sources, measuring emerging risks with the help of key performance indicators and proposing risk mitigation tactics. In operationalizing strategic supply risk management, firms are provided with preliminary guidelines on how to manage the risk associated with not being a preferred customer.
3. In going beyond simply examining a particular type of risk, the encompassing research approach to identifying sources and indicators of strategic supply risk *and* the tools available to counter it, enriches supply risk management literature by providing a holistic approach to risk management, while large parts of previous research concentrate solely on the identification of sources of risk. Future research, if not choosing a holistic approach, as well, should at least concentrate on filling the general gap in risk indicators and test efficient mitigation tactics.
4. The results suggest that being a preferred customer is not an individual phenomenon but can be traced to three sources. These are buyer strategy, treatment of the supplier and purchasing volume with the supplier. Hence, this study connects what seemed to be separate phenomena: the buyer can influence supply risk by selecting important suppliers and treating them accordingly.
5. The concept of strategic supply risk enriches the growing literature on customer attractiveness, supplier satisfaction and preferred customers by adding a risk dimension to the phenomenon, thus providing an avenue for future research as well.

6. Finally, from a methodological perspective, employing a world café as a method of explorative enquiry revealed itself to be a viable way of accessing and processing data. Compared to a series of interviews, a world café is not only less time-consuming, but also allows for interaction among the experts, not merely bilateral and successive conversations with a researcher and several interview partners.

6. Limitations and next steps

Sixteen purchasing managers participated in the workshop which constitutes a rather small sample. Also, as is typical of qualitative and explorative research, questions of representativeness of the sample arise. In addition, only purchasing managers took part in this research. The outcomes might have been different if it had been sales managers discussing whether they treat particular buyers preferentially and why. Further, all participants were from German-speaking countries and represented a limited range of industries. Therefore, caution is asked about making inferences about other industrial settings and cultures.

Future research should test the findings of this study with a larger and more representative sample incorporating the supplier's perspective. Furthermore, the indicators identified, such as supplier's responsiveness, and tools such as strategy alignment require further operationalization. How can they be measured correctly? How frequently should companies monitor the different risk sources? In addition, threshold values indicating what degree of strategy compatibility is decisive for achieving a preferred customer status, for example, still need to be developed.

Chapter 4

Developing and evaluating an effective supply risk management system

1. Introduction

Supply risks are increasingly widely recognized, both in the academic discourse and in practical application. The field of supply risk management emerged for two main reasons: (1) recent crises and catastrophes, and (2) modern supply chains which are inherently more vulnerable than traditional integrated production methods (Wagner and Bode, 2008). The complexity of modern supply chains and the increased reliance on the competitive advantage created by the supply chain as a whole inevitably leads to an increased exposure to supply risks. Therefore, supply risk management is developing into a distinct area in supply chain management research (Kleindorfer and Saad, 2005; Narasimhan and Talluri, 2009). For instance, between 2006 and 2009 the number of papers published in academic journals contained in the SCOPUS database has quadrupled. Practitioners' interest in supply risk management has risen due to the severe economic downturn in 2009. However, considering the inevitability of business cycles, supply risk management should be a topic of enduring importance.

According to Zsidisin, Ellram, Carter and Cavinato (2004, p. 397) supply risk is "*the potential occurrence of an incident associated with inbound supply from individual supplier failures or the supply market, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety*". Supply risk management is about the minimization of such risks while exploiting opportunities by aligning organizational processes and decisions (Narasimhan and Talluri, 2009). Reflecting the new situation of increased exposure to supply risk, firms are implementing supply risk management systems. However, the relationship between supply risk and supply chain performance has rarely been empirically tested. Current knowledge is not sufficient and even such empirical research that does exist is descriptive (Wagner and Bode, 2008). Firms desire a comprehensive supply risk management system in order to identify risks, monitor them on a regular basis and finally implement mitigation strategies. Currently, most research either describes the different supply risk management phases, or has largely focused on the content or process of single stages of such a system.

Considerable efforts have been directed at the first step of designing an effective risk management system, namely risk identification. A wide range of supply risk sources are identified in the literature, ranging from environmental risks (such as catastrophes) to more supplier-oriented risk sources (such as quality and logistics problems) (Hallikas et al., 2004; Jüttner and Ziegenbein, 2009; Moder, 2008; Norrman and Jansson, 2004; Schoenherr et al., 2008; Zsidisin et al., 2000; Zsidisin et al., 2008).

It is important for firms to know which risk sources exist. However, the next step is to measure them in time to react. For instance, there are clearly country-related risks. Changes in indicators such as corruption indices might point to likely future problems. Few researchers stress the importance of monitoring risks pro-actively and regularly (Dani, 2009; Hallikas et al., 2004; Norrman and Jansson, 2004). A first attempt to start with the development of indicators for regular risk measurement has been proposed by Blackhurst, Scheibe and Johnson (2008), but they conclude that risk monitoring "*has received the least attention by supply chain risk researchers and the literature has shown little focus on the tools necessary for temporal risk monitoring*".

Finally, being aware of potential risk sources and measuring their incidence through indicators sets the foundation for the third element of an effective supply risk management system: taking action to mitigate these risks. Supply risks can be diminished, counteracted, eliminated or accepted (Hallikas et al., 2004; Norrman and Jansson, 2004; Schoenherr et al., 2008). For doing so, several authors propose risk mitigation strategies, such as inventory increase and buffers, or alliance relationships on the one hand and multiple-sourcing strategies on the other (Chopra and Sodhi, 2004; Jüttner et al., 2003; Zsidisin et al., 2000).

Several authors have made a start by conceptualizing the process of an effective supply risk management system (see e.g. Dani, 2009; Knemeyer et al., 2009; Norrman and Jansson, 2004; Zsidisin and Ritchie, 2009), and although there are partial models focusing on single elements of a supply risk management system, comprehensive models are largely missing (Zsidisin and Ritchie, 2009). All three elements – supply risk sources, indicators for risk monitoring and mitigation strategies – have rarely been analyzed in conjunction, let alone been empirically tested. The most holistic model is that of Moder (2008), but even in that indicators for measurement are largely missing. Therefore, the objective of this paper is to develop a comprehensive supply risk management system and to test it empirically. More specifically, we address the following research questions: *Which variables in terms of: (1) considered risk sources; (2) indicators for risk monitoring; and (3) risk mitigation strategies are needed for a firm to set up an effective supply risk management system?*

To address these questions, this paper describes the design of a holistic supply risk management system. First, we discuss previous findings from the literature. Next, we filled in the missing elements through an explorative research approach. This paper relies on the results of two workshops involving thirteen firms and employing speed consortium benchmarking: a combination between consortium benchmarking (Schiele and Krummaker, 2011) and the world café discussion method (Brown and Isaacs, 2005), i.e. parallelized small group discussions. The

identified elements of this "ideal" supply risk management system were consequently employed as input for a survey to identify the practices used by firms that successfully minimize risk.

As a result, we identified twenty-four variables that contribute to supply risk management performance and that can be used as management blueprint for assembling individual supply risk management systems. An interesting finding was that the identification of risk sources alone does not directly contribute to supply risk management performance. Only monitoring risks with adequate indicators and applying mitigation strategies will reduce risk induced problems, the first phase of observing risk sources contributing but indirectly.

This finding should prompt researchers to redirect their efforts: away from the current focus on identifying and classifying ever more risk sources, but focusing on firms' monitoring and mitigation strategies.

This paper is structured as follows. First, we will discuss risk sources, risk indicators for monitoring and risk mitigation strategies in order to derive a conceptual framework. Next, we elaborate on the set of qualitative and quantitative research methods employed and the results of our empirical test. Finally, we draw conclusions for both management and theory, and propose future directions for research.

2. Prior literature and conceptual model

2.1 Supply Risks

Researchers have paid ample attention to the identification and classification of various supply risks. Different risk categorizations can be found in the literature. Tang (2006) describes operational risk and disruption risk. Operational risks include uncertainties, such as demand, supply and cost. Disruption risks include disasters and economic crises. Das and Teng (2001, p. 253) describe relational risk and performance risk for inter-firm alliances. Relational risk is "*the probability and consequences of not having satisfactory cooperation*" and performance risk is "*the probability and consequences that alliance objectives are not achieved, despite satisfactory cooperation among partner firms*". Another distinction that can be made is the difference between risk sources and risk outcomes (Zsidisin, 2003). Risk sources are either individual supplier failures or market characteristics. Kleindorfer and Saad (2005) classify risks as disruption risks (caused by events such as strikes and natural disasters) and supply and demand coordination and uncertainty risks. Seven risk categories, including disruptions, delays and inventory risks, are identified by Chopra and Sodhi (2004). Schoenherr et al. (2008) use product characteristics (quality and cost), partner characteristics (service and management capabilities)

and environment characteristics as a way to classify risks. Johnson (2001) distinguishes between two types of supply risks: capacity limitations and supply disruptions. Jüttner et al. (2003) identify environmental, network related, and organizational risk sources. Environmental risk sources refer to uncertainties in the interaction between the supply chain and its environment. Network-related risk sources are associated with the interaction between organizations within the supply chain. Organizational risk sources arise from within the organizations in the supply chain.

The first distinction we can recognize from these various risks is the distinction between environmental risk sources and risk sources related to the specific buyer-supplier relationship (Jüttner et al., 2003; Knemeyer et al., 2009; Schoenherr et al., 2008). Risk sources related to the buyer-supplier relationship arise either at the supplier or within the relationship. They can be further subdivided into operational, strategic and financial risks (see figure 1). We will discuss each of the four risk categories below.

Based on the work of Zsidisin (2003), and Manuj and Mentzer (2008), we define supply risk as "*the change of undesired events associated with the inbound supply of goods and/or services which have a detrimental effect on the purchasing firm and prevent it from meeting customers' demand within anticipated cost and time*".

- **Environmental risk sources** can be defined as possible events in the environment of the buyer-supplier relationship that have a detrimental effect on the purchasing firm. Terrorist attacks (Chopra and Sodhi, 2004; Kleindorfer and Saad, 2005; Schoenherr et al., 2008), industrial/labor strikes (Chopra and Sodhi, 2004; El-Sayegh, 2008; Schoenherr et al., 2008) or natural disasters (Chopra and Sodhi, 2004; El-Sayegh, 2008; Kleindorfer and Saad, 2005; Schoenherr et al., 2008; Zsidisin et al., 2000) are all examples of environmental risk sources. Environmental risks affect all firms operating in their respective markets, independent of the quality of their individual buyer-supplier relations.
- **Financial risk sources** are for instance the financial instability and financial failure of suppliers (Zsidisin et al., 2008). Wagner and Bode (2008) state that supplier business risks primarily concern financial instability and the consequences of supplier default, insolvency or bankruptcy. Supplier bankruptcy is also described as a risk source by Chopra and Sodhi (2004). Schoenherr et al. (2008) identify supplier risk as the risk of a supplier going bankrupt or otherwise out of business as a consequence of poor management. The risk of a supplier's financial instability is also described by Neiger, Rotaru and Churilov (2009); and Zsidisin et al. (2000). Therefore, we describe financial risk sources as the chance on supplier default, insolvency or bankruptcy, that have a detrimental effect on the purchasing firm.

- Many of the risk sources related to the supplier relationship are **operational risk sources**. For instance, Neiger, Rotaru and Churilov (2009) identify six supply chain risks, such as a supplier's inability to conform to specifications or non-standardized workflow in communication with the supplier. Schoenherr et al. (2008) identify amongst other factors the risk that a supplier is unable to deliver according to specifications and required standards, on-time and on-budget delivery, order fulfillment risk, engineering and innovation capability and supplier's supplier management. Zsidisin (2003) and Zsidisin et al. (2008) identify, among other factors, incoming product quality problems, the supplier incorrectly interpreting requirements, an inability to supply significantly increased volumes when demanded and difficulties in sharing information electronically with suppliers as possible risk sources. All such risk sources can be classified as "operational risks": they arise because the supplier is willing, but unable to produce and act according to the buyer's requirements. Therefore we define operational risk sources as the inability of a supplier to live up to the buyer's requirements, having a detrimental effect on the purchasing firm.
- The final risk category we can characterize as supplier relationship risk sources is termed "**strategic risk sources**". They concern the strategic orientation of the supplier: the supplier might be able but unwilling to comply with the buyer's wishes. Zsidisin (2003) differentiates between supplier obligations to other customers and relationship issues. Neiger et al. (2009) describe the risk of poor supplier's collaboration with the buyer and the risk of a supplier becoming a competitor. Chopra and Sodhi (2004) also describe the risk of a supplier integrating vertically with a competitor. Opportunistic behavior is another type of strategic risk described by Wagner and Bode (2008). Zsidisin et al. (2008) describe the possibility of suppliers putting the buyer on allocation, pass-through pricing and the inability to influence suppliers. We define strategic supply risk sources as the chance of not being treated as a preferred customer, having a detrimental effect on the purchasing firm. Whereas financial and operational risk sources affect all customers of a certain supplier, strategic risk only troubles some customers, as the supplier deliberately chooses not to comply with the specific requirements of this customer.

These four types of risk sources- environmental, financial, operational and strategic – allow researchers to collate the risk sources discussed in the literature and then to use them as a basic classification scheme with which to structure supply risk management systems (figure 1).

Within the supply chain risk management literature, risk identification and assessment are frequently discussed as the first step of a risk management process. Risk assessment is generally described as evaluating or calculating the probability of the occurrence of an unwanted event,

and its impact (Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad, 2005; Knemeyer et al., 2009; Norrman and Jansson, 2004; Zsidisin et al., 2000).

Knowing what the potential risk sources are, though, is not enough to manage risks. Risks need to be made visible through their measurement, using suitable indicators, as discussed in the next section.

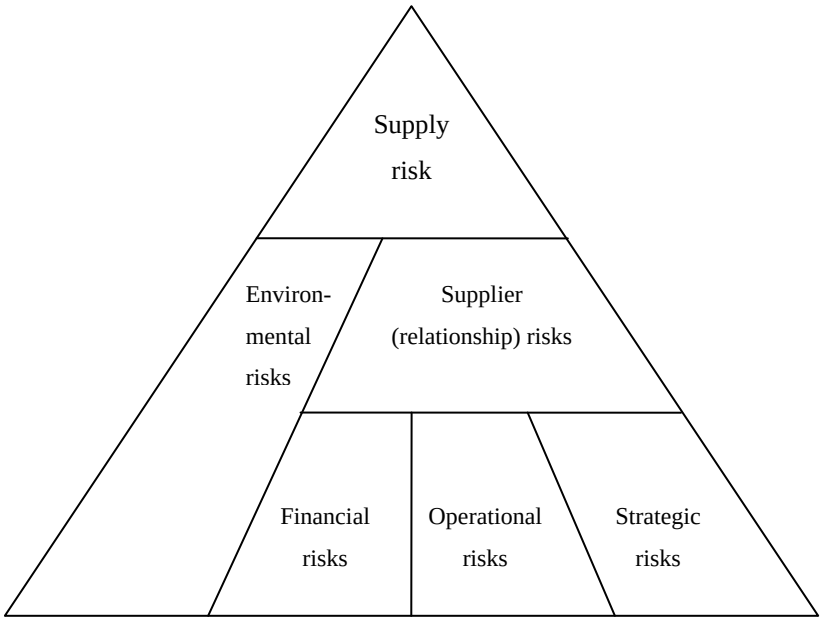


Figure 1 Supply risk classification

2.2 Supply Risk Monitoring

A frequently neglected phase in supply risk management processes is risk monitoring. Risk management is a dynamic process (Wagner and Bode, 2008); the probabilities of unwanted events occurring can change over time, as can the impact these event can have (Hallikas et al., 2004). However, monitoring risk is necessary as it can provide an early warning when risk levels are rising, giving companies time to react to changing circumstances by refining their mitigation strategies. Monitoring is treated as regular risk identification and assessment (Hallikas et al., 2004; Norrman and Jansson, 2004). Monitoring can be a very time-consuming process and it is therefore not feasible for companies to monitor all their different supply chain risks. Scarcity of resources force firms to select a limited set of risks to monitor on an ongoing basis. Also, we emphasize that measurements are needed for the monitoring of these risk sources. Monitoring may not only be an ongoing assessment of the probability and impact of certain risks, but companies should be able to use data that indicate if the probability of an unwanted event occurring is rising. Such indicators function like a traffic-light, in having a signaling function. Blackhurst et al. (2008) developed a risk assessment and monitoring system to track risk indices

over time for an automotive manufacturer. A heat graph was designed in which risk scores are calculated for certain parts or suppliers, using measures such as “defects/million”, “product complexity” and “supplier bankruptcy”. These risk indices are monitored over time by constructing trend graphs, to show if a risk is still within acceptable levels but rising. So far, there have been few other studies discussing indicators for risk monitoring. Therefore we will use explorative techniques to identify possible indicators.

2.3 Supply Risk Mitigation Strategies

Risk mitigation comprises the actions that can be taken to manage supply chain risks. Mitigation strategies can include multiple sourcing, increasing flexibility, pooling demand, supplier development, supplier audits and increasing inventory (Braunscheidel and Suresh, 2009; Chopra and Sodhi, 2004; Zsidisin et al., 2008).

An important distinction in supply risk mitigation strategies is the distinction between re-active and pro-active risk management (Dani, 2009; Knemeyer et al., 2009; Moder, 2008; Norrman and Jansson, 2004; Zsidisin et al., 2000). Re-active mitigation strategies do not diminish or eliminate risks: they counteract risk effects in response to an undesired event. Buffering and insurance are such reactive risk mitigation strategies: they do not prevent risks from arising but they can absorb the possible negative effects of risks. Pro-active risk mitigation strategies are strategies to diminish or eliminate risk sources, such as multiple sourcing or not buying in critical countries. But pro-active risk management is more than having pro-active risk mitigation strategies. It also concerns the risk management process. Whereas pro-active mitigation strategies are about avoiding unwanted events, a pro-active risks management process is concerned with predicting supply chain risks (Dani, 2009; Moder, 2008). A pro-active risk management process should be able to monitor risks on an ongoing basis, it should provide an early warning if the probability of unwanted events increases (or decreases), resulting in a cumulation of pro-active risk mitigation strategies taken on time.

2.4 Conceptual Model: a Supply Risk Framework

Based on the above mentioned literature we argue that an efficient risk management system consists of three elements (figure 2): (1) identification of risk sources to be monitored on a regular basis; (2) indicators needed to monitor these risk sources; and (3) re-active and pro-active risk mitigation strategies. Risk sources, indicators and mitigation strategies can be defined for environmental, financial, operational and strategic risk sources.

This conceptual framework was discussed with firms participating in the workshops and subsequently tested through a survey, as we will describe in the next section.

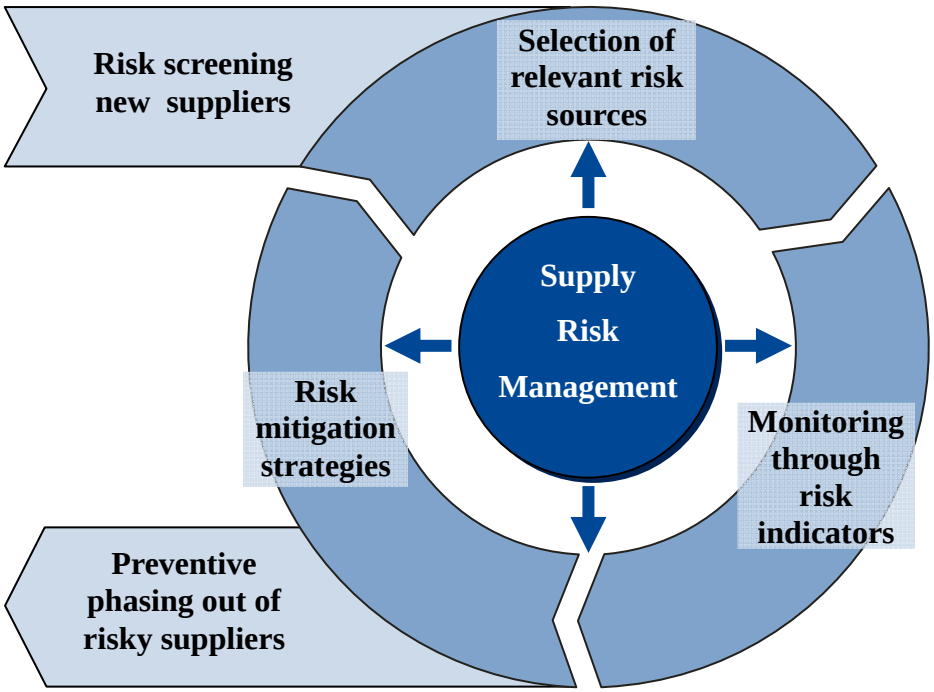


Figure 2 Supply risk management model

3. Research methodology

3.1 Method and data collection

Method. For this research, we used multiple methods: an exploratory, qualitative world café workshop and a quantitatively oriented, testing survey. Supply chain risk management is a comparatively recent research topic and the field of supply risk monitoring remains especially underdeveloped. Also, little is yet known about the relationship between different supply risk management actions and supply risk management performance. In such an under-researched area an exploratory research design seemed to be most suited for this research (Yin, 2009).

Besides this lack of academic research, supply risk management is a topic with a strong practical orientation. Unfortunately, the pace of academia as compared to practice is rather slow. The current economic crisis has forced many companies to act quickly to avoid or overcome supply risks. Therefore, to meet the call of practice for a quicker pace we needed a new type of research design.

The strong practical orientation coupled with a lack of academic research suggests an academic-practitioner collaborative research approach. This means uniting industry and

academia in a research partnership, thereby reflecting a growing trend in management research (Hatchuel, 2001; Tranfield et al., 2004; Trim and Lee, 2004). We used a speed consortium benchmarking project, combining a world café workshop with a survey. The consortium benchmarking method uses an academic-practitioner consortium to discuss the research question by jointly visiting best practice firms (Schiele and Krummaker, 2011). We used the world café method for the consortium discussion, as the world café allows us to explore and capture the knowledge of larger groups in a short period of time, and is a powerful conversational process leading to constructive dialogue and collaborative learning (Brown and Isaacs, 2005; Tan and Brown, 2005). The world café uses café tables on which participants simultaneously discuss the research topics. Several rounds of conversations are held. After each round, participants move to another table, so changing the group composition for each round (Brown and Isaacs, 2005). A subsequent survey allows us to validate the explorative workshop's findings for a larger population.

We formed a research consortium of 16 participants, whose knowledge was accessed in a one day workshop using the world café method. In the workshop, we used a list of risk sources derived from the literature as input for the world café discussions. Participants were asked to comment on these risk sources and discuss possible indicators and mitigation strategies to manage the risks. We used four discussion tables. Each table had a discussion leader and discussed one of the risk types (environmental, financial, operational and strategic). In four discussion rounds of approximately 40 minutes each, participants discussed the possible risk sources, indicators and mitigation strategies. Each participant sat on each discussion table only once, but not in a pre-specified order, so the group compositions changed for each round.

Data collection. After the discussions, participants were given the opportunity to assign points to each of the risk sources, indicators and measures identified during the discussions. Points were given in accordance to the importance of each issue. Participants were allowed to award as many points as they thought justified. This resulted in a list of risk sources (20), indicators (21) and mitigation strategies (22) that were considered to be the most important by the firms within the research consortium. These points were taken over in the subsequent survey.

In the survey, general company data and data about the respondent's position in the firm were also obtained. The survey was sent by email to those employees responsible for supply management in several German-speaking countries, yielding responses from Germany, Austria, Switzerland and Luxembourg. The email contained a link to a homepage with the questionnaire. For the survey, the database of BMEnet - an organization linked to the German association of materials management, purchasing and logistics (BME) - was used. In addition, the survey was

also sent to the customer database of h&z, a German consultancy firm with whose support the above mentioned workshop was organized. The survey was also announced on the homepages and newsletters of these organizations. One single e-mailing was possible and all data were collected within one week. Then the link to the survey was closed. During the second workshop, the results of the survey were shown to the participants of the first workshop and discussed in more detail.

In total, the survey yielded 213 usable answers. Most of the respondents were supply managers (57 %); others were supply employees (23 %), staff (11 %), supply risk managers (5 %) and board members (4 %). On average, the respondents had spent 8.6 years at their companies. Respondents came from typical German industries: mechanical engineering (25 %), electronic and electrical engineering (14 %), automotive (12 %), chemical industry (6 %), services (14 %) and others (29 %). The average number of employees for the companies is 3.750 and the average turnover € 883 million. The turnover of all the participants together totals up to € 118.000 million, with a combined supply volume of € 71.000 million. The good level of participation in the survey indicates once again the importance firms attribute to effective supply risk management.

3.2 Measures and validation

For the survey, we used a five-point Likert scale. Respondents could indicate to what extent they identify specific risk sources and to what extent they use the various indicators and mitigation strategies mentioned above. Answers ranged from 1 “no, not at all” to 5 “yes, completely”, with 3 indicating “partly”.

Both SPSS and - because we use formative constructs - SmartPLS software (Ringle et al., 2005) were used to analyze the data. The dependent variable - supply risk management performance - was based on reflective items, whereas all other constructs were based on formative items. Supply risk management performance is the ability of the firm to avoid supply risks; recognize potential risks in good time to react; and in case of their occurrence, minimize the impact on the firm. The items are adopted from the items developed by Moder (2008); see appendix A. The three supply risk management phases examined in this research -selection of relevant risk sources, risk monitoring and risk mitigation- were extracted from former literature; yet, we could not find any items developed to measure these concepts. Therefore, these constructs are designed as formative: rather than being reflected by their respective items, these constructs are formed by the risk sources, indicators and mitigation tools identified in the first workshop, the direction of causality is from the items to the construct instead of the other way

around. For instance, operational risk monitoring is formed by all the indicators used for operational monitoring. As we are only interested in these items that contribute significantly to supply risk management performance, we left out these items that had no significant relation with their respective constructs (Diamantopoulos, 2001).

The instrument showed good statistical properties as the Cronbach Alpha of the dependent variable was 0.804. Also, the composite reliability was a satisfactory 0.871. This is well above the minimum requirement of 0.7 (Henseler et al., 2009).

To assess the construct validity of formative items, multicollinearity needed to be examined. The VIF-scores for the formative construct ranged from 1.00 to 1.34, showing that they represent no cause for concern, since none of them exceeds 3.3 (Diamantopoulos, 2001) Also the tolerances were well above the 0.2 threshold that could indicate potential reliability problems (Field, 2009), as the lowest tolerance was 0.72.

3.3 Analysis

The first workshop yielded 63 variables in total (see appendix A). In order to assess the influence of these risk sources, indicators and mitigation strategies on supply risk management performance we analyzed the data in two steps. First, backward regressions were calculated for each risk category (environmental, financial, operational and strategic) and latent construct (risk sources, indicators and mitigation tools), to assess which of the 63 indicators really contribute to supply risk management performance. For each regression, variables were removed from the model when they did not contribute significantly to how well the model predicts supply risk management performance. These 12 regressions yielded 24 variables that contributed significantly to supply risk management performance, which were subsequently used as formative items for their respective constructs in the second step of the analysis.

Second, a PLS model was constructed for each risk category to determine the relationships between the different constructs; see figure 3 (the model for environmental risks) as an example. Missing values were dealt with by mean replacement. The significance of the path coefficiencies was determined by applying a bootstrapping procedure (213 cases, 1000 samples).

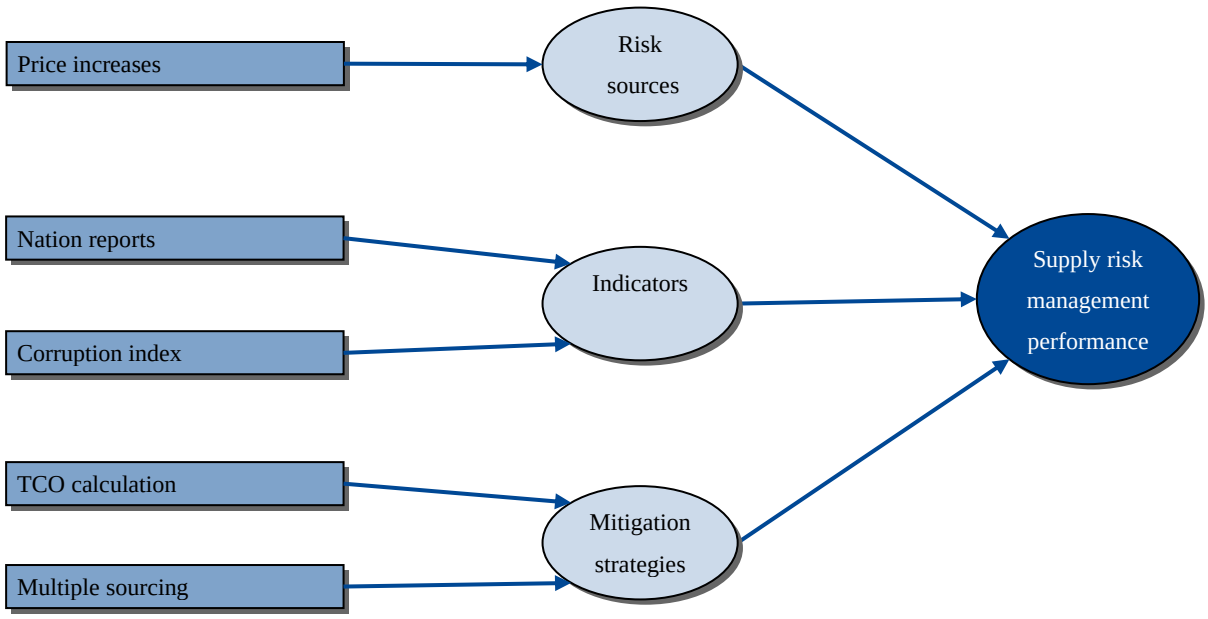


Figure 3 Example: PLS model environmental supply risks

For variables that are used similarly often by both successful and unsuccessful firms, the contribution to successful supply risk management cannot be assessed by this means. Still, we included those variables – duly marked – in the tables below, if they had a mean of 3 or higher in the 5 points scale, i.e. if all firms use these variables. Such variables might not display any variance between successful and unsuccessful firms (when split based on the mean score (3.21) for supply risk management performance) and therefore are not revealed by the regression analysis. However, we cannot conclude with statistical certainty that these variables do not need to be a part of a supply risk system and therefore, in a conservative approach, are reported here.

4. Results

Out of the 63 proposed variables, the regression yielded 24 variables that contribute to successful supply risk management, as can be seen in table 1. Only 5 risk sources should be investigated on a regular basis, the majority of variables a firm should use are supply risk indicators (9) and mitigation strategies (10). We will discuss these variables in this section on the basis of the different risk categories.

		Independent variables	B	SE B	β	R^2
Environmental	Risk sources	constant	2.18	0.30		0.06
		Price increases	0.24	0.07	.24 ***	
	Indicators	constant	2.50	0.15		0.13
		Nation reports	0.16	0.05	.24 **	
		Corruption index	0.13	0.06	.18 *	
	Mitigation strategies	constant	2.37	0.19		0.11
		TCO calculation	0.18	0.04	.28 ***	
		Multiple sourcing	0.09	0.05	.13	
Financial	Risk sources	constant	2.56	0.23		0.05
		Credit acquisition	0.13	0.05	.17 *	
		Supplier as victim of a take-over	0.09	0.06	.12	
	Indicators	constant	1.83	0.24		0.17
		Payment behavior	0.11	0.04	.18 **	
		Situation in the industry	0.17	0.06	.22 **	
		Equity ratio	0.12	0.05	.18 *	
	Mitigation strategies	constant	1.91	0.20		0.20
		Emergency plan	0.15	0.05	.21 **	
		On site risk audits	0.16	0.04	.25 ***	
		Supplier self-assessment	0.10	0.05	.15 *	
Operational	Risk sources	constant	2.73	0.19		0.04
		Manufacturing capabilities	0.15	0.06	.19 **	
	Indicators	constant	1.81	0.21		0.22
		Supplier assessment over time	0.18	0.06	.23 **	
		Outcome supplier process audits	0.21	0.05	.31 ***	
	Mitigation strategies	constant	1.53	0.21		0.27
		Risk pre-assessment	0.23	0.05	.34 ***	
		Supplier development	0.23	0.05	.29 ***	
Strategic	Risk sources	constant	2.85	0.17		0.03
		Production capacity	0.12	0.05	.16 *	
	Indicators	constant	1.88	0.25		0.14
		Changes in own turnover at supplier	0.19	0.06	.23 **	
		Market share supplier	0.17	0.06	.20 **	
	Mitigation strategies	constant	1.31	0.36		0.15
		Building trust (fairness)	0.14	0.08	.13	
		Intensify communication	0.14	0.07	.15 *	
		Increase competition	0.20	0.05	.26 ***	

*Table 1: Regressions * p < .05 ** p < .01 *** p < .001*

4.1 Environmental supply risks

From our research it appeared that companies do not explicitly monitor environmental risks like terrorist attacks, strikes or natural disasters (see table 2). Only price increases are monitored on a regular basis, which is done by almost all companies (mean 4.50). Both grip on raw material and currency exchange rate changes are also regarded by the majority of the companies. These indicators are used likewise by successful and unsuccessful companies, therefore our analysis cannot show the contribution of these variables to supply risk management performance. It is

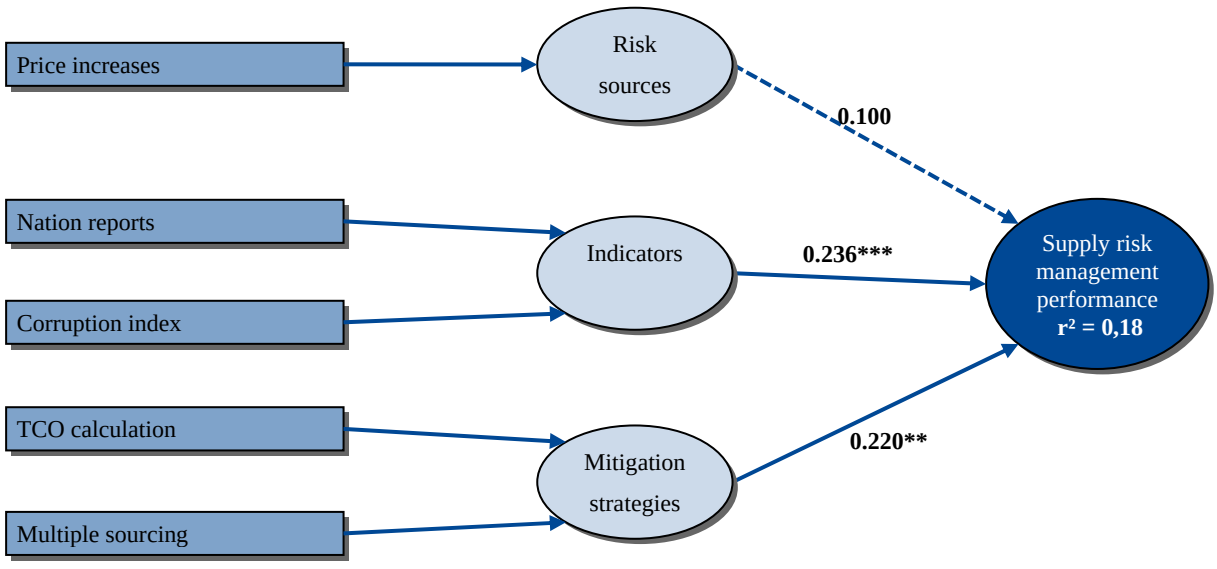
possible that these variables are important cornerstones for an effective supply risk management system. The same reasoning applies to avoiding critical countries as a mitigation strategy. In addition, total cost of ownership calculations and multiple sourcing are also used to mitigate environmental risks.

From figure 4 we learn that the following certain environmental risk sources over time does not directly contribute to successful supply risk management. However, the use of indicators for environmental risk monitoring and the use of mitigation strategies for environmental risk management do significantly influence supply risk management performance, together they are able to explain 18 %.

Environmental risks		Successful firms		Unsuccessful firms		t-value	df	Sig. of difference (2-tailed)
		Mean	S.d.	Mean	S.d.			
Risk sources	Currency exchange rate changes[1)]	3.83	1.27	3.63	1.28	1.11	200.00	0.267
	Price increases	4.50	0.83	4.21	0.96	2.32	187.36	0.021
	Grip on raw material[1)]	3.93	1.21	3.67	1.27	1.50	200.00	0.136
Indicators	Nation reports	3.03	1.33	2.41	1.21	3.44	199.00	0.001
	Corruption index	2.33	1.26	1.88	1.02	2.77	196.92	0.006
Mitigation strategies	TCO calculation	3.45	1.36	2.74	1.34	3.68	196.00	0.000
	Avoiding critical countries[1)]	3.51	1.26	3.52	1.21	-0.36	199.00	0.971
	Multiple sourcing	3.69	1.20	3.11	1.34	3.22	197.00	0.001

Table 2: Descriptive statistics environmental risks

[1)] No significant difference in use can be found between successful and unsuccessful firms, therefore analysis was not possible.



** p < .01, *** p < .001, ——→ significant path, - - - - → non-significant path

Figure 4 PLS analysis environmental supply risks

4.2 Financial supply risks

Three risk sources of financial problems are frequently regarded by successful and unsuccessful companies likewise: (1) deterioration of the order situation of the supplier, (2) the suppliers customer structure (few customers account for a high turnover), and (3) change in ratings (see table 3). They cannot be distinguished as influential for supply risk management performance, but might be a basic condition for a proper functioning supply risk management system. Problems in obtaining credit however, seems to be an important financial supply risk source to monitor over time. Another important financial supply risk source, although not used very often, is a change in ownership (supplier as victim of a takeover). If the take-over is done by a venture capitalist more dept capital is likely to be used. This can “scare” buyers and lead to less orders, with the consequence that the financial situation of the supplier deteriorates. Changes in the equity ratio are a good indicator to monitor such risks. Furthermore, the payment behavior of the supplier seems to be a good indicator to monitor financial risks, as is the -very often used- assessment of the specific situation in the industry of the supplier. Two out of three mitigation strategies for financial supply risks revolve about audits and assessments: both risk audits at the suppliers location as supplier self-assessment are useful for risk mitigation. Another, more reactive mitigation strategy is defining an emergency plan (to ensure for instance provision of materials or securing specific machinery by purchasing it).

Similar as for environmental risks, the choice to watch certain financial risk sources over time does not contribute to supply risk management performance (see figure 5). 24 % of that performance can however be explained by risk monitoring and risk mitigation, as they both show a significant relationship.

Financial risks		Successful firms		Unsuccessful firms				Sig. of difference (2-tailed)
		Mean	S.d.	Mean	S.d.	t-value	df	
Risk sources	Credit acquisition	3.36	1.20	3.05	1.10	1.86	197.47	0.065
	Deterioration order situation[1)]	3.88	0.93	3.84	1.05	0.27	199.00	0.785
	Unilateral customer structure[1)]	3.70	0.91	3.51	0.92	1.49	197.00	0.138
	Change in ratings[1)]	3.42	1.28	3.15	1.14	1.54	193.87	0.125
	Supplier as victim of a take-over[2)]	2.77	1.24	2.54	0.97	1.43	196.39	0.153
Indicators	Payment behavior	3.07	1.52	2.55	1.37	2.51	197.00	0.013
	Situation in the industry	4.06	1.00	3.49	1.17	3.62	182.70	0.000
	Equity ratio	3.62	1.16	3.14	1.34	2.68	196.00	0.008
Mitigation strategies	Emergency plans available	3.50	1.25	2.87	1.25	3.56	196.00	0.000
	On-site risk audits	3.64	1.38	2.87	1.35	3.95	198.00	0.000
	Supplier self-assessment	3.62	1.25	3.00	1.33	3.38	196.00	0.001

Table 3: Descriptive statistics financial risks

[1)] No significant difference in use can be found between successful and unsuccessful firms, therefore analysis was not possible.

[2)] No significant difference in use can be found between successful and unsuccessful firms, but explains success according to regression.

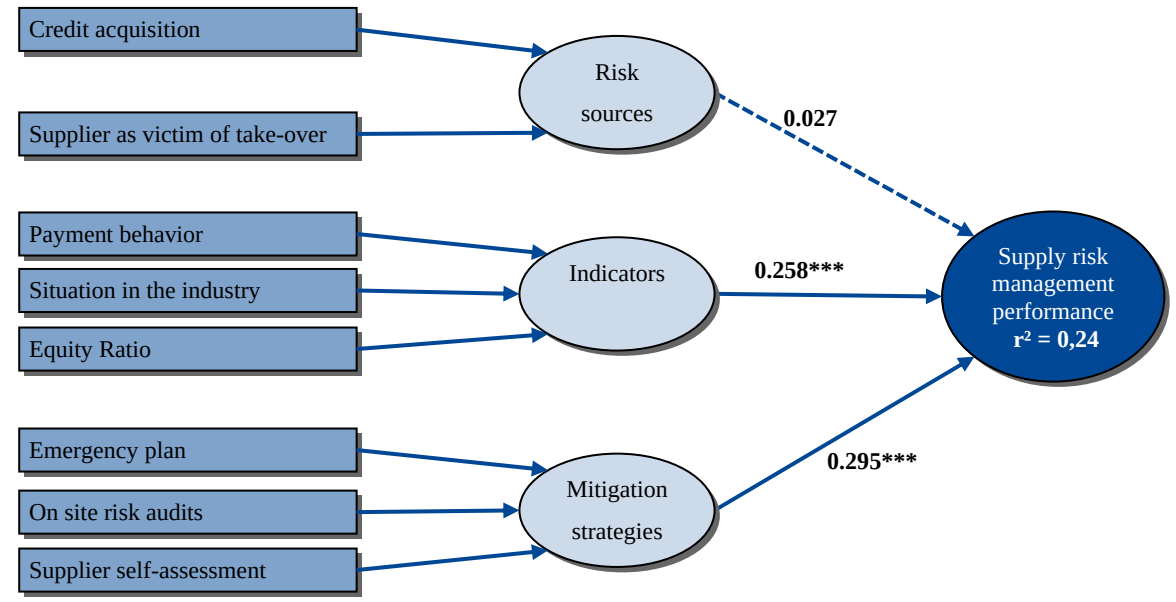


Figure 5 PLS analysis financial supply risks

4.3 Operational supply risks

We can only find one risk source that successful firms monitor more intensively than the less successful companies: lack of manufacturing capabilities (see table 4). The following risk sources do not differ significantly in use between successful and unsuccessful firms, but they might be crucial elements in a supply risk management system as well: supplier's lack of quality capabilities, poor logistic capabilities of the supplier, and communication failures (i.e. misunderstandings). It is very possible that these are fundamental risk sources to observe and are

therefore assessed by all companies. Furthermore, we can see that (changes in) the results of regular supplier assessments and the outcomes of process audits are oftentimes used to predict possible problems. And finally, risk oriented pre-assessment for new suppliers and supplier development are good strategies to avoid running in to supplier capability problems in the first place. In addition, keeping own inventory is a (reactive) mitigation strategy that all buyers in our sample seem to use frequently.

The PLS analysis in figure 6 shows that indicators and mitigation strategies for operational risks seem to explain 31 % of supply risk management performance, whereas the choice to regularly observe certain operational risk sources shows no significant relationship.

Operational risks		Successful firms		Unsuccessful firms		t-value	df	Sig. of difference (2-tailed)
		Mean	S.d.	Mean	S.d.			
Risk sources	Quality capabilities[1)]	3.20	1.11	2.98	0.99	1.49	196.00	0.139
	Purchasing logistics[1)]	3.49	1.17	3.26	1.07	1.47	196.00	0.143
	Manufacturing capabilities	3.23	1.03	2.80	1.09	2.86	197.00	0.005
	Communication failure[1)]	3.54	1.21	3.39	0.98	0.96	194.94	0.337
Indicators	Supplier assessment over time	4.30	0.97	3.56	1.20	4.74	176.89	0.000
	Outcome supplier process audits	3.83	1.21	2.93	1.28	5.16	199.00	0.000
Measures	Risk pre-assessment	3.92	1.15	2.98	1.26	5.50	198.00	0.000
	Supplier development	4.25	0.92	3.55	1.23	4.52	170.27	0.000
	Keeping own inventory[1)]	3.06	1.15	3.05	1.27	0.02	188.79	0.987

Table 4: Descriptive statistics operational risks

[1)] No significant difference in use can be found between successful and unsuccessful firms, therefore analysis was not possible.

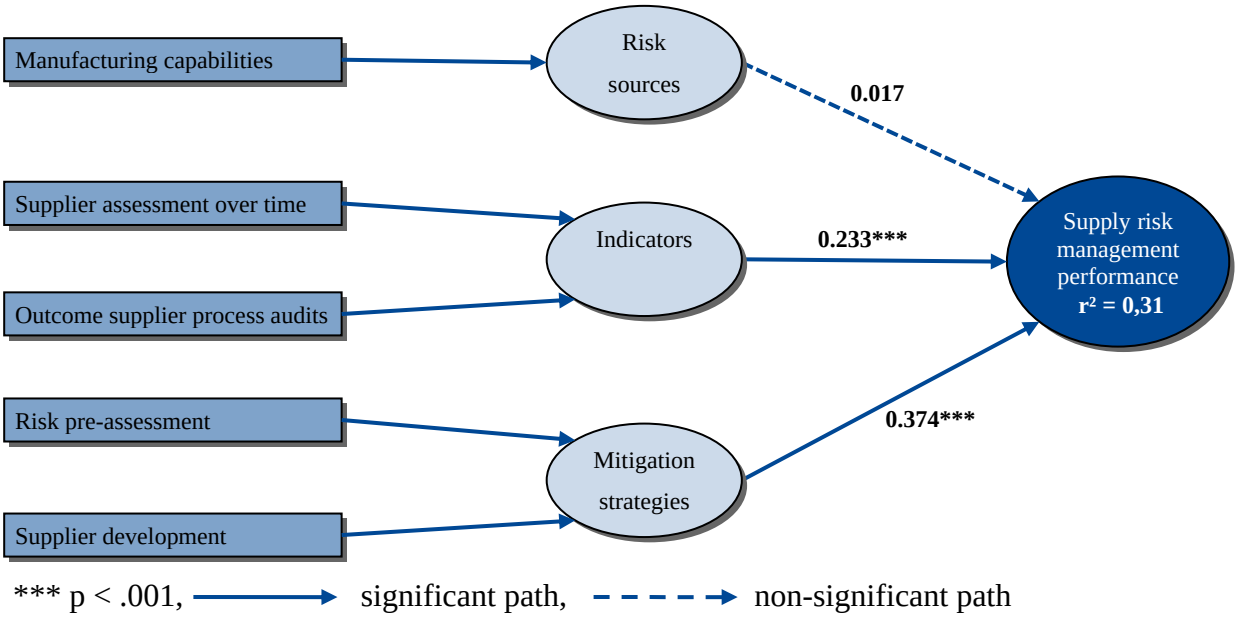


Figure 6 PLS analysis operational supply risks

4.4 Strategic supply risks

Both employee turnover at the supplier and dependency of the buyer are strategic risk sources that are regarded just as much by successful as by unsuccessful companies, and could therefore be basic requirements for a good supply risk management system (see table 5). The only strategic supply risk source which observation increases supply risk management performance is the total production capacity available on the market. What is more, changes in the buyer's turnover at the supplier is the most used indicator for monitoring strategic supply risks, followed by the market share of the supplier: they can both indicate if a supplier has more important customers to serve. In addition, the hierarchical position of the contact person at the supplier is used as an indicator by both successful and unsuccessful companies, therefore we cannot assess its importance for supply risk management performance. One rather surprising outcome is that both trust building and keeping up competition amongst suppliers are frequently used as strategic supply risk mitigation strategies. Also, intensified communication is used frequently and seems to improve supply risk management performance.

As figure 7 shows, the indicators and mitigation strategies used to manage strategic supply risks seem to be able to explain 21 % of supply risk management performance, whereas the choice to frequently regard certain strategic risk sources does not show a significant contribution.

		Successful firms		Unsuccessful firms				Sig. of difference (2-tailed)
Strategic risks		Mean	S.d.	Mean	S.d.	t-value	df	
Risk sources	Employee turnover[1)]	3.26	1.24	3.10	1.10	1.00	197.87	0.321
	Dependency[1)]	3.87	1.01	3.63	0.98	1.64	196.00	0.102
	Production capacity	3.25	1.20	2.81	1.11	2.72	197.00	0.007
Indicators	Changes in own turnover at supplier	4.25	0.97	3.72	1.14	3.49	181.90	0.001
	Market share supplier	3.76	1.08	3.14	0.94	4.30	194.82	0.000
	Hierarchical position of contact person[1)]	3.48	1.22	3.25	1.21	1.46	194.44	0.146
Mitigation strategies	Building trust (fairness)	4.48	0.64	4.14	0.92	2.98	158.41	0.003
	Intensify communication	4.30	0.80	3.94	1.08	2.64	167.34	0.009
	Increase competition	3.96	1.05	3.47	1.16	3.13	198.00	0.002

Table 5: Descriptive statistics strategic risks

[1)] No significant difference in use can be found between successful and unsuccessful firms, therefore analysis was not possible.

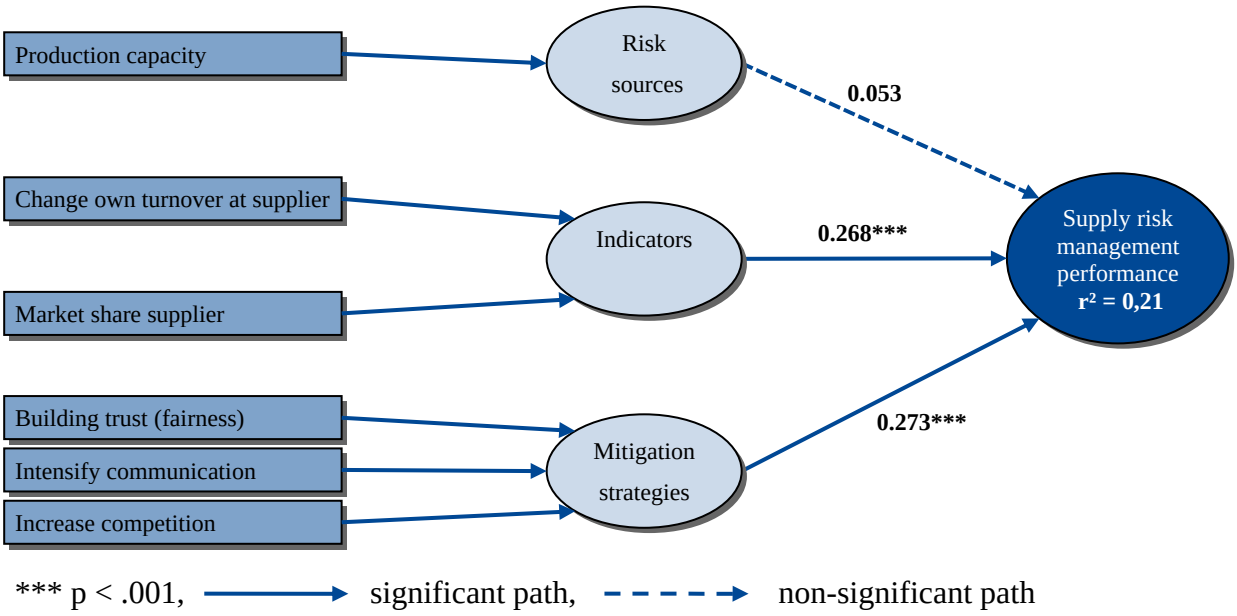


Figure 7 PLS analysis strategic supply risks

From the PLS models we can see that for none of the risk categories the choice to frequently observe certain risk sources seem to contribute directly to successful supply risk management. Contrarily, the use of indicators for risk monitoring and the use of mitigation strategies for all types of risk significantly increase supply risk management performance. The R^2 of 0.31 for the operational model indicates that operational indicators and mitigation strategies are the most important for successful supply risk management. Environmental variables are least important with an R^2 of 0.18. The financial and strategic models have R^2's of 0.24 and 0.21 respectively, showing that these variables explain more than 20 % of supply risk management performance.

5. Discussion and conclusion

5.1 Summary

Through a literature review and an exploratory world café discussion, we have identified risk sources, indicators and mitigation strategies that can be used in supply chain risk management for environmental, financial, operational and strategic supply chain risks. Using a survey we tested the effect of these variables on supply risk management performance. Out of 63 identified variables, we found that 5 environmental, 8 financial, 5 operational and 6 strategic variables contribute significantly to supply risk management performance. However, for none of the risk categories does the choice to regularly observe certain risk sources in itself contribute directly to supply risk management performance, as indicated by the non-significance of the

paths in all PLS models. Yet, both the use of indicators for supply risk monitoring and the use of supply risk mitigation strategies contribute directly to supply risk management performance.

With this research we give a more thorough description of the elements of supply risk management, thereby contributing to the need for effective supply chain risk management frameworks (Zsidisin and Ritchie, 2009). To the best of our knowledge, this study is one of the few to empirically test such an integrated supply risk management system (see e.g. Wagner and Bode, 2008), and the first in using practical variables to construct the three conceptual elements of risk sources, indicators and mitigation strategies.

How can companies benefit from these findings in their endeavor to develop an effective supply risk management system? First of all, it is recommended to indentify and assess possible risks, as is already amply described in the literature (Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad, 2005; Zsidisin et al., 2000). But it is not enough for companies to identify and assess their supply chain risks just once. Supply risk management is a dynamic process, since the probabilities of risks occurring are likely to change over time. Companies may want to choose which risk sources to monitor on a regular basis. To increase supply risk management performance, such monitoring should be carried out using early warning indicators. Unfortunately, the literature has not yet provide any indicators, beyond the indicators conceptualized by Blackhurst et al. (2008). Our findings contribute to the development of early warning indicators needed to anticipate supply chain risks before they emerge.

5.2 Theoretical implications

The literature gives ample attention to identifying (and assessing) risk sources, but our data seems to suggest that the pure observation of risk sources does not directly contribute to successful supply chain risk management. Suitable indicators are needed for monitoring these risk sources, since these indicators directly influence supply risk management performance. Although this research specifically focuses on supply risk management, it is not inconceivable that the use of specific early warning indicators can improve risk management processes in disciplines other than supply management as well.

Whereas most research in supply risk management describes different risk management processes (such as risk identification or assessment), little attention has been paid to empirically testing the relation between these specific processes and supply risk management performance (Ritchie and Brindley, 2007; Wagner and Bode, 2008), not to mention the exploration of the (practical) content of these management processes. Our scientific contribution lies in the relationships we identified between (1) the frequent observation of specific supply risk sources,

(2) supply risk monitoring with indicators, (3) supply risk mitigation strategies and supply risk management performance. Supply risk management performance seems to be determined by using indicators for risk monitoring and mitigation strategies for risk management. By identifying practical indicators and mitigation strategies that lead to successful supply risk management, we contribute to the development of supply risk management procedures, as called for by Ritchie and Brindley (2007) and Berg, Knudsen and Norrman (2008).

5.3 Managerial implications

We conclude that several indicators are useful for detecting risks. Our research has also identified several risk mitigation strategies that can be used in conjunction with these indicators. In the light of this, an effective supply risk management system can be designed. Using the identified indicators, companies can build an early warning system for supply risks. By investigating these indicators and implementing several mitigation strategies in conjunction for each risk category, these findings contribute to the development of an integrated, practical and effective supply risk management system. The literature so far has failed to provide any empirically tested system of this kind; the present research represents one of the few integrated systems that have been tested on a broad empirical basis.

Due to time and resource limitations, it is not possible for firms to monitor all the risks they face. Companies are forced to make a selection of risks to monitor on an ongoing basis, how to observe these risks and how to mitigate them. With this research input for such decisions is provided , as called upon by Zsidisin (2009).

6. Research limitations and future research

This research is subject to several limitations. First of all, the dependent variable “supply risk management performance” is based on subjective items. We asked respondents (for instance) how satisfied they are with their supply risk management and if they were able to minimize the occurrence of supply risks over the last few years. More objective performance measures - such as the percentage of risks companies were able to encounter- would probably extend the validity of our findings. Also, our methodology prevented the discovery of a best-practice case. Our findings reflect the average practice in supply chain risk management, yet a best-practice study would almost certainly promote the development of a successful supply risk management system.

More research is necessary, especially on the supply risk monitoring stage. Most of the indicators we identified are qualitative in nature, and we did not assess how companies use these indicators. The challenging question is how to operationalize these indicators in an effective and useful manner. How often should these indicators be measured? What are threshold values below (or above) which possible supply problems are to be expected? A second direction for future research could be the focus on industry differences. Risk sources, indicators and mitigation strategies are likely to vary between industries: supply risk management systems should be adjusted to these differences. A sector-specific approach could lead to more pragmatic supply risk management systems. A final research direction concerns the evaluation of supply risk mitigation strategies. Besides monitoring risks, the risk indicators identified in this research might also be suitable for evaluating supply risk mitigation strategies. A good pro-active mitigation strategy should decrease risks, which should be visible in the course of the indicators (i.e. leading to less “early warnings” once a certain pro-active mitigation strategy is implemented). Future research can assess the usability of indicators as a supply risk mitigation evaluation tool.

Chapter 5

Enhancing supply risk management performance: a transaction cost and social exchange theory perspective

1. Introduction

Supply risk management is developing into a focus area in supply chain management research (Kleindorfer and Saad, 2005; Narasimhan and Talluri, 2009). The field of supply risk management gained prominence mainly for two reasons: (1) recent crises and catastrophes, and (2) modern supply chains which are inherently more vulnerable than traditional integrated production methods (Wagner and Bode, 2008). The complexity of modern supply chains and the increased reliance on the competitive advantage created by the supply chain as a whole inevitably leads to an increased exposure to supply risks. Cyclical economic downturns and subsequent supplier failures periodically increase the interest in supply risk management even more.

Faced with greater exposure to supply risks, firms increasingly try to implement supply risk management systems. In the last years, also extensive research on supply risk management has been carried out. Different risk management principles have been described for managing supply risks, such as risk identification, risk assessment or risk mitigation (see for instance Blackhurst et al., 2008; Harland et al., 2003; Kleindorfer and Saad, 2005; Knemeyer et al., 2009), but also enhancing a firm's supply chain agility or early supplier involvement (Braunscheidel and Suresh, 2009; Tang and Tomlin, 2008; Zsidisin and Smith, 2005). A performing supply risk management system allows firms to identify risk sources, measure the risk's emergence and allow to react in due time, thus mitigating supply risks.

However, the young and emerging field of research on supply risk management still leaves many questions open on how to design such a supply risk management system. For instance, little is known on origination, characteristics and causal pathways of risks (Ritchie and Brindley, 2007) or the fundamental question on when exactly risk occur Tang and Nurmaya Musa (2010). Also, there is a need to relate risk management activities to performance (Knemeyer et al., 2009; Melnyk et al., 2004; Ritchie and Brindley, 2007; Wagner and Bode, 2008), so as to eventually being able to create a framework to get hold of the risk involved in complex supply chains (Zsidisin and Ritchie, 2009). Most published models are either rather confined, lack theoretical grounding, are not empirically tested, or a combination of the above (Wagner and Bode, 2008). The challenge is how to contribute with a theoretically grounded and empirically tested model allowing firms to manage supply risks.

This study addresses these shortcomings by utilizing a comprehensive framework wherein both transaction cost economics and social exchange theory are used to examine supply risk management performance, i. e. the ability of the firm to minimize their risk exposure. More precisely, we test the social exchange theory based constructs of dependency and preferred

customer status as antecedents to transaction cost based explanations for supply risk performance. Our model is investigated by surveying a large sample of firms and analyzing the success of their supply risk management efforts. Analytical techniques are used that allow for an estimation of the relationship between factors suggested by transaction costs economics and its anteceding factors derived from social exchange theory. In doing so, we contribute to the discussion linking the two theories, empirically test the assumed relationships and expand the knowledge on efficient supply risk management systems.

Findings indicate that, as opposed to often postulated, asset specificity appears not to be the most influential governance mechanism. Instead, managing behavioral uncertainty has a much higher power explaining successful supply risk management. Furthermore, the newly introduced constructs derived from social exchange theory, preferred customer status, next to dependency, is a good antecedent explaining two of the transaction cost constructs. Moreover, adding to managerial applicability, it can be shown that being a preferred customer can to a certain extend compensate for dependency in buyer-supplier relations and ultimately reduce supply risk exposure.

In the next section we will discuss previous literature on supply risk management, transaction cost theory and social exchange theory and derive testable hypotheses. Then, we present empirical data and use them to test the relationships. Finally, a concluding discussion rounds-up this paper.

2. Theoretical Foundation

2.1 Supply Risks

According to Zsidisin et al. (2004, p. 397) supply risk is "*the potential occurrence of an incident associated with inbound supply from individual supplier failures or the supply market, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety*". Analyzing supply risk, it can be differentiated between risk sources and risk outcomes, such as quality or delivery problems. Risk sources can either stem from individual supplier failures or from market characteristics, which affect all suppliers (Zsidisin, 2003).

Scholars have paid ample attention to the identification and classification of different risk sources, leading to a variety of risk categories, such as operational risk and disruption risk (Tang, 2006); relational risk and performance risk (Das and Teng, 2001); disruption risks and risks stemming from supply and demand coordination problems (Kleindorfer and Saad, 2005); capacity limitations and supply disruptions (Johnson, 2001); or environmental, network related

and organizational risk sources (Jüttner et al., 2003). Chopra and Sodhi (2004) identified seven risk source categories, including disruptions and inventory risks. Schoenherr et al. (2008) use product characteristics (quality and cost), partner characteristics (service and management capabilities) and environment characteristics as a way to classify supply risks.

Summarising, it could be distinguished between environmental risks (which influence the performance of all suppliers in the affected area), financial risk (referring to the bankruptcy of a particular supplier), operational risks (deriving out of quality problems of a supplier) and strategic risks (for instance when the supplier does not consider the buyer sufficiently important and in case of bottlenecks reduces the supply for that particular buyer, but not for others). It is important to highlight that the supply risk firms are facing, thus, is a multi-facet problem resulting in the extreme form in a complete interruption of supply, but gradually emerging through quality problems or reduction in delivery quantity.

However, identifying different risk categories is not sufficient to handle these risks. Supply chain risk management is about the minimization of these risks while exploiting opportunities by aligning organizational processes and decisions (Narasimhan and Talluri, 2009). Several supply risk management processes have been described in literature, such as risk specification, risk assessment and risk mitigation (Kleindorfer and Saad, 2005); risk identification, risk assessment, risk management and risk monitoring (Hallikas et al., 2004) or risk analysis, risk evaluation and risk management (Mullai, 2009). Substantial attention has been given to the single stages of risk identification and/or assessment (see for instance Hallikas et al., 2002a; Neiger et al., 2009; Pavlou and Manthou, 2008; Schoenherr et al., 2008; Zsidisin et al., 2004). Also, different risk mitigation/ reduction strategies are explored, such as sharing information, establishing back-up systems, early supplier integration, building flexibility, improving communication, building buffer inventories and multiple sourcing (Chopra and Sodhi, 2004; Kleindorfer and Saad, 2005; Tang and Tomlin, 2008; Zsidisin et al., 2000; Zsidisin and Smith, 2005). One problem is that some of these recommendations are commonly assumed to contradict each other, such as early supplier integration and multiple sourcing. Thus, without a thorough understanding of the determinants of supply risk performance and their interrelation, managerial implications suggested without embedding them in a consistent theoretical model are not free from some arbitrariness.

2.2 Determinants of supply risk management performance

Uncertainty is the key element of risk (Yates and Stone, 1992). At the same time, uncertainty also stands at the explanatory core of transaction cost economics (see for instance

Kaufmann and Carter, 2006; Walker and Weber, 1987). Transaction cost economics, therefore, could contribute to the understanding of supply risks. Most of transaction cost research focuses on vertical integration (Coase, 1937; David and Han, 2004; Rindfleisch and Heide, 1997; Williamson, 1975) and governance problems in interorganizational relationships without common ownership (Rindfleisch and Heide, 1997). Yet, the use of transaction cost theory in operations management, more specifically supply chain management, should be extended, as Williamson himself recently stated (Grover and Malhotra, 2003; Hobbs, 1996; Williamson, 2008). In line, Grover and Malhotra (2003) plea for future transaction cost research to evaluate different supply chain management challenges, such as the allocation of supply chain investments or the coordination problem of information and material flows across organizations caused by complex, global supply chains. We take up this challenge to use transaction cost theory to study supply chain management, in particular from a supply risk perspective.

However, transaction cost theory has been criticized for primarily concentrating on contractual issues and neglecting relational mechanisms (Ghoshal and Moran, 1996; Nooteboom et al., 1997; Poppo and Zenger, 2002). Yet, these relational mechanisms are considered to be an important antecedent to transaction specific outcomes, for instance explaining relation-specific supply risks, as opposed to environmental supply risks affecting all suppliers operating in a particular environment. Social exchange theory has been proposed to complement transaction cost based argumentations (Bunduchi, 2008; Liu et al., 2009; Young-Ybarra and Wiersema, 1999). It is based on the concepts of reciprocity and power-dependency, which might lead to opportunism, one of the key underlying assumptions of transaction cost theory (Rindfleisch and Heide, 1997), and core to the understanding of supply risks (Ariño, 2001; Manuj and Mentzer, 2008; Morgan et al., 2007).

Transaction cost economics and social exchange theory together may provide a more comprehensive explanation of the determinants of supply risk management performance and eventually lead to empirically backed guidelines for supply risk management.

2.3 Transaction cost theory and supply risk management performance

The transaction cost theory describes market and hierarchies (firms) as different governance structures to complete transactions (Coase, 1937). If transaction costs are low, the market is the best governance structure, else vertical integration is the best option. Transaction costs comprise the costs for managing relationships (search costs, contracting costs, monitoring costs and enforcement costs) but also opportunity costs (stemming from inferior governance decisions)

(Dyer, 1997; Rindfleisch and Heide, 1997). The two underlying assumptions of the transaction cost theory are bounded rationality and opportunism (Rindfleisch and Heide, 1997).

Bounded rationality assumes that decision makers are limited in their information processing and communication capability. These cognitive limitations become a problem in uncertain environments, where it is not possible to specify circumstances surrounding an exchange beforehand and performance cannot properly be assessed afterwards. Opportunism is defined as "*self-interest seeking with guile*" (Williamson, 1985, p. 47). Decision makers may want to serve their self-interest when given the opportunity, resulting in cheating, lying, or violation of agreements, which might lead to supply problems.

Opportunism becomes a problem when asset specificity is present in a relationship, as in these relationships market competition does not serve as a "natural" restraint on opportunistic behavior. The two assumptions of bounded rationality and opportunism have a significant impact on supply risk management, as both give rise to possible supply risks (Chopra and Sodhi, 2004; Morgan et al., 2007). Bounded rationality can for instance lead to capacity problems when a supplier is not able to estimate future demands, which leads to the risk of no or delayed supply. An example of opportunism is intellectual property leakage.

The key constructs in transaction cost theory are asset specificity and uncertainty. Asset specificity refers to the transferability of assets that support a given transaction (Williamson, 1985). These assets have little or no value outside the exchange relationship, and therefore lead to sunk cost should the relationship end. Asset specificity is safeguarding problem: market competition is limited or absent and therefore does not serve as a restraint on opportunism. In general, asset specificity is regarded as the most influential transaction cost construct (Carter and Hodgson, 2006; David and Han, 2004; McIvor, 2009).

In transaction cost theory a distinction is made between two different types of uncertainty: environmental uncertainty and behavioral uncertainty. Environmental uncertainty refers to "*unanticipated changes in circumstance surrounding an exchange*" (Noordewier et al., 1990, p. 82). Environmental uncertainty translates into an adaptation problem: when circumstances surrounding an exchange relationship change it can be difficult to modify agreements (Rindfleisch and Heide, 1997). Behavioral uncertainty, on the other hand, stems from difficulties in monitoring the contractual performance of exchange partners (Williamson, 1985). This is an evaluation problem: it can be difficult to verify compliance with agreements of exchange partners (Rindfleisch and Heide, 1997).

These transaction cost constructs explain the existence of supply risks, as uncertainty is a key characteristic of risk (Yates and Stone, 1992). Environmental uncertainty can for instance be

demonstrated by the existence of currency exchange rate risks or natural disasters, leading to environmental supply risks. Risks related to behavioral uncertainty are risks such as delayed deliveries linked to operational or strategic supply risks. The existence of asset specificity in an exchange relationship, finally, enlarges possible risk impacts, as it leads to sunk costs.

Since transaction cost theory has been criticized for being incomplete in mainly addressing the contractual characteristics of an exchange relationship, social exchange theory will be discussed below to address the relational characteristics of such a buyer-supplier relationship (Bunduchi, 2008; Liu et al., 2009; Young-Ybarra and Wiersema, 1999).

2.4 Social exchange theory and supply risk management performance

The basic idea of social exchange theory is that social exchanges consist of a series of interactions that generate obligations (Emerson, 1976). The concepts involved in this theory are actors, resources, structures and processes (Molm, 2003). Actors (e.g. persons, firms) exchange certain resources (e.g. goods or services) within a structure (e.g. dyadic relation or network). Different types of exchange relationships exist: negotiated exchange and reciprocal exchange (Blau, 1964).

In negotiated exchange there is a common decision process, in which the actors negotiate to find agreement on the exchange conditions (Blau, 1964; Cropanzano and Mitchell, 2005; Molm, 2003). Buyer-supplier relationships generally are regarded as negotiated relationships, since exchange contracts are involved.

In contrast, reciprocal exchange is built on the concept of reciprocal interdependence (Cropanzano and Mitchell, 2005). An action of one partner leads to the response of another partner, but this response is uncertain. The actions of the partners are not negotiated and separately performed (Molm, 2003).

Central to social exchange theory are the concepts of power and dependency, as well as trust and commitment (Molm, 2003). The dependence in a social relationship creates power, as one party will be more dependent than the other (Emerson, 1962). Especially in negotiated relations, actors may be inclined to (mis)use this power and inequality and behave opportunistically (Cropanzano and Mitchell, 2005; Molm et al., 1999).

On the other hand social exchange theory suggests that exchange relationships can develop into mutual commitments, in which actors trust each other (Cropanzano and Mitchell, 2005; Molm, 2003). This relational view is increasingly regarded as complementary to the negotiated buyer-supplier relationship, as the social interaction fosters the development of commonly held norms and trust between the exchange partners (Liu et al., 2009; Poppo and Zenger, 2002). The

development of norms and trust acts as a control mechanism against opportunism, elevates relational performance (Liu et al., 2009), enhances the supplier's willingness to share information (Tsai, 1998 #2560) and leads to preferred customer treatment by the supplier (Uzzi, 1997). Social exchange theory therefore contributes to the understanding of relational supply risks.

3. Hypotheses development

3.1 Asset specificity

Asset specificity refers to the extent in which investments are specific to a certain supply relationship (Williamson, 1985). If the investments have little or no value outside this relationship, they will lead to sunk cost should this relationship end. Asset specificity can take different forms, such as physical asset specificity (e.g. investments in customized equipment), human asset specificity (e.g. possession of specific knowledge that cannot be obtained elsewhere) or site specificity (Williamson, 1991a). Asset specificity causes lock-in situations, as the investing party becomes dependent on his supply chain partner (Bensaou and Anderson, 1999; Hawkins et al., 2008). In cases of asset specificity there is an exposure to risks such as raising prices or reduction of service levels (David and Han, 2004; Ellram et al., 2008; Holcomb and Hitt, 2007; Leiblein et al., 2002).

Whereas, on the one hand it has been argued that asset specificity can increase opportunistic behavior (see e.g. Hawkins et al., 2008; Rindfleisch and Heide, 1997), on the other hand, in certain situations, asset specificity is also known to lead to more cooperative behavior. For instance, Lui et al. (2009) find that in a Chinese business context, asset specificity is more likely to lead to trust (and therefore cooperative performance and better performance) than to opportunistic behavior (and therefore worse performance). Also, Rokkan (2003) states that "*in relationships characterized by a strong norm of solidarity, specific investments actually decrease the receiver's opportunism*", as opposed to relationships with weak norms of solidarity where asset specificity leads to opportunism.

Whereas asset specificity can increase possible opportunism from the under-investor, it will also decrease possible opportunistic behavior from the investing party (Hawkins et al., 2008). Song and Di Benedetto (2008) found that suppliers are more involved in innovation processes with a buyer if the level of specific investments of that supplier is higher. In a study about trust, Suh and Kwon (2006) find that supplier's specific investments decrease the risk for the buyer and lead to more trust within the relationship. They state that "*a company might consider a transaction-specific asset invested by their partner as a favorable devotion to their relationship*"

(p. 197). So in situations of supplier's asset specificity, the supplier will try his best to keep his buyer satisfied, for instance by providing valuable information. The supplier does not want to risk the buyer stepping out of the relationship, because that would transform the supplier's specific investments to sunk cost. Therefore, in case of supplier's asset specificity, (risk) governance for the buyer will be easier and more likely to succeed because the supplier will cooperate as much as possible. Also, from a supplier's point of view, the buyer could be expected to behave opportunistically when the supplier made specific investments for the relationship. To avoid this opportunism the supplier will show devotion to the relationship, for instance by building commitment and trust (Carr and Pearson, 1999; Wathne, 2000). This will decrease supply risks such as intellectual property leakage or quality problems for the buyer.

Hypothesis 1. Supplier's asset specificity is positively related to the buyer's supply risk management performance.

3.2 Uncertainty

Uncertainty is characterised by unanticipated changes surrounding an exchange relationship. The transaction cost theory assumption of bounded rationality causes problems in situations of uncertainty: not all possible future contingencies can be taken into account when specifying exchange contracts, exposing buyers to possible supply risks (Grover and Malhotra, 2003). The more uncertainty there is in an exchange relationship, the less ability the buyer has to (properly) identify and assess possible supply risks. The opportunity to manage supply risks is lower when there is little ability to predict supply risks. Therefore, supply risk management performance is negatively influenced by uncertainty.

Second, as uncertainty is a key characteristic of risk (Yates and Stone, 1992), we can easily recognize that high levels of uncertainty lead to high levels of supply risks. So uncertainty also influences supply risks management performance simply because the amount of supply risks present in uncertain relationships is higher. Recognition and minimization of risks and their impact is easier when there are not that many risks around. More risk means that companies are less likely to succeed in avoiding or overcoming these risks, and if they are able to it will place a heavy burden on their resources.

The two types of uncertainty distinguished in transaction cost theory, environmental and behavioral, lead to different kind of supply risk management problems. Environmental uncertainty is the extent to which circumstances surrounding an exchange relationship cannot be specified beforehand (Grover and Malhotra, 2003). These changing circumstances can originate

from different sources, for instance from the upstream or the downstream market (Joshi and Stump, 1999). Unpredictability of technology or demand volume are examples of environmental uncertainty, they lead to adaptation problems for the supply chain. In a rapidly changing environment, firms are easily caught by surprise as it is difficult to write contracts that take into account all possible future outcomes (Klein et al., 1990). Renegotiations of contracts are likely to be needed in such volatile markets, which for instance raises the risk of delays and supplier opportunism (Anderson and Schmittlein, 1984; Hawkins et al., 2008; Joshi and Stump, 1999; Walker and Weber, 1987).

Hypothesis 2. Environmental uncertainty is negatively related to the buyer's supply risk management performance.

Behavioral uncertainty exists within the context of an exchange relationship and is the extent to which compliance with agreements of exchange partners cannot be verified ex-post: the buyer has no assurance that the supplier performs as specified (Williamson, 1985). This leads to evaluation problems such as the inability to assess supplier's quality standards (Grover and Malhotra, 2003). Morgan et al. (2007, p 522-523) found that a buyer's "*ability to monitor focal supplier behavior can limit opportunistic behavior*", and Kaufmann and Carter (2006) show that behavioral transparency leads to an increase in non-financial performance of the supplier relationship. Consequently, the inability to assess supplier's performance is likely to lead to opportunism and performance risks (Heide and John, 1990). Or as Poppo and Zenger (2002, p. 709) state: "*when performance is difficult to measure, parties have incentives to limit their efforts toward fulfilling the agreement*". So in situations of high behavioral uncertainty buyers incur more risks which places a heavy burden on risk management efforts.

Hypothesis 3. Behavioral uncertainty is negatively related to the buyer's supply risk management performance.

Having indicated the transaction cost characteristics that influence supply risk management performance in exchange relationships, we will now further develop our framework by integrating relational aspects. Including these aspects will enhance our framework as it gives a more complete view of possible governance mechanisms to manage supply risks (Liu et al., 2009; Power and Singh, 2007). We will use social exchange theory to identify the antecedents of the transaction cost constructs. The two faces of social exchange theory, as discussed by Molm

(2003), are power-dependence and commitment. As we will research the governance mechanism from the buyer's perspective, we will use buyer's dependency and buyer's preferred customer status to operationalize these two faces of exchange mechanisms.

3.3 Dependency

Dependency exists in situations where the buyer has to rely on the actions of a supplier to achieve his goals. A buyer's asset specificity can be a cause of dependency (as the buyer is dependent on the supplier for his assets), but more causes for dependency exist, such as a limited supply market or poor internal management of the buyer (Kumar et al., 1995; Lonsdale, 1999). If a buyer is dependent on a particular supplier, it is likely that this supplier will be less hesitant to make specific investments for this relationship. The buyer's dependency prevents him from walking out of the relationship, thus leading to less risk of sunk cost for the supplier. Therefore we state that buyer's dependency will positively influence supplier's specific investments.

On the other hand, in situations of buyer's dependency, a supplier can behave opportunistically and could limit knowledge transfer initiatives trying to maintain or widen a possible knowledge gap (Corsten and Felde, 2005). This opportunistic behavior is likely to increase behavioral uncertainty, as information asymmetry is a frequently found representation of behavioral uncertainty (Grover and Malhotra, 2003; Hobbs, 1996). Also, although the buyer will expect opportunistic behavior from the supplier, he does not know when and how it will emerge. Buyer dependency gives suppliers no incentive whatsoever to enlighten the buyer's evaluation problem caused by behavioral uncertainty.

Hypothesis 4. A buyer's dependency is positively related to (a) supplier's asset specificity and (b) behavioral uncertainty.

3.4 Preferred customer status

A buyer is a preferred customer when he is more attractive for his supplier than other customers of this supplier. As a consequence, the buyer enjoys preferential resource allocation by the supplier (Steinle and Schiele, 2008). Supplier's commitment to the relationship with the buyer and supplier's performance both increase when a buyer has preferred customer status (Ellegaard et al., 2003). Christiansen and Maltz (2002) describe that being an interesting customer for suppliers leads to suppliers attention and loyalty, and that it warrants open exchange of knowledge and information. So if the supplier prefers the buyer compared to other buyers, he will be more committed to the relationship and more willing to cooperate. Therefore it

is more likely that the supplier is willing to make specific investments for this relationship, in favour of the buyer. Also behavioral uncertainty is likely to diminish. Behavioral uncertainty is an evaluation problem: it is difficult for the buyer to assess whether the supplier performs according to the agreement (Rindfleisch and Heide, 1997). In situations of high uncertainty, the introduction of more relational structures (such as preferential customer treatment) leads to purchasing performance improvement (Noordewier et al., 1990). If the supplier prefers the buyer he will serve this buyer before his other customers and direct the best resources to this buyer, thus effectively strategic supply risk is reduced. Also, the supplier will be more inclined to provide the buyer with the information needed to assess the supplier's performance. Finally, opportunistic behavior of the supplier is also less likely if the buyer has preferred customer status, as the supplier will be reluctant to take advantage of the situation at the expense of the buyer in order to avoid losing this attractive customer. For instance, it has been found that the supplier's awarding a buyer with preferred customer status lead to a more benevolent pricing behavior by the supplier, that is, the latter exactly not behaving opportunistically (Schiele et al., 2011). Knowledge on the supplier's prime commitment will also decrease the behavioral uncertainty for the buyer.

Hypothesis 5. A buyer's preferred customer status with suppliers is (a) positively related to supplier's asset specificity, and (b) negatively related to behavioral uncertainty.

3.5 Control variables

We included firm size (in turnover) as a control variable, as bigger firms are more likely to succeed in their risk management effort. They have more opportunity to practice (they purchase more and have more suppliers) and more resources to devote to their supply risk management system than smaller companies do. We also included purchasing volume for the same reason; firms that purchase more will be better practiced and devote more resources to their supply risk management than firms which purchase lower volumes. The last control variable included is the percentage of global sourcing: international supply chains face additional risks compared to local supply chains.

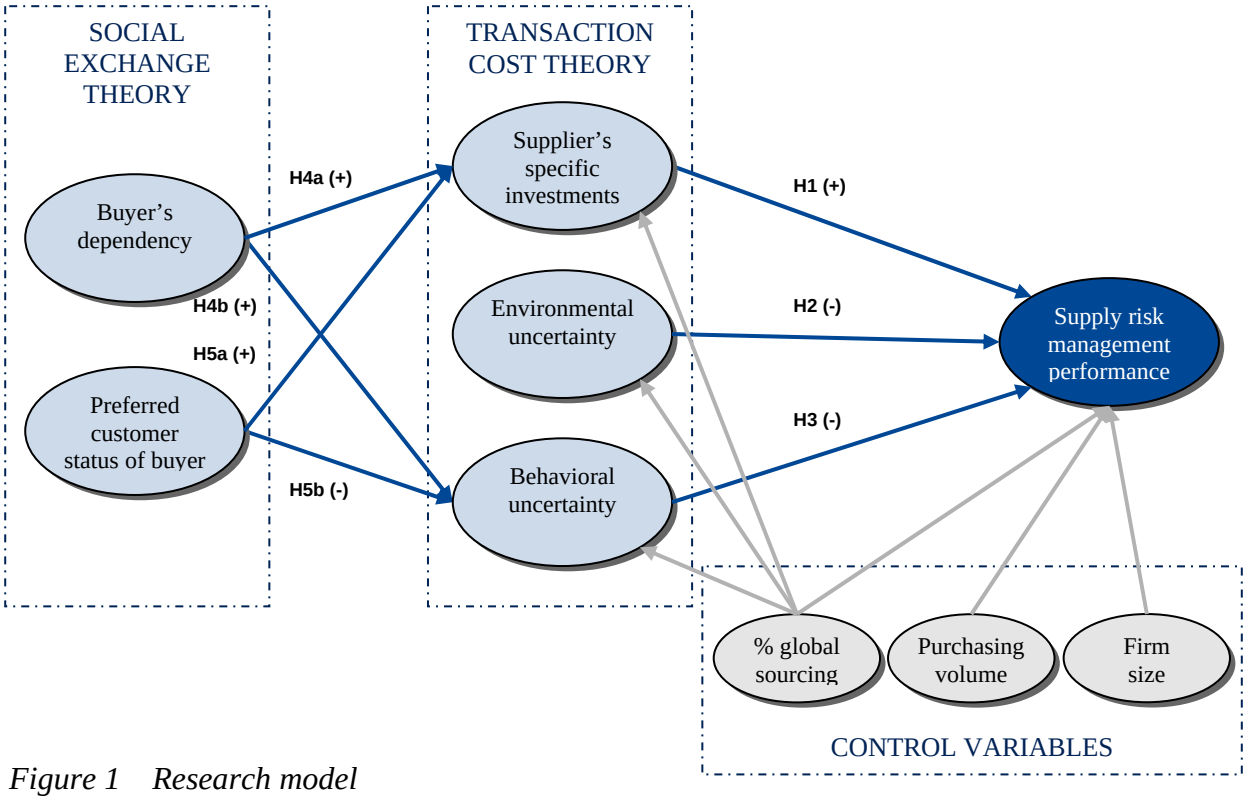


Figure 1 Research model

4. Methodology

4.1 Data collection and sample

Data was collected by means of a survey administered in German-speaking countries. For the survey the database of BMEnet, an organization linked to the German association of materials management, purchasing and logistics -BME- was used. In addition to that the survey was also sent to the customer database of a German consultancy firm. The survey was sent by email to employees responsible for supply management in several German speaking countries, yielding responses from Germany, Austria, Switzerland and Luxembourg. Additionally, the survey was announced on the homepages and newsletters of BMEnet and the consultancy firm. The email and the announcement contained a link to a homepage with the questionnaire. Only one single e-mailing was necessary, as all data could be collected within one week. Because of the short time span and single mailing, differentiation between early and late respondents is neither possible nor necessary. Since we had no direct access to the databases it was not possible to check for non-response bias. No significant difference in answers between the two groups (respondents from BMEnet and respondents from the consultancy firm) could be identified.

In total the survey yielded 207 usable responses. Most of the respondents were supply managers (59 %), others were supply employees (20 %), staff (4 %), board members (4 %),

supply risk employees (2 %) and supply risk managers (1 %). On average, the respondents had spent 8.7 years at their companies. Respondents came from typical German industries: mechanical engineering (23 %), electronic and electrical engineering (13 %), automotive (12 %), chemical industry (5 %), services (13 %) and others (34 %).

4.2 Measurement development

All the measures in the survey are reflective and measured on a five-point Likert scale, answers ranged from 1 “no, not at all” to 5 “yes, completely”. Questions were asked in German language. The scales were originally developed in English and translated and back-translated by two specialists.

Asset specificity refers to what extend companies in an exchange relationship have made specific investments which are of no or minor value outside that relationship. We used the measures developed by Heide and John (1990) to measure these supplier’s specific investments. To measure *Environmental uncertainty* we used the volatility items as developed by Klein, Frazier and Roth (1990), which describe the extent to which firms are taken by surprise because of environmental changes. *Behavioral uncertainty* is about difficulties in monitoring the performance of a supplier. Therefore, we used part of the items described by Grover and Malhotra (2003) to measure monitoring suppliers’ performance. We adopted the items developed by Corsten and Felde (2005) for the *Dependency* construct. *Preferred customer status* is about the attractiveness of a customer for his supplier compared to other customers of this supplier. We adapted the items developed by Gao et al. (2005). The dependent variable to be explained is *supply risk management performance*: the ability of the buyer to avoid supply risks; recognize potential risks in due time to react; and in case of their occurrence, minimize the impact on the firm. We adopted the items for supply risk management performance from the items developed by Moder (2008). All items used can be found in appendix A.

5. Analysis and Results

We used SmartPLS (Ringle et al., 2005) to validate our measures and test our hypotheses. SmartPLS is a structural equation modelling tool that uses a series of interdependent OLS regressions to minimize residual variances (Chin et al., 2003). A PLS model consists of an outer (measurement) model and an inner (structural) model. The measurement model shows the relationship between the latent variables and their observed variables, and the structural model describes the relationships between the latent variables. PLS is suitable to estimate complex structural equation models, especially when the prediction of dependent endogenous variables is

the core purpose of the research (Chin, 1998; Henseler et al., 2009). Also, PLS has less strict demands on data regarding sample size and distributional assumptions than covariance-based methods (Chin, 1998; Henseler et al., 2009). Finally, it has been shown that the estimates of PLS are more accurate with sample sizes of 250 or lower as compared to co-variance based algorithms (Reinartz et al., 2009).

When evaluating the PLS model three considerations are important: (1) the reliability and validity of the measurement model, (2) the size and significance of the path coefficients, and (3) the capability of the model to predict the outcome variables (Hulland, 1999).

5.1 Measurement model

To assess the indicator reliability of the model we first examined the individual item loadings with their respective constructs. All loadings except for three are well above the 0.7 threshold (Chin, 1998; Henseler et al., 2009). One item for buyer's dependency has a loading of 0.67, and two item loadings for the preferred customer construct were 0.67 and 0.69. Hulland (1999) argues that items should only be dropped when loadings are below 0.4 or 0.5, therefore we decided to leave these constructs intact. The composite reliability scores were highly satisfactory between 0.803 and 0.872 (see table 1), showing internal consistency for each constructs as they are well above the 0.6 threshold (Henseler et al., 2009).

Convergent validity shows that each item correlates strongly with the construct it relates to. Convergent validity is satisfactory because all items load positively and with a significant t-value on their respective constructs ($t > 7.8$). Also, the average variance extracted (AVE) for each construct is above 0.5 (Chin, 2010; Fornell and Larcker, 1981): the latent variable explains at least 50 % of its indicators' variance (see table 1).

	Composite reliability	AVE
Supplier's specific investments	0.860	0.754
Environmental uncertainty	0.827	0.616
Behavioral uncertainty	0.872	0.696
Dependency	0.810	0.589
Preferred customer status	0.803	0.506
Supply risk management performance	0.867	0.620

Table 1 Composite reliability and AVE scores

To assess discriminant validity for the constructs we used the Fornell-Larcker Criterion (Fornell and Larcker, 1981), which prescribes that the AVE of a latent variable should be higher

than the squared correlations between the latent variable and the other latent variables. Basically this means that the latent variables better explain the variance of its own indicators than the variance of other latent variables, as can be seen in the cross-correlation matrix in table 2: the square root of the AVE scores (in bold on the diagonal) are all greater than the cross-correlation scores.

	Supplier specific investm.	Env. uncer-tainty	Beh. uncer-tainty	Depen-dency	Pref. cust. status	Supply risk man. perf.	% glob. sourc.	Firm size	Purch-asing vol.
Supplier's specific investments	**0.868**								
Environmental uncertainty	0.199	**0.793**							
Behavioral uncertainty	0.157	0.272	**0.834**						
Dependency	0.463	0.166	0.239	**0.765**					
Preferred customer status	0.212	-0.254	-0.268	0.049	**0.711**				
Supply risk man. performance	0.128	-0.131	-0.328	-0.039	0.230	**0.788**			
% global sourcing	0.048	0.024	0.010	-0.006	0.068	0.180	**1.000**		
Firm size	0.048	-0.022	0.009	0.083	0.152	0.161	0.132	**1.000**	
Purchasing volume	0.080	0.060	0.035	0.049	0.096	0.107	0.089	0.826	**1.000**

[a] Values on the diagonal are shared variances within a construct (square root of AVE)

Table 2 Construct cross correlation matrix

5.2 Structural model

The structural model estimates the relationship between the different constructs. To determine the significance of the path coefficients we used a bootstrapping procedure with 207 cases and 1000 samples. Missing values were dealt with by mean replacement.

The path-coefficients and t-values of the constructs can be found in table 3. The model showed an R^2 of 19.6 %, which shows the theoretical and managerial relevance of our model (Combs, 2010). The R^2 of supplier's asset specificity is 25.2 %, and that of behavioral uncertainty is 13.3 %, indicating that both dependency and preferred customer status are good explanations for behavioral uncertainty, but other antecedents clearly exist, as a large part of the construct still needs to be explained.

Hypothesis 1 states that high asset specificity for a supplier will lead to high supply risk management performance. This hypothesis is confirmed as the path coefficient is 0.185 and significant ($p < 0.01$). For hypothesis 2 - high environmental uncertainty leads to low supply risk management performance - we did not find any support: the path coefficient is only -0.082 and not significant. The existence of behavioral uncertainty has a strong significant impact ($p <$

0.001) on supply risk management performance: high uncertainty leads to worse performance. The path coefficient of behavioral uncertainty is -0.336, showing that influence of behavioral uncertainty on supply risk management performance is much larger than that of supplier's asset specificity. Finally, hypotheses 4 and 5 are also supported: both dependency and preferred customer status have a significant impact on the two transaction cost constructs. The path coefficients from dependency to supplier's asset specificity and behavioral uncertainty are respectively 0.451 and 0.249, showing that high dependency leads to more asset specificity and more behavioral uncertainty. Preferred customer status has a positive effect on supplier's asset specificity and a diminishing effect on behavioral uncertainty (path coefficients resp. 0.199 and -0.278).

None of the control variables had a significant effect on any of the constructs, except for the percentage of global sourcing which has a significant effect on supply risk management performance.

	Hypothesized path	Coeffi-cient	t-value	Sig.
H1	Supplier's asset specificity => Supply risk man. perf.	0.185	2.558	$p < 0.01$
H2	Environmental uncertainty => Supply risk man. perf.	-0.082	0.962	n.s.
H3	Behavioural uncertainty => Supply risk man. perf.	-0.336	4.877	$p < 0.001$
H4a	Dependency => Supplier's asset specificity	0.451	8.441	$p < 0.001$
H4b	Dependency => Behavioural uncertainty	0.249	3.502	$p < 0.001$
H5a	Preferred customer status => Supplier's asset specificity	0.199	2.583	$p < 0.01$
H5b	Preferred customer status =>Behavioural uncertainty	-0.278	3.868	$p < 0.001$
	Control variables			
	% global sourcing => Supplier's asset specificity	0.037	0.572	n.s.
	% global sourcing => Environmental uncertainty	0.017	0.117	n.s.
	% global sourcing => Behavioural uncertainty	0.030	0.429	n.s.
	% global sourcing => Supply risk management perf.	0.158	2.353	$p < 0.01$
	Firm size => Supply risk management perf.	0.169	0.687	n.s.
	Purchasing volume => Supply risk management perf.	-0.045	0.184	n.s.

Table 3 Results of path-analysis

6. Discussion

In this empirical paper we tested the influence of the transaction cost concepts on supply risk management performance. We hypothesized that supplier's asset specificity has a positive influence on supply risk management performance, and that both environmental uncertainty and behavioral uncertainty have a negative influence on supply risk management performance. Whereas we found no evidence for the negative effect of environmental uncertainty, we did

show that both supplier's asset specificity and behavioral uncertainty have a significant effect on supply risk management performance. Furthermore, we tested the influence of dependency and preferred customer status as social exchange theory based antecedents of two of the transaction cost constructs, namely supplier's asset specificity and behavioral uncertainty. Dependency has a dual role in supply risk management performance. On the one hand, buyer's dependency has a positive influence on supplier's specific investments, leading to better supply risk management performance. On the other hand, a buyer's dependency leads to more behavioral uncertainty, thus having a negative effect on supply risk management performance. Given that the influence of behavioral uncertainty on supply risk management performance is twice as big as the influence of supplier's asset specificity, buyer's dependency should best be avoided. Preferred customer status reveals to be a previously largely unnoticed but highly significant antecedent of the transaction cost constructs. When a buyer has been awarded preferred customer status by the supplier, the latter is more willing to invest in assets only used for this buyer. Also, behavioral uncertainty decreases when a buyer has preferred customer status.

6.1 Theoretical implications

The findings of this study support the premises of the transaction cost theory, and more specifically, establish the importance of this theory for supply risk management. We confirm the effectiveness of asset specificity and behavioral uncertainty as governance mechanisms in supply chain settings, and more precisely, we find behavioral uncertainty to be twice as influential on supply risk management performance. These findings follow on to the findings of Suh and Kwon (2006) who find a negative impact of behavioral uncertainty on trust in a partner. They state that "*the impact of behavioral uncertainty on trust and other subsequent business decisions is becoming more important due to the increasing ambiguity in the ever changing business environments in the post modern world*" (p. 197). Our findings adhere to their notion and we want to stress the importance of this contribution to the existing literature base of transaction cost theory, as most former studies claim that asset specificity is the most important governance mechanism in supply chain management (Carter and Hodgson, 2006; McIvor, 2009). Our findings imply that from a supply risk management perspective, research focus should be redirected from asset specificity issues to behavioral uncertainty. Both supply risk management and transaction cost theory could benefit from a more intensified focus on the concept of behavioral uncertainty, trying to elaborate on the antecedents of and effects caused by behavioral uncertainty.

Furthermore, we enhance theory building by developing a framework that integrates the transaction cost theory and the social exchange theory, thereby contributing to the recently emerged notion that transactional and relational governance mechanisms should be used in conjunction to effectively manage buyer-supplier relationships (Liu et al., 2009; Power and Singh, 2007). Supply risk management research benefits from such an integration as it addresses both the contractual and the relational governance mechanisms affecting performance, therefore providing a more comprehensive view on supply risk management issues. From a social exchange perspective, we show that both the negotiated and the relational view on exchange relationships need to be taken into account as governance mechanisms for buyer-supplier relationships. Our findings encourage to extend the integration of transaction cost theory and social exchange theory also beyond the field of supply risk management. The two bodies of theory complement each other from a conceptual perspective, while our research has provided encouraging evidence that also from an empirical perspective it is feasible to follow this path further.

6.2 Managerial implications

Our findings indicate that in supply management, supplier's asset specificity and behavioral uncertainty both are valuable governance mechanisms that can be used to increase risk management performance. Attention should first and foremost be given to behavioral uncertainty, as this is the most influential governance mechanism for supply risk management systems. In order to decrease behavioral uncertainty and increase supplier's asset specificity two relational governance mechanisms can be used: dependency and preferred customer status. First of all, dependency has a somewhat dual role as a governance mechanism. In order to decrease behavioral uncertainty, companies should avoid dependency from their suppliers as much as possible, as a buyer's dependency significantly increases behavioral uncertainty. On the other hand, increasing a buyer's dependency will also increase supplier's specific investments, which has a positive influence in supply risk management performance. Dependency has therefore a difficult dual role in managing supply risks, which might depend on the type of risk which is supposed to be mitigated.

Secondly, preferred customer status is a valuable mechanism to increase risk management performance in supply chain relationships. A company's preferred customer status has a positive effect on supplier's specific investments and a negative effect on behavioral uncertainty. Therefore the relational mechanism of building preferential status with a supplier reveals to be a strong governance mechanism in managing supply risks. Extending previous findings on the

benefits preferred customer status has on suppliers' flexibility (Williamson, 1991b), global sourcing success (Steinle and Schiele, 2008) and supplier contribution to innovation and supplier pricing (Schiele et al., 2011), our research has shown that preferred customer status also contributes to better supply risk performance. This implies that companies should try to achieve preferred customer status with their key suppliers. To some extend preferred customer status can also compensate for the increase in behavioral uncertainty caused by dependency, thus generating a competitive advantage.

7. Limitations and future research

Our research is subject to several limitations. First of all, our survey investigated the different concepts and supply risk performance for a buyer in general. To get a better understanding of the functioning of transactional and relational governance mechanisms in specific situations, these concepts should be studied in dyadic buyer-supplier relationships as well. Furthermore, we did not investigate the transaction cost concept of exchange frequency because this can only be measured for specific exchange relationships. Another issue for future research are possible other antecedents of behavioral uncertainty. Our R^2 of 13.3 shows that many other factors have an influence on behavioral uncertainty. Since this is the most important concept for risk management, more research is needed on this topic.

Chapter 6

The importance of supply risk management process maturity in an uncertain business context

1. Introduction

Supply risk issues have gained prominence, both in the academic discourse as in practical application. The field of supply chain risk management emerged because of several reasons such as recent crises and catastrophes, globalization, more dynamic market places, and modern supply chains which are substantially more vulnerable than traditional integrated production methods (Braunscheidel and Suresh, 2009; Harland et al., 2003; Tang and Tomlin, 2008; Wagner and Bode, 2008). The complexity of these modern supply chains and the increased reliance on the competitive advantage of the supply chain as a whole leads to an increased exposure to supply risks. Therefore, supply chain risk management is developing into a focus area in supply chain management research (Kleindorfer and Saad, 2005; Narasimhan and Talluri, 2009).

One of the key characteristics of risks (Yates and Stone, 1992) is an underlying construct of the transaction cost theory: namely uncertainty (conceptualized as environmental and behavioral uncertainty (Grover and Malhotra, 2003)). In situations with high uncertainty, transaction costs will be higher (Rindfleisch and Heide, 1997), whereas performance is likely to be lower when uncertainty is present (Jun et al.; Kaufmann and Carter, 2006; Trkman and McCormack, 2009). This implies that in an exchange relationship comprising high uncertainty –as compared to situations with low uncertainty- supply risk management performance is likely to be lower.

On the other hand, supply risk management activities are regarded as having a positive influence on firm- and supply chain management performance (see for instance Berg et al., 2008; Ritchie and Brindley, 2007; Wagner and Bode, 2008). A supply risk management system consists of several stages. Different authors mention different supply risk management stages, but basically the following stages can be identified: risk identification, risk assessment, risk management and risk monitoring (see for instance Berg et al., 2008; Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad, 2005; Mullai, 2009). Reflecting the new situation of increased exposure to supply risk, firms are implementing these supply risk management principles to improve their risk management performance. However, the relationship between supply risk management and supply risk management performance has rarely been empirically tested (Melnyk et al., 2004; Ritchie and Brindley, 2007). Current knowledge is not sufficient and most of the rare empirical research is descriptive (Wagner and Bode, 2008). Wagner and Bode (2008) plea for more empirical research in supply risk management to explain supply chain performance based on both the strategy process and strategy content.

Moreover, supply risk management is more than merely applying certain risk management methods such as risk assessment or monitoring. Developing a company's capabilities in supply risk management is suggested to increase the positive effects of supply risk management

methods (Berg et al., 2008). As Pfohl, Köhler and Thomas (2010) argue "*supply chain risk management does not work simply by applying a number of methods. It rather is a philosophy that is supposed to be deeply rooted within the company and the supply chain*". So the development of general supply risk management procedures and capabilities is proposed to increase supply risk management performance. Whereas extensive studies have been executed on maturity in supply chain management (see for instance Schiele, 2007), research on process maturity in a supply risk management setting is still in an initial stage.

Based on these identified inadequacies in supply risk management literature, our research goal is threefold:

- First, we will test the transaction cost concepts of environmental and behavioral uncertainty as antecedents of supply risk management performance.
- Second, we will test the effect of the supply risk management principles risk monitoring and risk mitigation on supply risk management performance, as well as their moderating effects on the relation between uncertainty and supply risk management performance.
- And finally, we will also investigate the direct and moderating effect of supply risk management process maturity on supply risk management performance and its relation with uncertainty.

For doing so, we discussed previous findings from literature. Then, we filled in missing elements through an exploratory research approach. This paper relies on the results of two workshops with 13 firms, employing speed consortium benchmarking in order to design an "ideal" supply risk management system. The elements of this model have then been employed as input for a survey, identifying the practices used by successfully risk minimizing companies. The identified indicators and mitigation strategies are subsequently used as formative measurement items to conceptualize the constructs of risk monitoring and risk mitigation. Based on the responses of 213 companies, we identified 4 risk indicators and 5 mitigation strategies that conceptualize our constructs "risk monitoring" and "risk mitigation". These indicators and mitigation strategies can be used as management blueprint for designing individual supply risk management systems. Furthermore, we show that both environmental and behavioral uncertainty have a significant negative effect on supply risk management performance. The use of mitigation strategies contributes to supply risk management performance and moderates the relationship between environmental uncertainty and supply risk management performance. Risk monitoring has no direct effect, but positively moderates both relations between uncertainty and supply risk management performance. More importantly, developing an enhanced risk management process -i.e. process maturity- contributes greatly to supply risk management performance while also

moderating the negative effect of environmental uncertainty. These finding alerts researchers to redirect their efforts, away from the current focus of identifying and classifying continuously more risk sources, but focusing on their measurement, mitigation strategies and the development of their supply risk management process in general.

This paper is organized as follows: we will first develop hypotheses derived from a reflection of the transaction cost theory and supply (risk) management literature. Then the empirical test will be described, which will finally allow us to draw conclusions.

2. Hypotheses development

Based on the work of Zsidisin (2003) and Manuj (2008), we define supply risk as the chance of an undesired event associated with the inbound supply of goods and/or services which have a detrimental effect on the purchasing firm and prevent it from meeting customers' demand within anticipated cost and time. We regard supply risk management as a buying firm's activities to recognize, monitor and mitigate these supply risks. Therefore, we define our dependent variable -supply risk management performance- as the extent to which the buying firm is able to recognize and monitor potential risks in due time to react, and in case of risk occurrence is able to minimize the impact this risk has on the buying firm.

2.1 Transaction cost theory and supply risk management performance

As Ritchie and Brindley (2007, p. 310) already indicated "*[…] there is likely to be a significant degree of uncertainty surrounding many supply chain situations*". High levels of uncertainty lead to high levels of supply risks, as uncertainty is a key characteristic of risk (Yates and Stone, 1992). Uncertainty is one of the core concepts of the transaction cost theory, which assumes that bounded rationality causes problems in situations of uncertainty: not all possible future contingencies can be taken into account when specifying exchange contracts, exposing buyers to possible supply risks (Grover and Malhotra, 2003). The more uncertainty there is in an exchange relationship, the less ability the buyer has to (properly) identify and assess possible supply risks. The opportunity to manage supply risks is lower when there is little ability to predict supply risks. Therefore, supply risk management performance is negatively influenced by uncertainty. Also, uncertainty influences supply risk management performance simply because the amount of supply risk present in relationships with uncertainty is higher. Recognition and minimization of risks and their impact is easier when there are not that many risks around. More risk means that companies are less likely to succeed in avoiding or overcoming these risks, and if they are able to it will place a heavy burden on their resources, thus increasing transaction costs.

The transaction cost theory describes two types of uncertainty: environmental uncertainty and behavioral uncertainty. Environmental uncertainty is about "*unanticipated changes in circumstances surrounding an exchange*" (Noordewier et al., 1990, p. 82), which cannot be specified beforehand (Grover and Malhotra, 2003). These changing circumstances can originate from different sources, for instance from the upstream or the downstream market (Joshi and Stump, 1999). Unpredictability of technology or demand volume are examples of environmental uncertainty, they lead to adaptation problems for the supply chain. In a rapidly changing environment, firms are easily caught by surprise by these changes as it is difficult to write contracts that take into account all possible future outcomes (Klein et al., 1990). Renegotiations of contracts are likely to be needed in such volatile markets, which for instance raises the risk of delays and supplier opportunism (Anderson and Schmittlein, 1984; Hawkins et al., 2008; Joshi and Stump, 1999; Walker and Weber, 1987).

Hypothesis 1. Environmental uncertainty is negatively related to a buyer's supply risk management performance.

Behavioral uncertainty exists within the context of an exchange relationship and is the extent to which compliance with agreements of exchange partners cannot be verified ex-post: the buyer has no assurance that the supplier performs as specified (Williamson, 1985). This leads to evaluation problems such as the inability to assess supplier's quality standards (Grover and Malhotra, 2003). Morgan et al. (2007, p 522-523) found that a buyer's "*ability to monitor focal supplier behavior can limit opportunistic behavior*", and Kaufmann and Carter (2006) show that behavioral transparency leads to an increase in non-financial performance of the supplier relationship. Consequently, the inability to assess supplier's performance is likely to lead to opportunism and performance risks (Heide and John, 1990). Or as Poppo and Zenger (2002, p. 709) state: "*when performance is difficult to measure, parties have incentives to limit their efforts toward fulfilling the agreement*". So in situations of high behavioral uncertainty buyers incur more risks which places a heavy burden on risk management efforts.

Hypothesis 2. Behavioral uncertainty is negatively related to a buyer's supply risk management performance.

Besides testing the relationship between uncertainty and supply risk management performance, this research also addresses the question if supply risk management activities can

diminish or even negate the negative effect of uncertainty on supply risk management performance. In the remainder of this section we propose three possible supply risk management variables that influence supply risk management performance and moderate the effect of environmental and behavioral uncertainty on supply risk management performance.

2.2 Supply risk management process maturity

In supply risk management literature most of the attention is given to the development of the different stages of a supply risk management system (e.g. Hallikas et al., 2004; Kleindorfer and Saad, 2005). Risk identification and assessment are frequently discussed as the first two steps of a risk management process. Risk identification is about the recognition and understanding of possible risk sources. Risk assessment is generally described as evaluating or calculating the probability of occurrence of an unwanted event, and its impact (Hallikas et al., 2004). The next supply risk management activity is regular risk monitoring, Indicators can be used to identify risk levels that are still within limits but rising, indicating possible future problems (Blackhurst et al., 2008). The last step in the process is the use of mitigation strategies to either diminish, eliminate, or counteract risks (Schoenherr et al., 2008). Several scholars pay attention to possible mitigation strategies that can be used (e.g. Chopra and Sodhi, 2004; Zsidisin et al., 2000). We will discuss the last two steps of the process in more detail later on.

Despite these efforts to address the different stages of supply risk management, little attention has been given to the influence the supply risk management process itself has on performance (see for instance Wagner and Bode, 2008). Without clearly defined processes, there is a danger of spontaneous and non-systematic action. In supply chain management, clearly defined processes reflect high maturity of the purchasing function, subsequently leading to better performance (Schiele, 2007). In his research, Schiele found a positive relationship between purchasing maturity and financial performance, but he subsequently states that links between maturity and other performance indicators -such as supply risk management performance- may exist. In developing a tentative model for assessing supply chain risk management programs, Berg, Knudsen and Norrman (2008) argue that certain capabilities must be possessed for successful supply risk management. The benefits of supply risk management will increase when firms improve their risk management capabilities, i.e. mature in their risk management process.

We define supply risk management process maturity as the extent to which a company has developed the capabilities to deal with different supply risks embedded into a systematical business process. We argue that the more mature this supply risk management process is, the better supply risk management performance will be. Also, the effect of a highly uncertain

context on supply risk management performance will be diminished by a mature supply risk management process.

Hypothesis 3: Supply risk management process maturity is positively related to a buyer's supply risk management performance.

Hypothesis 4: Supply risk management process maturity weakens the effect of (a) environmental uncertainty and (b) behavioral uncertainty on a buyer's supply risk management performance.

2.3 Monitoring supply risks

An oftentimes neglected phase in supply risk management processes is risk monitoring. Risk management is a dynamic process (Wagner and Bode, 2008), probabilities of unwanted events occurring can change over time, even as the impact these events can have (Hallikas et al., 2004). Monitoring supply risk is necessary as it can provide as an early warning when risk levels are rising, giving companies time to react to these changing circumstances by altering their mitigation strategies. Few authors stress the importance of monitoring risks pro-actively and on a regular basis (Dani, 2009; Hallikas et al., 2004; Norrman and Jansson, 2004), but at the same time, monitoring is implicitly treated as risk identification and assessment on a regular basis. This is a very time-consuming process and it is therefore not feasible for companies to realize for all their different supply risks. Scarcity of resources force companies to select a limited set of risks to monitor on an ongoing basis. We emphasize that measures are needed for the monitoring of these risk sources. Monitoring may not (only) be an ongoing assessment of the probability and impact of certain risks; companies should be able to use figures that indicate if chances on an unwanted event occurring are rising. Therefore we define risk monitoring as the use of indicators for regularly assessing probabilities of risk occurrence. These indicators should function like a traffic-light, they have a signaling function. A first attempt to start with the development of indicators for regular risk measurement has been proposed by Blackhurst et al. (2008), who state that risk monitoring "*has received the least attention by supply chain risk researchers and the literature has shown little focus on the tools necessary for temporal risk monitoring*" (p. 146). They developed a risk assessment and monitoring system to track risk indices over time for an automotive manufacturer. A heat graph is designed in which risk scores are calculated for certain parts or suppliers, using indicators like "defects/million", "product complexity" and "supplier bankruptcy". These risk indices should be monitored over time by constructing trend graphs, showing if a risk is still within acceptable levels but rising. To test whether risk monitoring is

indeed undeservedly neglected we test the influence of risk monitoring on supply risk management performance, and on the relation between uncertainty and supply risk management performance.

Hypothesis 5: Risk monitoring is positively related to a buyer's supply risk management performance.

Hypothesis 6: Risk monitoring weakens the effect of (a) environmental uncertainty and (b) behavioral uncertainty on a buyer's supply risk management performance.

2.4 Mitigating Supply Risks

Measuring risk incidence through indicators leads to the next element of a supply risk management system: taking action to mitigate risks. Supply risk mitigation comprises the actions used to eliminate, diminish or counteract supply risks (Hallikas et al., 2004; Norrman and Jansson, 2004; Schoenherr et al., 2008). Mitigation strategies can be for instance multiple sourcing, increases in flexibility, pooled demand, supplier development, supplier audits or inventory increases (Braunscheidel and Suresh, 2009; Chopra and Sodhi, 2004; Zsidisin et al., 2008). An important distinction we can find in the risk management strategies is the distinction between re-active and pro-active risk management (Dani, 2009; Knemeyer et al., 2009; Moder, 2008; Norrman and Jansson, 2004; Zsidisin et al., 2000). Re-active mitigation strategies counteract risk effects when an undesired event occurs. Buffering and insurances are such reactive risk mitigation strategies, they do not prevent any risk from happening but they can absorb possible negative risk effects. Pro-active risk mitigation strategies are strategies to diminish or eliminate risk sources, such as multiple sourcing or not buying in critical countries.

It goes without saying that the use of mitigation strategies -either proactive or reactive- should improve supply risk management performance. Also, the use proper risk mitigation strategies can counterbalance high uncertainty, as proactive strategies can avoid possible future unwanted events (which are more likely in an uncertain context), and reactive strategies diminish the effect such events can have on the organization.

Hypothesis 7: Risk mitigation is positively related to a buyer's supply risk management performance.

Hypothesis 8: Risk mitigation weakens the effect of (a) environmental uncertainty and (b) behavioral uncertainty on a buyer's supply risk management performance.

In figure 1 the complete research model is depicted.

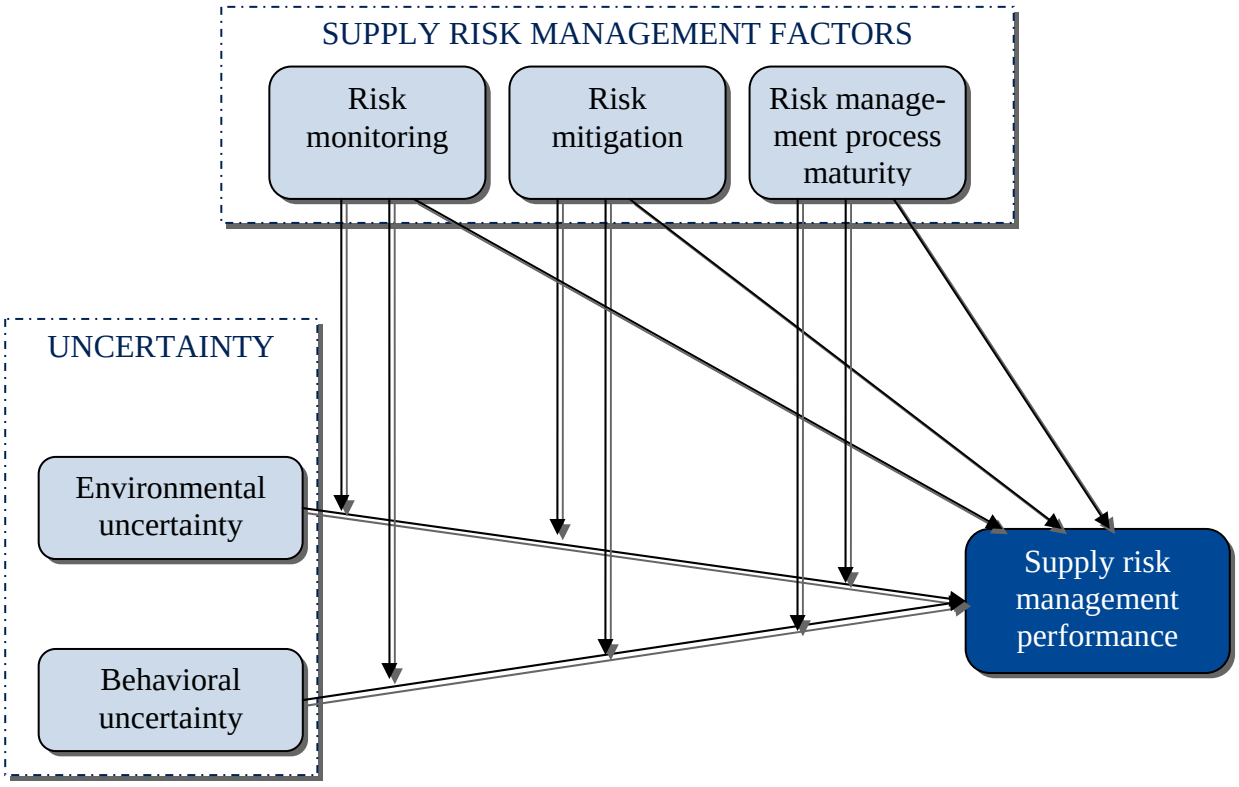


Figure 1 Research model

3. Research methodology

For this research we used multiple methods: an exploratory-qualitative world café workshop and a quantitatively oriented, testing survey. Supply risk management is a fairly new research topic and especially the field of supply risk monitoring is still underdeveloped. Also, research on the relationship between different supply risk management actions and supply risk management performance should be extended (Ritchie and Brindley, 2007). Therefore, a combination of exploratory and confirmatory research is most suited for this research. In addition, the strong practical orientation of the topic calls for an academic-practitioner collaborative research approach. This means to unite industry and academia in a research partnership, thereby meeting a growing need in management research (Hatchuel, 2001; Tranfield et al., 2004; Trim and Lee, 2004). We used the speed consortium benchmark approach, combining a world café workshop with a survey. In consortium benchmarking, an academic-practitioner consortium discusses

research issues by jointly visiting best practice firms (Schiele and Krummaker, 2011). We used the world café method for the consortium discussion, as the world café allows to explore and capture the knowledge of larger groups in a short period of time, and is a powerful conversational process leading to constructive dialogue and collaborative learning (Brown and Isaacs, 2005; Tan and Brown, 2005). The survey allows to validate the explorative workshop's findings on a larger base. So far, we are not aware of any other studies developing measures to conceptualize the constructs "risk monitoring" and "risk mitigation". Therefore, we developed formative measurement items for these constructs based on the world café findings. For all other constructs, we use existing reflective scales that have been developed in former research.

3.1 Data collection and sample

We formed a research consortium of 16 participants, whose knowledge was accessed in a one day workshop using the world café method. In the workshop we used a list of risk sources derived from literature as input for the world café discussions. Participants were asked to comment these risk sources and discuss about possible indicators and mitigation strategies to manage the supply risks. We used four discussion tables, each table had a discussion leader and discussed one of the following risk types: environmental, financial, operational and strategic risks. Environmental risks are events in the environment of the supplier or supply chain relationship that can cause problems, such as terrorist attacks or labor strikes (Chopra and Sodhi, 2004; Kleindorfer and Saad, 2005; Schoenherr et al., 2008). Risk sources related to the supplier(relationship) are problems that arise either at the supplier or within the buyer-supplier relationship and they can be operational (i.e. inability to conform to specifications (Neiger et al., 2009)), strategic (i.e. supplier obligations to other customers (Zsidisin, 2003)) or financial (i.e. supplier bankruptcy (Schoenherr et al., 2008)) in nature.

In four discussion rounds of approximately 40 minutes each, participants discussed the possible risk sources, indicators and mitigation strategies used by their companies. Each participant sat on each discussion table once, but not in a pre-specified order, so the group compositions changed for each round.

After the discussions participants were given the opportunity to assign points to each of the risk sources, indicators and mitigation strategies identified during the discussions. Points were given in accordance to the importance of each issue. Participants were allowed to distribute as many points as they thought necessary. This resulted in a list of the most important risk indicators (21) and mitigation strategies (22). These were taken over in the subsequent survey as formative measurement items for the latent constructs "risk monitoring" and "risk mitigation".

In addition, we included “supply risk management process maturity”, “environmental uncertainty” and “behavioral uncertainty” as independent variables. “Supply risk management performance” was added as a dependent variable.

In the survey, general company data and data about the respondent’s position in the firm were also asked. The survey was sent by email to employees responsible for supply management in several German speaking countries, yielding responses from Germany, Austria, Switzerland and Luxembourg. The email contained a link to a homepage with the questionnaire. For the survey the database of BMEnet, an organization linked to the German association of materials management, purchasing and logistics -BME- was used. In addition to that the survey was also sent to the customer database of a German consultancy firm with which the above mentioned workshop was organized. The survey was also announced on the homepages and newsletters of these organizations. One mailing was possible and all data was collected within the exceptionally short period of one week. Then the link to the survey was closed. In the second workshop the results of the survey were shown to the participants of the first workshop and discussed in detail.

In total the survey yielded 207 usable answers. Most of the respondents were supply managers (59 %), others were supply employees (20 %), staff (4 %), supply risk employees/ managers (3 %) and board members (4 %). On average the respondents had a tenure of employment at their companies of 8.7 years. Respondents came from several, -most of the time typical German- industries: mechanical engineering (23 %), electronic and electrical engineering (13 %), automotive (12 %), chemical industry (5 %), services (13 %) and others (34 %).

3.2 Measurement development

For the survey we used a five-point Likert scale. Respondents could indicate to what extent they observe different risk sources and to what extent they use the different indicators and mitigation strategies mentioned above. Answers ranged from 1 “no, not at all” to 5 “yes, completely”.

The constructs “risk monitoring” and “risk mitigation” are respectively based on the indicators and mitigation strategies that emerged from the world café workshop. As the extensive use of a specific indicator or management tool does not necessarily mean that other indicators/ management tools are used extensively as well, these items are modeled as formative, i.e. they are defining or forming their construct (Diamantopoulos, 2001). From a more practical point of view it is of interest which manifest variables of these formative constructs significantly contribute to supply risk management performance. Therefore we used regressions to determine these variables, and only modeled these variables as items for their respective constructs in the

subsequent PLS analysis. For risk monitoring this means that 4 out of 21 indicators identified during the workshop are identified as relevant. These four variables are: 1) change in the focal companies' turnover with a supplier (strategic), 2) nation reports (environmental), 3) payment behavior of the supplier (financial), and 4) supplier process audits (operational). These are indicators used for risk monitoring that have a positive effect on supply risk management performance. 22 Mitigation strategies are identified during the workshop, and 5 of these mitigation strategies have a significant effect on supply risk management performance. These mitigation strategies are: 1) on-site risk audits, 2) supplier development, 3) risk pre-assessment, 4) building trust, and 5) increase competition between suppliers. These mitigation strategies are useful elements for a supply risk management system, as they all contribute to supply risk management performance.

All other constructs in our research are reflective. The "environmental uncertainty" items are adopted from Klein, Frazier and Roth (1990). "Behavioral uncertainty" is often conceptualized as the difficulty of assessing the performance of transaction partners (Rindfleisch and Heide, 1997). Therefore our items are based on the items about monitoring supplier performance (for measuring transaction cost), developed by Grover and Malhotra (2003). The "supply risk management process maturity" construct is based on the work of Schiele (2007), and the items of the dependent construct -supply risk management performance- are adopted from Moder (2008). The measurement items for the reflective constructs can be found in appendix A.

4. Analysis and results

SmartPLS software (Ringle et al., 2005) is used to analyze the data since it is capable of dealing with both formative and reflective constructs, and it can be used for analyzing models with high complexity (MacCallum and Browne, 1993). Missing values were dealt with by mean replacement. The significance of the path coefficiencies is determined with a bootstrapping procedure (207 cases, 1000 samples). Moderating effects are calculated separately by creating an interaction effect between the independent variable and the moderator variable. Since this is not directly possible with formative constructs, we use the two-stage approach as described by Henseler and Fassott (2010) to determine the moderating effects. This means that we first ran the main effects model to determine the latent variable scores. Subsequently, the moderating effects are tested by calculating the interaction effect with single item constructs; the single items being the latent variable scores calculated in the first step.

4.1 Measurement model

To assess the indicator reliability for the reflective constructs we first checked the path-loadings for each individual item, which are all above the required 0.7 (Chin, 1998), except for one behavioral uncertainty item which had a path-loading of 0.695. Due to the small deviation from 0.7 and satisfactory composite reliability scores we decided to leave this construct intact. Further, the instrument showed good statistical properties as the Cronbach Alpha's ranged from 0.714 to 0.875. Also the composite reliability was satisfactory between 0.824 and 0.909 (see table 1). This is well above the minimum requirement of 0.7 (Nunnally, 1978).

Convergent validity for the reflective items is shown because all the items load with a significant t-value on their related construct, and the AVE scores for each construct are higher than 0.5 (Fornell and Larcker, 1981), see table 1. To assess discriminant validity for the reflective constructs we used the Fornell-Larcker Criterion, which shows that the latent variables better explain the variance of its own indicators than the variance of other latent variables, as can be seen in the cross-correlation matrix in table 2. We also included the factor- and cross loadings of the individual items in table 3.

	Cronbach's Alpha	Composite reliability	AVE
SRM Performance	0.799	0.868	0.622
SRM Process Maturity	0.875	0.909	0.667
Environmental uncertainty	0.714	0.824	0.612
Behavioral uncertainty	0.781	0.868	0.689

Table 1 Statistical Properties

	SRM perf.	SRM proc. mat.	Risk mon.	Risk mit.	Env. Unc.	Beh. Unc.
SRM perf.	**0.7887**[a]					
SRM proc. mat.	0.6805	**0.8167**				
Risk mon.	0.4940	0.5764	-			
Risk mit.	0.5583	0.5899	0.6761	-		
Env. Unc.	-0.1446	-0.0052	-0.0348	-0.1043	**0.7823**	
Beh. Unc.	-0.3405	-0.2049	-0.1304	-0.2658	0.2600	**0.8301**

[a] Values on the diagonal are shared variances within a construct (square root of AVE)

Table 2 Construct cross-correlation matrix

	SRM perf.	SRM proc. mat.	Env. unc.	Beh. unc.
sat1	**0.80**	0.60	-0.07	-0.24
sat2	**0.81**	0.62	-0.09	-0.33
sat3	**0.75**	0.41	-0.13	-0.24
sat4	**0.79**	0.49	-0.18	-0.25
process1	0.62	**0.86**	0.04	-0.17
process2	0.57	**0.82**	0.03	-0.20
process3	0.58	**0.82**	-0.03	-0.18
process4	0.50	**0.81**	-0.05	-0.10
process5	0.49	**0.77**	-0.02	-0.18
unc_env1	-0.07	0.06	**0.72**	0.22
unc_env2	-0.08	0.05	**0.72**	0.17
unc_env3	-0.16	-0.06	**0.89**	0.23
unc_beh1	-0.16	-0.05	0.27	**0.69**
unc_beh2	-0.35	-0.23	0.23	**0.90**
unc_beh3	-0.29	-0.18	0.18	**0.88**

Table 3 Factor- and Cross loadings

To estimate whether multi-collinearity is present for the formative items we calculated the VIF-scores of the manifest variables. The VIF-scores ranged from 1.08 to 1.37, with an average of 1.19. As the threshold-value for formative items is 3.3 (Diamantopoulos and Siguaw, 2006) there is no cause for concern about multicollinearity.

4.2 Structural model

The path-coefficients and t-values of the constructs can be found in table 4. The model shows a good R^2 of 54 %, which shows the theoretical and managerial relevance of our model (Combs, 2010).

	Hypothesized path	Path coefficient	t-value	Signifi-cance
H1	Env. uncertainty => SRM performance	-0.092	2.14	$p < 0.05$
H2	Beh. uncertainty => SRM performance	-0.157	3.44	$p < 0.001$
H3	Risk man. process maturity => SRM performance	0.493	7.17	$p < 0.001$
H4a	Risk man. process maturity x Env. uncertainty	0.124	2.55	$p < 0.01$
H4b	Risk man. process maturity x Beh. uncertainty	0.041	0.85	n.s.
H5	Risk monitoring => SRM performance	0.090	1.26	n.s.
H6a	Risk monitoring x Env. uncertainty	0.146	3.67	$p < 0.001$
H6b	Risk monitoring x Beh. uncertainty	0.077	1.71	$p < 0.05$
H7	Risk mitigation => SRM performance	0.157	2.12	$p < 0.05$
H8a	Risk mitigation x Env. uncertainty	0.099	2.16	$p < 0.05$
H8b	Risk mitigation x Beh. uncertainty	0.042	0.88	n.s.

Table 4 Results of path-analysis

Hypothesis 1 states that environmental uncertainty leads to worse supply risk management performance. This hypothesis is confirmed with a path coefficient of -0.092 ($p < 0.05$). In addition, more behavioral uncertainty also deteriorates supply risk management performance (hypothesis 2, path coefficient -0.157, $p < 0.001$). The direct effect of a supply risk management process maturity on supply risk management performance is strong with a path coefficient of 0.493 ($p < 0.001$). The moderating effect of that same variable on the relation between environmental uncertainty and supply risk management performance is also significant (path coefficient 0.124, $p < 0.01$), but no significant interaction effect with behavioral uncertainty could be found. For hypothesis 5 we found no support. The use of indicators for risk monitoring does not directly contribute to supply risk management performance. However, it does moderate the relation between both environmental and behavioral uncertainty and supply risk management performance (respectively hypothesis 6a, path coefficient 0.146, $p < 0.001$; and hypothesis 6b, path coefficient 0.077, $p < 0.05$). The use of mitigation strategies for risk management significantly improves supply risk management performance (hypothesis 7, path coefficient 0.157, $p < 0.05$). As for the last hypothesis, risk mitigation moderates the relation between environmental uncertainty and supply risk management performance (path coefficient 0.099, $p < 0.05$), but no significant effect on the relation between behavioral uncertainty and supply risk management performance can be found.

5. Discussion and contributions

5.1 Discussion

By means of a literature review and an exploratory world café discussion we have identified risk indicators and mitigation strategies which can be used in supply risk management. With a survey we tested the influence of two transaction cost concepts - environmental uncertainty and behavioral uncertainty- on supply risk management performance. We also tested the influence of several supply risk management concepts -risk monitoring, risk mitigation, and risk management process maturity- on supply risk management performance, and their effects on the relations between both environmental- and behavioral uncertainty and risk management performance. Furthermore, we conceptualized the constructs risk monitoring and risk mitigation by identifying four indicators and five mitigation strategies that determine supply risk management performance. The risk indicators that affect supply risk management performance are: change in the focal companies' turnover with a supplier, the outcomes of nation or industry reports, payment behavior of the supplier, and the results of supplier process audits. The mitigation

strategies that affect supply risk management performance are: on-site risk audits, supplier development, risk pre-assessment, trust building and increasing competition between suppliers.

With this research we give a precise description of some of the elements of supply risk management, thereby contributing to the need for appropriate supply chain risk management frameworks (Zsidisin and Ritchie, 2009). To the best of our knowledge, this study is one of the few to empirically test such elements of a supply risk management system, using practical variables to build the conceptual elements of risk monitoring and risk mitigation.

It became clear that the use of indicators in itself does not significantly improve supply risk management performance, but it does weaken the negative effects that environmental- and behavioral uncertainty have on supply risk management performance, i.e. a more indirect influence can be detected. The use of mitigation strategies is also shown to be relevant for successful supply risk management. From this research we can see that prevention is indeed better than cure, as all the relevant mitigation strategies are pro-active strategies to avoid or minimize supply risk sources. We also show that successful supply risk management is less likely when high uncertainty is present. Both environmental uncertainty and behavioral uncertainty have a negative impact on supply risk management performance. But most importantly, this study shows that supply risk management process maturity has a strong positive influence on supply risk management performance, besides diminishing the effect of environmental uncertainty. It is most determinative for successful supply risk management. Thus the practice with- and internal set-up of supply risk management within companies is far more important for their performance than the uncertainties they face.

If companies want to succeed in their supply risk management endeavors, one of the first conditions is a well-developed supply risk management process. Risk assessment at individual suppliers and on a regular basis will for instance improve supply risk management performance, as will a more thorough analysis of problem suppliers. A company may want employees from different departments to be aware of possible risk sources and these employees should know how to react on the various risks. In addition, the risk management process itself can be evaluated on a regular basis as well. The well-known proverb *"practice makes perfect"* is also applicable for supply risk management. When operating in an uncertain context companies might want to pay even more attention to their supply risk management process. Besides developing general risk management capabilities and structures, companies can identify and assess possible risks, as is ample described in literature (Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad, 2005; Zsidisin et al., 2000). However, it is not enough for companies to identify and assess their supply risks once. Supply risk management in an ongoing process as the chances on risks

occurring can change over time. Ideally, companies should monitor risk sources on a regular basis. Our research shows that this monitoring can be done with early warning indicators. Unfortunately, literature does not provide any indicators yet, except for the indicators mentioned by Blackhurst et al. (2008). We made a contribution to the development of early warning indicators needed to recognize supply risks before they emerge. In addition, we identified several mitigation strategies that can be used to manage supply risks. Companies should (if possible) monitor the payment behavior of their supplier, as it is a good indicator of potential financial problems. Changes in their own turnover by their supplier can indicate possible strategic risks, and nations reports warn for possible environmental problems. A recurring theme during this research is supplier audits. Supplier audits can function both as an early warning for operational problems and as a pro-active risk mitigation strategy. Also risk pre-assessment before building a relationship with a new supplier is of major importance for risk mitigation. And finally, there should be a good balance in the supplier portfolio, as both building trust and keeping up competition between suppliers function as good mitigation strategies.

5.2 Theoretical contributions

With this research we first of all contribute to the large theoretical base of transaction cost economics research. We show that an important element of this theoretical framework -uncertainty- also has explanatory power in a supply risk management context. The premise that high uncertainty leads to higher transaction cost, such as costs for supply risks, -in this research shown by worse supply risk management performance- holds true for supply risk management situations. Both environmental and behavioral uncertainty determine supply risk management performance, the latter having a larger negative effect than the former. Consequently we offer a more complete perspective on supply risk management by including environmental and behavioral uncertainty as antecedents of risk management performance.

Furthermore, whereas most research in supply risk management describes (stages in) the risk management process, little has been done to empirically test the relation between the elements of this process and supply risk management performance. Our research contributes to this growing research topic. The attention given in literature to the different stages of a supply risk management system is well-founded by our research; the stages of risk monitoring and risk management should be thoroughly examined since they determine supply risk management performance. Literature gives ample attention to identifying (and assessing) risk sources and effects, but the pure observation of risk sources is not directly contributing to risk moderation.

We showed that risk monitoring and especially risk mitigation are important elements in supply risk management.

In addition, we also contribute to the existing knowledge on supply risk management by conceptualizing the constructs “risk monitoring” and “risk mitigation”. As far as we are aware, no other studies exist that develop measurement items that can be used to measure these constructs with survey data. We identified practical indicators and mitigation strategies that can be used to build these constructs, while simultaneously showing the effect of these variables on supply risk management performance, thus contributing more in detail to the content of a successful supply risk management system.

And finally, the importance of process maturity in supply risk management has only been dealt with on a conceptual and explorative level (see for instance Berg et al., 2008; Pfohl et al., 2010). With our confirmatory research we demonstrate the importance of having a mature supply risk management process. We showed that supply risk management process maturity determines to a great extend supply risk management performance, thus adding empirical evidence to the tentative model Berg et al. (2008) developed, and contributing to the need for supply chain risk management assessment frameworks as called upon by Berg et al. (2008) and Ritchie and Brindley (2007). The importance of supply risk management maturity to increase supply risk management performance indicates that research attention should not only be directed to the different stages of a supply risk management process, but more on the development of general supply risk management capabilities and procedures.

5.3 Managerial contributions

Several indicators revealed to be useful in detecting supply risks, and we also identified several risk mitigation strategies that can be used in conjunction with these indicators. On these grounds, a supply risk management system can be designed. With the identified indicators companies can build an early warning system for supply risks. By investigating these indicators and several mitigation strategies in conjunction, we have made a contribution to the development of an integrated and practically applicable supply risk management system. Due to time and resource limitations it is not possible for firms to monitor all the risks they face. Companies are forced to make a selection of risks to monitor on an ongoing basis, how to observe these risks and how to encounter them. With this research input for such decisions is provided, as called upon by Zsidisin an Ritchie (2009).

Nonetheless, without developing supply risk management capabilities and procedures, companies are less likely to succeed in their supply risk management efforts. This research

shows that supply risk management process maturity is essential for successful supply risk management: developing capabilities and procedures is a first step towards risk minimization. Therefore, companies need to reflect upon their manner of dealing with supply risks. Especially companies that operate in an uncertain environment should be aware of their risk management system, as they are less likely to succeed in their supply risk management. Extra caution is needed when they face unanticipated changes in their supply chain environment, or when they have difficulty in monitoring their supplier's performance.

6. Research limitations and future research

This research has several limitations. First of all, the dependent variable "supply risk management performance" is based on subjective items. We asked respondents for instance how satisfied they are with their supply risk management and if they were able to minimize the occurrence of supply risks in the last few years. Although perceptual measures are considered satisfactory in operations management research (Ketokivi and Schroeder, 2004), more objective performance measures -like the percentage of risks companies were able to encounter- would surely contribute to the validity of our findings. Also, our methodology prevented the discovery of a best-practice case. Our findings reflect the average practice in supply risk management, yet a best-practice study would probably enhance the development of a successful supply risk management system. Future research could for instance develop a more specialized performance construct focusing not only on effectiveness but also efficiency, as also described by Ritchie and Brindley (2007).

From a contingency point of view, research needs to be done more in detail about the specific impact of different contingency factors on supply risk management performance, as proposed by Trkman and McCormack (2009). We showed that contingency factors such as the amount of uncertainty vested in a supply chain relation- have an effect on supply risk management performance, but more detail is needed about the types of factors and their impact.

In addition, future research needs to be done especially on the risk monitoring stage. Most of the indicators we identified are qualitative, and we did not assess how companies use these indicators. The challenging question is how to operationalize these indicators in a proper and useful manner. Also, the performance of the supply risk indicators needs to be assessed. Do indicators really function as an early warning? In order to do that, a more objective measure for supply risk management performance may be required.

Another direction for future research lies with the evaluation of supply risk management practices. The identified risk indicators might be suitable for evaluating risk mitigation strategies

as well. A good pro-active mitigation strategy should decrease risks, which should be visible in the course of the indicators (i.e. leading to less “early warnings”). Future research can assess the usability of indicators as a supply risk management evaluation tool.

A final research direction could be the focus on industry differences. Risk sources, indicators and mitigation strategies can vary between industries as they are likely to face different levels of uncertainty and supply risk management systems should be adjusted to that. A sector specific approach could lead to more pragmatic supply risk management systems.

Chapter 7

Discussion

1. Introduction

The research in this thesis was aimed at examining risk management issues in supply management. The main research goal was to identify the contextual factors and supply risk management activities that influence supply risk management performance. In this concluding chapter we discuss the key findings and the theoretical and practical contributions that can be derived from the preceding chapters. Finally, we will discuss the limitations of this study and give suggestions for future research.

2. Main findings

The first issue discussed in this thesis is what research method would be suitable to examine a still underdeveloped, highly relevant but also swiftly topic such as supply risk management. The notion that business management research should not only be rigorous but also relevant is extensively debated in literature (see for instance Starkey et al., 2009; Van de Ven, 2007). The issue of speed however, is largely neglected in this discussion, whereas in today's high velocity environments, firms seek possible solutions for newly arisen problems or phenomena -such as supply risks- on short notice. We designed speed consortium benchmarking as a research method to overcome the problem of different clockspeeds in academia and practice (**chapter 2**). We showed that speed consortium benchmarking makes it possible for academia to address business phenomena in high velocity environments, thus bridging the gaps in knowledge transfer and knowledge production between academia and practice.

The method combines consortium benchmarking (Schiele and Krummaker, 2011) with the world café discussion method (Brown and Isaacs, 2005). In consortium benchmarking, an academic-practitioner consortium –usually consisting of about 12 participants- discusses a certain research question by jointly visiting several best practice firms (Schiele and Krummaker, 2011). Consortium benchmarking meets both the rigor (reliability and validity) and relevance criteria of good research, but fails to meet the timeliness criteria of research in high clockspeed environments. Therefore we replaced the benchmark visits with the world café discussion method, so strongly shortening the research cycle. The world café uses café-style tables on which small conversation groups discuss certain topics. During the discussions, participants move between tables/ discussion groups, thereby cross-pollinating ideas and knowledge. Parallelizing the discussions of the research consortium speeds up the knowledge capturing process, thus making it possible to be used for research in high velocity environments as well. Consequently, academics may be able to keep in touch with a larger part of the business community (Hughes et al., 2011).

Part of the world café discussion transcripts are used to explore the under-researched phenomenon of strategic supply risks (**chapter 3**). Strategic supply risk is the risk for a buyer of not being a preferred customer of its supplier, i.e. the supplier offers no preferential resource allocation to this customer (Steinle and Schiele, 2008). We identified three main underlying sources of strategic supply risk: (1) differences in strategic orientation or roadmaps between the buyer and the supplier, (2) the buyer's treatment of his supplier, and (3) the purchasing volume of the buyer accounting for only a minor share of the supplier's turnover. In all these situations, the supplier simply does not care enough for his customer.

A proper supply risk management system also consists of indicators that can be used for risk monitoring. For strategic supply risks we found the most important indicators to be: (1) responsiveness of the supplier, (2) supplier's interest in cooperation with the buyer, (3) supplier's treatment of the buyer, and (4) the buyer's turnover share at the supplier (compared to the share of other customers of this supplier).

In general, simply accepting strategic supply risk was not regarded as good management in our study's population. One clear risk mitigation tool raised from the data: identifying alternative sources of supply. Other tools are more proactive in nature as they aim to decrease strategic supply risk sources: (1) designing detailed long-term and/or exclusive contracts, (2) increase cooperation with the supplier, (3) strategy alignment, (4) relationship development between the buyer's and the supplier's staff, and (5) increasing the purchasing volume at the supplier.

The outcomes of the exploratory world café discussions were subsequently taken over in a survey to test our findings on a larger scale. For different supply risk categories - environmental, financial, operational and strategic - we were able to identify (1) the supply risk sources that should be monitored over time, (2) the indicators that can be used for this monitoring and (3) the tools necessary for mitigating these risks. All these variables (see figure 1) contribute significantly to supply risk management performance and are therefore important building blocks for a successful supply risk management system (**chapter 4**).

In addition, we showed that the choice to keep track of certain risk sources over time does not contribute to supply risk management performance. Yet, using supply risk indicators and supply risk mitigation strategies does significantly improve supply risk management performance. Therefore, supply risk monitoring and supply risk mitigation are important stages in a supply risk management process.

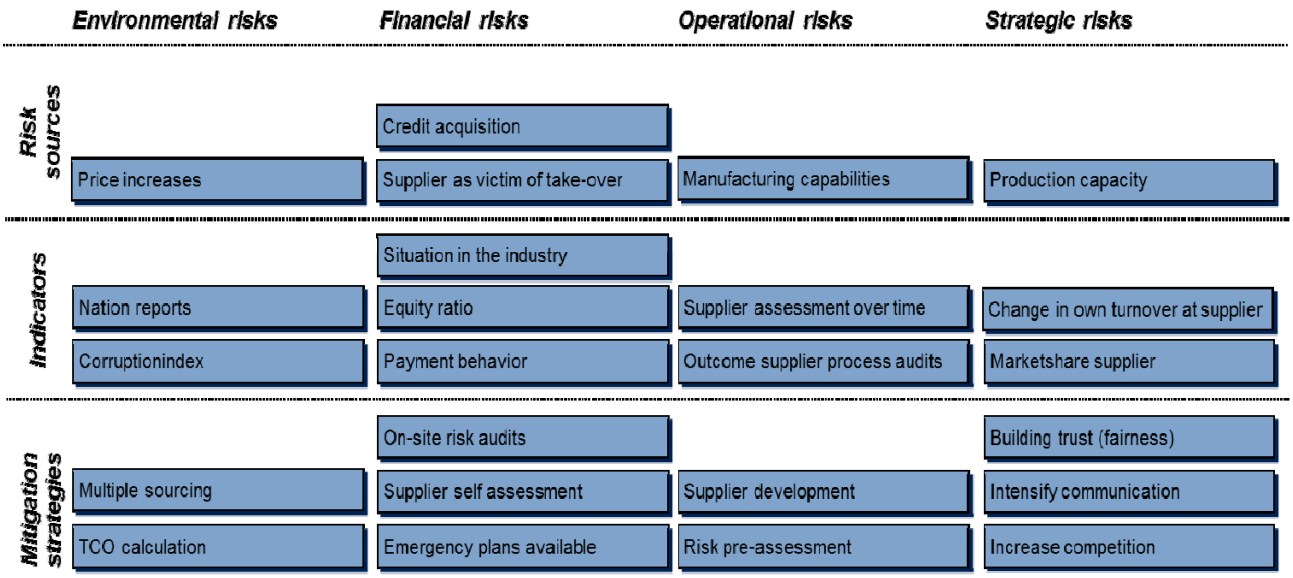


Figure 1 Variables that increase supply risk management performance

We found good explanatory power in the transaction cost theory when it comes to supply risk management issues. Supplier's asset specificity is found to improve supply risk management performance, whereas behavioral uncertainty has a negative effect on supply risk management performance, the latter having the strongest influence (**chapter 5**). Furthermore, based on the social exchange theory, we tested the influence of supplier's dependency and preferred customer status as antecedents of supplier's asset specificity and behavioral uncertainty. Preferred customer status is found to be a highly significant antecedent of these transaction cost constructs, as it increases supplier's asset specificity while at the same time decreasing behavioral uncertainty, thus having an indirect positive effect on supply risk management performance. The role of buyer's dependency however, is a little bit more ambiguous. Whereas buyer's dependency increases supplier's asset specificity (and thus indirectly also supply risk management performance), it also increases behavioral uncertainty (thereby indirectly decreasing supply risk management performance as well). Including these relational concepts based on the social exchange theory enables us to gain a more comprehensive understanding of supply risk management performance.

As for the supply risk management process of risk identification, risk monitoring and risk mitigation, our study shows that simply identifying risk sources to frequently consider is not enough for buyers: in order to be successful, risk monitoring and risk management is necessary (**chapter 4 and 6**). As opposed to the current opinion that risk monitoring is about risk

identification and risk assessment on a regular basis, we made a start by identifying possible indicators that can function as an early warning in risk monitoring. When we combine the indicators for the different types of risk as identified in chapter 4 (see figure 1), four indicators emerge that have the strongest influence on supply risk management performance: (1) change in the buyer's turnover at a supplier, (2) the outcomes of nation reports or industry reports, (3) payment behavior of the supplier, and (4) supplier process audits. In addition, the following risk mitigation strategies are the most important building blocks of a risk management system: (1) on-site risk audits, (2) supplier development, (3) risk pre-assessment, (4) building trust, and (5) increase competition between suppliers.

Besides showing the influence of the different elements of a supply risk management system (risk sources, indicators and mitigation strategies), another main finding of our study is the major influence of supply risk management process maturity on supply risk management performance (**chapter 6**). A well-developed supply risk management process is one of the first conditions for successful supply risk management. This supply risk management process maturity can for instance be achieved by developing general supply risk management practices such as cross-functional risk management, risk assessment of individual suppliers and the in-depth analysis of problem suppliers. Regular evaluation of the supply risk management process itself will also contribute to maturity development in supply risk management processes.

Finally, we showed that risk monitoring, risk mitigation and risk management process maturity do not only have a direct effect on supply risk management performance, but they also (partly) diminish the negative influence environmental uncertainty and behavioral uncertainty have on supply risk management performance. This eventually shows that, even in a highly uncertain environment, successful supply risk management is possible as long as buyers use a carefully designed supply risk management system and develop their supply risk management practices.

3. Implications and contributions

As this thesis consists of a number of articles, all the contributions and implications can be found in the respective discussion sections of each chapter. In this concluding section we will highlight some of these contributions for theory and practice.

3.1 Rigor, relevance and the issue of speed

Chapter 2 discusses the speed problem in academic practitioner collaboration, and proposes speed consortium benchmarking as a research method to execute rigorous and relevant research in high clockspeed environments.

Theoretical contribution. With the proposed speed consortium benchmarking method we contribute to the discussion on academic-practitioner collaboration, by including the clockspeed problem as a relevant issue. In our opinion, sound scholar-practitioner collaboration in high clockspeed environments should fulfill three requirements: rigor, relevance and speed. The proposed speed consortium benchmarking method satisfies these requirements. We illustrate that a slightly adapted world café method (i.e. including table moderators, a plenary final evaluation and recording the discussions) speeds up the research process while at the same time ensures high quality data, making this method well suitable for use in academic enquiry. By means of accelerating the data collection part of the research process, we aspire to contribute to reducing the academic practitioner divide, without sacrificing rigor.

Furthermore, addressing the speed issue in methodological approaches opens up research fields that are otherwise barred. High speed environments might have been accessible for academic research since long ago, but it is only until we as scientists are able to address the speed criteria that our research can meet the relevance criteria (for these high-speed environments) as well.

Finally, speed consortium benchmarking increases opportunities for collaborative research. Active participation of practitioners increases relevance and trust in the outcomes and thus, knowledge dissemination. With this contribution we hope to shift the academic rigor-relevance debate from “should we pursue academic-practitioner research collaboration?” (Kieser and Leiner, 2009; Mitev and Venters, 2009; Starkey et al., 2009) to “how can we effectuate academic-practitioner research collaboration to ensure rigor, relevance and timeliness of the findings?”, which is in line with the conclusion of Hodgkinson and Rousseau (2009) that bridging the rigor-relevance gap is already happening.

Practical contribution. The practical contribution of our speed consortium benchmarking method is not enclosed in the knowledge about development and application of this method itself, but in the possibilities it offers to disseminate knowledge from a multitude of research fields to a non-academic audience. By designing a method that ensures quick dissemination of research findings, a much larger industry pool is unlocked for which relevant research can be aspired, as now also high-speed industries can benefit from research collaboration with academia.

Besides, the world café allows for cross-pollination of ideas between the discussion participants, enabling them to learn from each other. As with consortium benchmarking (Schiele and Krummaker, 2011), engaging in scholar-practitioner research collaboration gives practitioners a chance to define research questions, giving them the opportunity to influence the research topic and thus ensuring relevance. Consequently, acceptance of the research method and trust in the findings are increased.

3.2 Strategic supply risk as a distinct type of supply risk

In **chapter 3 (and 4)** we investigate (among others) the concept of strategic supply risk, i.e. the risk of not receiving preferential customer treatment from a supplier. When strategic supply risk is present, the supplier is able, but not willing to deliver to a particular customer, or performs below potential. We developed a supply risk management system comprising the risk sources of strategic supply risks, indicators for monitoring these risks and mitigation strategies to manage these strategic supply risks.

Theoretical contribution. Our study adds to the growing literature base on supply risk management through exploring the previously neglected concept of strategic supply risk by using a preferred customer perspective. More in detail, we embed this concept into the different stages of a comprehensive supply risk management system by identifying strategic supply risk sources, indicators that can be used for monitoring strategic supply risks and mitigation tools for managing strategic supply risks. It is especially this holistic view of a supply risk management system that contributes to existing knowledge of strategic supply risk management, as previous research tended to generally focus only on specific parts of such a supply risk management system (e.g. only risk identification).

Moreover, the growing literature on customer attractiveness, supplier satisfaction and preferred customers is enriched by enclosing the concept of risk. Strategic supply risk provides an extra argument to pursue further research on this subject.

Practical contribution. Managers would benefit from examining the compatibility of the buyer's and the supplier's strategy and roadmaps, as a mismatch in strategic orientation is one of the main sources of strategic supply risks. Furthermore, buyer's should be aware of their treatment of the supplier, if a supplier is not treated fairly strategic supply risk is likely to emerge. A final reason for the existence of strategic supply risk is the buyer's share in the supplier's turnover: a low share is a source of strategic supply risk.

In addition, we identified several indicators of strategic supply risk. Monitoring and assessment efforts should be directed at the supplier's responsiveness and cooperation:

lengthening response time or little reaction to improvement suggestions for instance might indicate strategic supply risks. Besides, (deteriorating) supplier's treatment of the buyer could indicate strategic supply risks as well. And finally, a buyer's share in the suppliers turnover can be monitored as an indication for strategic supply risk: generally, strategic supply risk is likely if the share drops below ten percent or is minor in comparison with the share of other customers of the supplier.

Strategic supply risks can be mitigated by identifying alternative sources of supply. From a more proactive point of view, we found five important risk management tools: contract design, cooperation, strategy alignment, relationship development and purchasing volume. Detailed and exclusive contracts may secure preferred customer status and thus diminish strategic supply risks. Furthermore, joint development projects can for instance enhance buyer-supplier cooperation, which also reduces strategic supply risk. Another promising tool is joint roadmap/strategy development and discussing strategic issues with the supplier. Moreover, relationship development between the buyer's and the supplier's staff is essential in preventing strategic supply risks. Finally, increasing the purchasing volume with a supplier is an important tool in strategic supply risk management.

With these identified risk sources, indicators and tools managers will be able to build a comprehensive risk management system for managing strategic supply risks.

3.3 Transactional and social characteristics of an exchange relationship determine supply risk management performance

Chapter 5 investigates the ability of the transaction cost theory to explain supply risk management performance, and social exchange theory is used to identify antecedents of the transaction cost constructs "asset specificity" and "behavioral uncertainty". Findings indicate that supplier's asset specificity positively influences supply risk management performance whereas behavioral uncertainty has a negative influence. In addition, both preferred customer status and buyer's dependency positively influence supplier's specific investments (i.e. asset specificity). Behavioral uncertainty is positively influenced by buyer's dependency, but negatively by preferred customer status.

Theoretical contribution. Our research findings establish the importance of the transaction cost theory in explaining supply risk management issues. Both asset specificity and behavioral uncertainty seem to be influential governance mechanisms in supply risk management settings. But as opposed to former studies that found asset specificity to be the most influential governance mechanism (see for instance Carter and Hodgson, 2006; McIvor, 2009), our study

suggests that in a supply risk management setting, behavioral uncertainty is the most important of the two. This finding complies with Suh and Kwon (2006) who suggest that the impact of behavioral uncertainty on business decisions is becoming increasingly important in today's volatile modern world. So in a supply risk management context, research focus should be redirected from the concept of asset specificity to the concept of behavioral uncertainty. Elaborating on the antecedents and effects of behavioral uncertainty would benefit both supply risk management and transaction cost theory research.

In addition, we add to the recently arisen notion that transactional an relational governance mechanisms should be used in conjunction to effectively manage exchange relationships (Liu et al., 2009). We introduced a framework that integrates the transaction cost theory and social exchange theory, providing a more comprehensive view on supply risk management issues as we take into account both the contractual and the relational governance mechanisms that affect supply risk management performance. Such an integrated framework provides more handles to address supply risk management issues. With these findings we adhere to Power and Singh's (2007, p. 1306) view that in a supply chain context, as opposed to a mono-theoretical approach, "*[…] a multiple theory approach is perhaps more useful to explain the complex interplay of factors more likely to be found in the real world*". Research can benefit from such a combination of theories as it provides more leads to future research directions while simultaneously outlining a more complete picture of the subject under study, in our case supply risk management. We hope to stimulate the use of such aggregated models -combining the transaction cost theory and the social exchange theory- beyond the field of supply chain management.

Managerial contribution. Our research indicates that supplier's specific investments and behavioral uncertainty can influence risk management performance. Managerial attention should first and foremost be focused on behavioral uncertainty, as decreasing behavioral uncertainty has the biggest influence on supply risk management performance. Besides, supplier's asset specificity should be increased. Two relational governance mechanisms can be used to decrease behavioral uncertainty and increase supplier's asset specificity: dependency and preferred customer status. Increasing a buyer's dependency can have a positive influence on supplier's specific investments (asset specificity), consequently improving supply risk management performance. On the other hand increasing dependency will also increase behavioral uncertainty (and thus decrease supply risk management performance), so dependency may only be used as a governance mechanism in situations where behavioral uncertainty is already low or absent in the initial situation. In addition, building supplier commitment by striving for preferred customer status is a valuable mechanism for increasing supply risk management performance as it

increases supplier's specific investments while decreasing behavioral uncertainty. Besides earlier research findings that preferred customer status can be beneficial for supplier's flexibility, global sourcing success, supplier pricing and supplier's contribution to innovation (Schiele et al., 2011; Steinle and Schiele, 2008; Williamson, 1991b), we now also show its importance for successful supply risk management.

3.4 The supply risk management process

Chapter 4 and 6 discuss supply risk management systems. We designed an holistic supply risk management system including (1) identified supply risk sources to monitor on a regular basis, (2) indicators that can be used for supply risk monitoring, and (3) tools for supply risk mitigation. These variables were identified for different types of supply risk: environmental, financial, operational and strategic. In total, twenty-four different variables (risk sources, indicators and tools) were identified that contribute significantly to supply risk management performance. In addition, we showed that the identification of risk sources itself does not contribute directly to supply risk management performance, whereas risk monitoring and risk mitigation does. Also, supply risk management process maturity seems to have a considerable influence on supply risk management performance.

Theoretical contribution. As empirically tested supply risk management systems are still scarce (Wagner and Bode, 2008), this research contributes to the development of effective supply chain risk management frameworks, as called upon by for instance Zsidisin and Ritchie (2009). Former research mostly either discusses the different stages of a supply risk management process (see for instance Hallikas et al., 2004; Harland et al., 2003; Mullai, 2009), or defines practical tools for one or several stages (see for instance Neiger et al., 2009; Schoenherr et al., 2008). We built and tested a comprehensive supply risk management system, while simultaneously exploring the practical content (e.g. mitigation tools) of the elements of such a supply risk management system. With our research we are able to explain more than 50 % of the variance in supply risk management performance, which is about 17 % more than former research (Moder, 2008).

Our research suggests that the identification of risk sources to observe on a regular basis is not sufficient for good supply risk management: for all different supply risk types (environmental, financial, operational and strategic) only risk monitoring and risk mitigation contribute significantly to supply risk management performance. This implies that research should focus less on risk identification and assessment techniques and more on risk monitoring and mitigation. Especially the field of risk monitoring is still underdeveloped (Blackhurst et al.,

2008) and deserves more attention. We made a start by identifying possible indicators that can be used for risk monitoring.

Besides designing the different supply risk management stages, our study also revealed that supply risk management process maturity has a significant influence on supply risk management performance. Whereas the variables identified in our supply risk management system are specific actions companies can undertake in managing supply risks, process maturity is about the development of general skills and procedures to manage supply risks. Developing a detailed and cross-functionally practiced supply risk management process can be beneficial, as such a process was found to considerably improve supply risk management performance. With these findings we build upon earlier more exploratory work on this subject (Berg et al., 2008; Pfohl et al., 2010).

Practical contribution. In supply risk management, companies can benefit from developing their supply risk management process and evaluating it on a regular basis, as supply risk management process maturity has a strong influence on supply risk management performance. Companies might profit for instance from developing detailed procedures for their risk management system, assess the risk of individual suppliers on a regular basis, and examine the risks related to problem-suppliers more thoroughly.

We also identified several risk sources that may be monitored on a regular basis, and indicators and tools for supply risk monitoring and mitigation are suggested (see figure 1 for an overview of all the variables). The most important indicators for risk monitoring are: change in the buyer's turnover share with a supplier, nation reports, payment behavior of the supplier, and the results of supplier process audits. Futhermore, the following mitigation tools seem most important: on-site risk audits, supplier development, risk pre-assessment, trust building, and increasing competition between suppliers. With these tools we provide companies with possible building blocks to design a proper supply risk management system.

4. Limitations and future research

The limitations and directions for future research can be found in the discussion sections of each chapter. This final section discusses the main issues and possibilities with regard to methodology, sample and content of this thesis.

4.1 Methodology

Our designed method "speed consortium benchmarking" can accelerate part of the research process, but not all phases. Sufficient knowledge of the state-of-the-art of the research topic

under study and an initial research framework are still needed before starting the world café discussions, and consume substantial research time. The same holds true for the phases after data collection: analysis and dissemination of the new knowledge into the academic community by visiting conferences and publishing papers will take the same amount of time as with other research approaches. The acceleration is mainly focused on the data collection phase of academic research.

Moreover, in order to be able to fulfill the rigor criteria of academic research, speed consortium benchmarking calls for a very disciplined design. Up front, sufficient knowledge of the literature base of the research topic is definitely needed to gain useful results. Having different moderators at each table requires multiple researchers, and their role in the world café discussions should be thoroughly discussed in advance, requiring a lot of scholarly time.

Future research on this topic could focus on the evaluation of multiple speed consortium benchmark studies, as a meta-study on this subject would enhance the validity of our speed consortium benchmarking method.

A last comment can be made on the items used for our confirmatory survey. The dependent variable “supply risk management performance” is based on subjective items. Although it is not uncommon to use perceptual measures in operations management research (Ketokivi and Schroeder, 2004), more objective performance measures on the effectiveness and efficiency of supply risk management practices can add to the validity of our findings.

4.2 Sample

Thirteen firms attended the world café discussions for our research, which is a limited sample. Since our exploratory work on especially strategic supply risk management is based on the outcomes of this sample, future research should test the findings of our study on a larger and more representative scale.

Furthermore, our study only included purchasing managers experiences in supply risk management, whereas employees from other departments of the buyer (e.g. production or R&D) might also experience and handle supply risks. Future research should take the perspectives of these employees into account as well. In addition, considering the supplier’s point of view may also yield valuable insights, especially on the preferred customer issues associated with strategic supply risk management.

Finally, all data was collected in German-speaking countries. Making inferences about other industry settings or cultures is therefore limited. A future research direction could be focused on

industry and cultural differences in supply risk management; an industry specific approach for instance could lead to more pragmatic and valuable supply risk management systems.

4.3 Future research directions in supply risk management

Our research indicates that the amount of uncertainty present in a buyer-supplier relationship has a negative effect on supply risk management performance, though proper supply risk management practices can partly negate this effect. In line with this finding, more research can be done on the impact of different contingency factors (like uncertainty) on supply risk management performance, as also indicated by Trkman and McCormack (2009).

Furthermore, our research shows that both risk monitoring and risk mitigation have a positive effect on supply risk management performance, and we identified several practical indicators and tools that can be used for this supply risk monitoring and mitigation. However, more research is necessary as the indicators and tools necessary require further operationalization. Especially the field of risk monitoring needs more attention, as most of the effective indicators identified are qualitative in nature. How can these indicators be measured correctly? What are threshold values indicating risks are likely to occur (i.e. when does the “traffic light” switch from green to orange or red)? How often should companies assess the different risk sources?

A final research direction can be the evaluation of supply risk mitigation practices. The supply risk indicators identified in this study might not only be suitable for risk monitoring, but have potential to be used as an evaluation mechanism for risk mitigation tools as well. Proper supply risk mitigation tools decrease supply risks, which should manifest in the course of the risk indicators, i.e. leading to less “early warinings”. This can reveal the best working mitigation tools, leading to more efficient supply risk management systems. Assessment of the usefulness of supply risk indicators as a supply risk management evaluation tool will therefore be a meaningful future research approach.

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Appendix A Survey items

All questions are based on a 5-point Likert scale (1 = no, not at all; 3 = partly; 5 = yes, completely).

Reflective items

Supply risk management performance

- Our supply risk management is better than that of our competitors
- Overall we are satisfied with our supply risk management

In recent years, we were able to (taking into account the industry cycle):

- Minimize the frequency of supply risks occurring
- Minimize the magnitude of the effect of occurring supply risks

Supplier's asset specificity

- The procedures and routines developed by our suppliers as part of their relationship with our company are tailored to our particular situation
- We often use unusual technological standards and norms that require extensive adaptation by our supplier

Environmental Uncertainty

- We are often surprised by the market development in our industry
- We are often surprised by the actions of our competitors
- We are often surprised by the customer reaction

Behavioral Uncertainty

- It takes significant effort to detect whether or not suppliers conform to specifications and quality standards
- Accurately evaluating our major suppliers requires a lot of effort
- It is costly, in time and effort, to clearly monitor the performance of our key suppliers

Dependency

- It would be difficult for us to replace our key suppliers in the short term
- Our success depends significantly on the performance of our suppliers

- Our major suppliers command resources that we would have difficulties obtaining somewhere else

Preferred customer status

- Our major suppliers are keen to stay in a long-lasting exchange relationship with us
- If other companies make a better offer to our suppliers, our suppliers would probably accept, even if it would jeopardize the business relationship with us (R)
- The best resources of our suppliers work for us
- We have the impression that our company is more attractive to our suppliers than their other customers

Supply risk management process maturity

- Our company has introduced a detailed supply risk management process
- Our supply risk process is practiced cross-functionally
- We regularly assess the risks of individual suppliers (e.g. quarterly, yearly)
- We improve our risk management process on a regular basis
- Part of our risk management process is the in-depth analysis of problematic suppliers

Formative items

For the formative constructs we listed the 63 variables identified during the workshops and asked respondents which of these mentioned risk sources they observe, which of the mentioned indicators they used for measuring these risks and which of the mentioned mitigation strategies they used. Only those items that contributed significantly to supply risk management performance were included in the PLS models.

Environmental supply risks

"Environmental and political" risks are the same for all market participants at one location. The differ in this respect from the other risk types that only concern specific buyer-supplier relationships. The following deals with (1) the question which risk sources your company watches/follows? (2) How these risks are monitored? And (3) what measures are taken to address the risks?

For the following questions, please choose whether you agree with the statements presented (between "no, not at all", "partial", "yes, completely true" or the intermediate values).

(1) Which general risks do you watch/follow?

- Currency exchange rate changes
- Price increases (for instance commodity price fluctuations)
- Availability/ access to raw materials
- Obstruction of transport routes (e.g. due to bad weather, armed conflict, piracy etc.)

(2) Which valuation approaches / indicators, in particular their changes, do you use to recognize environmental risks in time?

- Revert to a total cost of ownership analysis
- Country reports / industry reports (e.g. WEF, EMD, Faser Institute etc.)
- Corruption index (e.g. Transparency International)

(3) What measures do you take to handle anticipated or actual problems that are general in nature and affect all suppliers in a specific location?

- Hedging
- Series-/ order specific total cost of ownership calculation in the scope of the outsourcing decision
- Increased presence in critical countries (e.g. purchasing office, representative, own sales organization, etc.)
- We avoid awarding contracts to suppliers from critical countries from the start
- Multiple sourcing strategy (distribution of procurement volume to suppliers in multiple countries)

Financial supply risks

In this part the financial risks are considered. In extreme cases, financial risks mean that the supplier has to stop doing business due to lack of liquidity. The following deals with (1) the question which risk sources your company watches/follows? (2) How these risks are monitored? And (3) what measures are taken to address the risks?

For the following questions, please choose whether you agree with the statements presented (between “no, not at all”, “partial”, “yes, completely true” or the intermediate values).

(1) Which financial risks do you watch/follow? What are the main reasons why suppliers are getting into financial difficulties?

- Suppliers suffer from liquidity shortages due to problems in obtaining credit

- Declining order situation as the cause of liquidity deficiency
- Customer structure of the supplier (few customers with a high share in the supplier's turnover and the loss of a major customer of the supplier as a trigger for liquidity problems)
- Change in the rating of the supplier at the rating agencies and banks
- Change in ownership (supplier is victim of a takeover by another company)

(2) Which valuation approaches / indicators, in particular their changes, do you use to recognize financial risks in time?

- Consideration of the payment behavior of the supplier to his (2^{nd} tier) suppliers
- Indebtedness of the supplier
- Cash flow development of the supplier
- Number of customers of the supplier
- Assessment of the specific situation in the industry of the supplier
- Equity ratio
- (Production)capacity utilization of the supplier
- Observation of the development of credit ratings (e.g. Crediteform, D & B, Hermes, etc.)

(3) What measures do you take to handle anticipated or actual liquidity problems of suppliers?

- Exclusive contractual arrangements (e.g. pre-emption, securing know-how/machines etc.)
- Defining an emergency plan (e.g. provision of materials, purchasing of machinery etc.)
- Financial support of the supplier (e.g. guarantees/warranties, participations, purchasing commitments etc.)
- On-site risk audits at the supplier
- Regular supplier self-assessment

Operational supply risks

Operational supply risks are those that ultimately result from lack of competence of the supplier. Operational risks are caused by the inability of the supplier to meet required performance expectations (despite his best efforts). The following deals with (1) the question which risk sources your company watches/follows? (2) How these risks are monitored? And (3) what measures are taken to address the risks?

For the following questions, please choose whether you agree with the statements presented (between "no, not at all", "partial", "yes, completely true" or the intermediate values).

(1) Why is the supplier not able to meet its obligations, although he tries in principle?
- Compliance with standards and regulations (lack of quality capabilities of suppliers)
- Procurement logistics, delivery performance (poor logistic capabilities of the supplier)
- Production capacity / utilization of the supplier (lack of manufacturing capabilities of the supplier)
- Communication (misunderstandings, slow / no response by the supplier)
- Global sourcing as a cause of operational risks

(2) Which valuation approaches / indicators, in particular their changes, do you use to recognize operational risks in time?
- Changes in the results of the regular supplier assessment over time
- Outcomes of the process-audits
- Delivery reliability / delivery performance (e.g. from SAP)
- Condensation of subjective assessments from informal conversations with interface partners at the supplier
- Product-specific quality indicators (e.g. ppm etc.)

(3) What measures do you take to handle anticipated or actual problems of overburdening / overloading of the suppliers?
- Conversations with the supplier
- Risk-oriented pre-assessment for new suppliers
- Detailed contractual arrangements (e.g. ownership of tools, penalties, Incoterms etc.)
- Supplier development
- Keeping own stock

Strategic supply risks

Strategic risks are caused by the fact that the buyer is not (any longer) sufficiently attractive for the supplier. The supplier is in principle technically capable to solve problems and provide the desired performance, but doesn't exert itself enough. In case of doubt, he gives preference to its other customers.

For the following questions, please choose whether you agree with the statements presented (between "no, not at all", "partial", "yes, completely true" or the intermediate values).

(1) Which causes do you watch/follow, that lead to strategic risks?

- Supplier shifts its priority to other technologies (e.g. because our product is at the end of the product life cycle)
- Supplier is becoming a competitor
- Staff changes at the supplier
- Dependence on suppliers (limited availability of alternative suppliers)
- Production capacity on the market (lack of manufacturing capacity in the industry)
- Disregard for intellectual property rights (know-how drain by the supplier)

(2) Which valuation approaches / indicators, in particular their changes, do you use to recognize strategic supply risks in time? What indicators help to recognize that our business for the supplier has become less attractive?

- Changes in own turnover at the supplier
- Market share of the supplier
- Supplier's turnover with our competitors
- Hierarchical position of the contact person at the supplier (Managing director, key account manager, regional manager?)
- Reliability / behavior / reaction time / development of personal contacts

(3) What measures do you take to handle anticipated or actual problems as a result of being of too little importance for the supplier?

- Establishment strategic partnership / exclusive contract / framework agreement
- Building trust (e.g. fair treatment / promt payment, etc.)
- Intensified communication (workshops, annual meetings, demand forecast, etc.)
- Pooling of demand, resulting in higher purchase volumes at the supplier
- Serve as a pilot customer (e.g. implementation of reference projects, tests, joint publications, etc.)
- Building of sufficient sales volume at the supplier (e.g. 10 – 15 %)
- Increasing competition (setting up of a second or third source to induce suppliers to devote us more attention)

Samenvatting

(Summary in Dutch)

Innovatief inkoop-risicomanagement

De ontwikkeling van een integraal inkoop-risicomanagement system

1 Introductie

Door onder andere toenemende outsourcing en globalisering zijn supply chains de laatste jaren steeds complexer en kwetsbaarder geworden. Bedrijven zijn daardoor meer afhankelijk geworden van toeleveranciers voor het behalen van competitief voordeel. Ter voorkoming van negatieve effecten op de operationele en financiële performance van bedrijven, als gevolg van het slecht presteren van toeleveranciers, is goed risicomanagement in de relatie met deze leveranciers essentieel.

Ondanks de recente wetenschappelijke aandacht voor risicomanagement in de inkoop is het bruikbare onderzoek op dit vakgebied tamelijk summier. Veel inkooponderzoek richt zich slechts op één of enkele fasen van het risicomanagement proces, zoals risico-identificatie of risico-evaluatie, terwijl ander fasen zoals het monitoren van inkooprisico's grotendeels genegeerd worden. De meer complete modellen zijn over het algemeen conceptueel van aard en niet empirisch getoetst. Ook de effectiviteit is nauwelijks onderzocht: de link met bedrijfsprestaties wordt nog maar weinig gelegd.

Het doel van dit onderzoek is tweeledig: gebaseerd op de transactiekosten en social exchange theorie zullen wij contextuele factoren identificeren die invloed hebben op de performance van het inkoop-risicomanagement. Tevens ontwerpen en toetsen we een uitgebreid inkoop-risicomanagement systeem. De centrale vraag in dit onderzoek luidt dan ook:

Welke contextuele factoren en inkoop-risicomanagement activiteiten hebben invloed op de inkoop-risicomanagement performance?

2 Aanpak en resultaten

Om bovenstaande vraag te beantwoorden hebben we een methode ontwikkeld die het mogelijk maakt om onderzoek te doen in snel veranderende markten en industrieën (zoals in het geval van risicomanagement): speed consortium benchmarking. Deze methode maakt gebruik van de world café discussie methode waarin een consortium van bedrijven de onderzoeksthema's simultaan en in meerdere discussierondes bediscussieerd aan verschillende café tafels. De uitkomsten van die discussies kunnen worden gebruikt als input voor een validerende enquête. Als leidraad voor het onderzoek werd een op literatuurstudie gebaseerd inkoop-risicomanagement model gebruikt bestaande uit de volgende fasen: (1) identificeren van risico oorzaken die regelmatig beoordeeld moeten worden; (2) monitoren

van deze risico's met behulp van indicatoren; en (3) het nemen van managementmaatregelen om deze risico's te voorkomen of verkleinen.

De input voor de world café discussies bestond uit uit de literatuur geabstraheerde inkooprisico oorzaken, geclassificeerd in de volgende categorieën: (1) omgevingsrisico's, (2) financiële risico's, (3) operationele risico's, en (4) strategische risico's. In de discussies werden deze risico oorzaken waar mogelijk aangevuld en besproken, alsmede mogelijke indicatoren en managementmaatregelen die gebruikt zouden kunnen worden om deze risico's te beheersen. De uitkomsten van deze world café discussie is overgenomen in een enquête om de bevindingen op grotere schaal te kunnen testen.

In de wetenschappelijke literatuur zijn met name strategische inkooprisico's nog onderbelicht. Daarom is op basis van de exploratieve world café discussies invulling gegeven aan een managementmodel voor deze strategische risico's. Bij strategisch inkooprisico is de leverancier wel in staat, maar niet bereid om te leveren zoals gewenst door de klant. Met andere woorden: de klant geniet ten opzichte van zijn concurrentie niet de voorkeur van de leverancier. De volgende belangrijke oorzaken van strategische inkooprisico's zijn geïdentificeerd: (1) een verschil in strategische oriëntatie tussen leverancier en klant, (2) de behandeling van de leverancier door de klant en (3) het inkoopvolume van de klant draagt slechts in kleine mate bij aan de totale omzet van de leverancier. Indicatoren voor het monitoren van deze risico's zijn: (1) afnemende reactiesnelheid van de leverancier, (2) interesse van de leverancier in samenwerking met de klant, (3) de behandeling van de klant door de leverancier, en (4) de omzet van de klant bij de leverancier in vergelijking met andere klanten. Het identificeren van alternatieve leveranciers blijkt een belangrijke managementmaatregel voor strategische risico's. Meer proactieve maatregelen zijn: (1) het ontwerpen van gedetailleerde en/of exclusieve contracten, (2) verhoogde samenwerking met de leverancier, (3) het op één lijn brengen van de strategie, (4) het ontwikkelen van de individuele relaties tussen de medewerkers van leverancier en klant, en (5) het verhogen van het inkoopvolume bij de leverancier.

De uitkomsten van de exploratieve world café discussies voor alle risico-categorieën zijn overgenomen in een enquête om de bevindingen op grotere schaal te kunnen toetsen. Het blijkt dat het identificeren van regelmatig te beoordelen inkooprisico's niet bijdraagt aan de inkoop-risicomanagement performance. Het monitoren van risico's en het nemen van managementmaatregelen zijn wel belangrijke fasen in een inkoop-risicomanagement proces: deze hebben een significant positief effect op risicomanagement performance. Meer concreet zijn er voor alle risico-categorieën specifieke indicatoren en managementmaatregelen

gevonden die bijdragen aan risicomanagement performance. De meest belangrijke indicatoren zijn: (1) verandering in de omzet van de klant bij de leverancier, (2) de uitkomsten van landen- en industrierapporten, (3) het betalingsgedrag van de leverancier, en (4) proces audits bij de leverancier. Belangrijke management maatregelen zijn: (1) risico audits bij de leverancier ter plekke, (2) leveranciersontwikkeling, (3) vroegtijdige risico inschatting, (4) het opbouwen van vertrouwen en (5) concurrentie verhogen tussen leveranciers.

De transactiekosten theorie laat zien dat verschillende context factoren een effect hebben op inkoop-risicomanagement performance. Wanneer een leverancier specifieke investeringen heeft gedaan in de relatie met de klant is de kans op succesvol risicomanagement groter. Aan de andere kant leidt veel onzekerheid in een relatie tot slechtere risicomanagement performance. Het gaat hierbij met name om onzekerheid met betrekking tot het gedrag van de leverancier. De social exchange theorie biedt goede ingangen om deze onzekerheid te beïnvloeden: het ontwikkelen van een voorkeursstatus bij de leverancier doet de negatieve effecten van gedragsonzekerheid deels teniet, en zorgt ervoor dat leveranciers eerder geneigd zijn specifieke investeringen te doen (wat dus weer leidt tot hogere risicomanagement performance). Deze specifieke investeringen door de leverancier worden ook eerder gedaan wanneer de klant afhankelijk is van deze de leverancier. Aan de andere kant leidt deze afhankelijkheid juist tot een grotere gedragsonzekerheid, en kan deze dus het beste vermeden worden.

Het negatieve effect van onzekerheid op inkoop-risicomanagement performance neemt af wanneer bedrijven de eerder genoemde indicatoren en managementmaatregelen gebruiken, het gebruik daarvan heeft een modererend effect. Buiten deze specifieke managementfasen in het inkoop-risicomanagement systeem toont ons onderzoek aan dat “proces-volwassenheid” van het risicomanagement in sterke mate bijdraagt aan risicomanagement performance. Het gaat hierbij niet om het gebruik van specifieke indicatoren of managementmaatregelen, maar meer om het ontwikkelen van algemene risicomanagement-structuren en -capaciteiten. In een goed ontwikkeld proces worden inkooprisico’s door het hele bedrijf heen onderkend, herkend en gemanaged, blijkend uit bijvoorbeeld het instellen van frequente risicobeoordelingen voor individuele leveranciers en een verdiepte analyse van probleemleveranciers. Deze procesvolwassenheid heeft een sterk direct effect op de inkoop-risicomanagement performance.

3 Contributie

Dit onderzoek draagt bij aan de ontwikkeling van inkoop-risicomanagement kennis. Het ontwikkelde model verklaart meer dan 50 % van de inkoop-risicomanagement performance, dit is 17 % meer dan eerdere onderzoeken. We hebben een bijdrage geleverd aan het ontwikkelen van het relatief nieuwe concept strategisch inkooprisico, een type risico dat voornamelijk voorkomt in tijden van economische voorspoed, wanneer leverancier kunnen kiezen wie ze wel en niet willen leveren. We verklaren waarom strategische inkooprisico's zich voordoen en geven mogelijke oplossingen voor het monitoren en managen van deze risico's.

Ook draagt dit onderzoek bij aan de ontwikkeling van de management fase "monitoren van inkooprisico's", tot nu toe grotendeels genegeerd in wetenschappelijk onderzoek. We tonen aan dat het monitoren van inkooprisico's van significant belang is voor risicomanagement performance. Ook wordt er een praktische invulling gegeven aan deze management fase door het identificeren van bruikbare indicatoren die een signalerende functie kunnen hebben in het herkennen van stijgende (of dalende) inkooprisico's.

Naast het identificeren van de specifieke inkooprisico's, indicatoren en managementmaatregelen toont dit onderzoek ook een sterke relatie aan tussen inkoop-risicomanagement "proces volwassenheid" en risico management performance: het ontwikkelen en verbeteren van algemene managementprocedures draagt sterk bij aan inkoop-risicomanagement succes.

Daarnaast blijkt de transactiekosten theorie erg bruikbaar voor het verklaren van inkoop-risicomanagement performance. Daarbij is het voorkomen van gedragsonzekerheid het meest bepalend, in tegenstelling tot eerder onderzoek dat relatie specifieke investeringen als belangrijkste concept aanmerkt. Het samenvoegen van de gebruikte transactiekosten theorie en de social exchange theorie bied zeker mogelijkheden voor verdere theorieontwikkeling waarin zowel transactionele als relationele beheersmaatregelen meegenomen kunnen worden voor het managen van leveranciersrelaties. Op conceptueel niveau lijken deze theorieën elkaar aan te vullen, het gebruik daarvan kan leent zich zeker voor uitbreiding tot buiten het terrein van inkoop-risicomanagement onderzoek.

Een laatste bijdrage van deze dissertatie is de ontwikkeling van een onderzoeksmethode die rekening houdt met de "clockspeed" in bepaalde industrieën. Vertrekkende van het standpunt dat bedrijfskunde een toegepaste wetenschap is beargumenteren we dat tijdigheid – naast nauwkeurigheid en relevantie- een belangrijk criterium is voor goed (toegepast) onderzoek. Speed consortium benchmarking geeft een invulling aan de door ons nagestreefde

samenwerking tussen wetenschap en praktijk. Deze methode maakt het mogelijk om middels een academisch-praktische samenwerking in snel veranderende industrieën wetenschappelijk onderzoek te kunnen doen. Dit vergroot niet alleen de wetenschappelijke kennis, maar levert tegelijkertijd ook een bijdrage aan de praktijkontwikkeling in deze industrieën. Daarmee pogen we de kloof tussen wetenschappelijk nauwkeurig en praktisch relevant onderzoek te verkleinen.