Entrepreneurial Orientation in Supply Chain Partnerships – A Driving Force for New Product Development Performance?

Ricarda B. Bouncken,1,2 Boris D. Plüschke1,3 and Robin Pesch1,4

Abstract: This paper investigates how the entrepreneurial orientation of a firm affects their new product superiority within the context of supply chain partnerships. Empirical results of 171 firms show that their entrepreneurial orientation contributes to new product superiority. If firms manage to learn from their downstream partners in the supply chain, they can increase their products superiority. Yet, if firms face technological uncertainty their products superiority decreases. When considering moderators, we find that the effect of entrepreneurial orientation on new product superiority increases under inlearning but decreases under technological uncertainty and higher age of the firm.

Keywords: Entrepreneurial Orientation, Alliances, Supply Chain

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1 Introduction

For quite some time entrepreneurship has been emphasized as a driver for change and economic growth (Hatten & Coulter, 1997; Holt, 1992; Schumpeter, 1934; Shane & Venkataraman, 2000), whereas EO only recently has been uncovered as a crucial success factor on the firms’ performance (Covin & Slevin, 1991). Entrepreneurial orientation (EO) defines the innovative, proactive and risk-taking behaviour within firms. Even though EO’s dimensions and effects have proofed to be as a crucial success factor on firms performance by first meta-analytical studies (Rauch, Wiklund, Lumpkin, & Frese, 2009), but none of the 56 underlying studies investigated the effect on neither new product performance nor across firms, particular supply chain partnerships.

New product development is an essential condition of firms’ performance. (Balachandra & Friar, 1997; Griffin, 1997; Olson, Walker, & Ruekert, 1995). External links are built for firms deficient on resources and for the improvement of firm’s innovativeness (Karniouchina, Victorino, & Verma, 2006). Supply chain partnerships are interfirm agreements between two or more firms ranging from arm’s-length contracts to equity-based joint ventures. but also challenging task, since it is resource intensive, risky, fuzzy and uncertain (Schröder, 1996; Wang, Yeung, & Zhang, 2011). Supply chain partnerships allow, first, transferring resources, capabilities, and especially knowledge up and down the supply chain and, second, sharing the inherent risks and uncertainty between the partners. We argue that firms with a strong EO are the source and simultaneously engine behind their innovativeness and the joint product development process across firms in supply chain partnerships: With the innovativeness of their EO they provide novel ideas or even components into the partnership and, as with their proactiveness and risk-taking they foster the exploitation and further development of these novel ideas. EO eases the entering of supply chain partnerships. As such firms with high EO are attractive
supply chain partners. Also, EO stimulates the continuous pursuit, proliferation, and implementation of new business ideas that stabilizes and advances the supply chain partnership.

To explore this black box, we study how EO affects new product superiority supply chain. We provide answers to two lacunas – to new product performance and in the context of supply chain partnerships. We deliver more insights in internal and external issues (Davis, Morris, & Allen, 1991). As internal issue, we investigate the influence of firm age, since older firms have to struggle with inertia which can be oppressed by EO (e.g. Hannan & Freeman, 1984; Sørensen & Stuart, 2000). As an external issue we consider the effects of technological uncertainty, one crucial challenge of new product development within today’s dynamic market environments. As an relational issue, we analyze how interorganizational learning interacts with EO on new product development performance as learning is a vehicle for overcoming firms’ limited knowledge base (Grant & Baden-Fuller, 2004).

We proceed in the following manner. First, we describe EO within supply chain partnerships and its effects on new product development performance in terms of new product superiority. Then, we describe the internal, relational issues, and external, including firm age, learning, and technological uncertainty as influencing factors. Within the third section we present our empirical study followed by a discussion of our results and some concluding remarks.

2 Theory

2.1 Entrepreneurial Orientation

The idea of entrepreneurship goes back to Schumpeter (1934) who has described entrepreneurs as persons which are steadily trying to improve their economic position by being innovative. Entrepreneurship refers to the individual as well as to the corporate level (Miller,
1983) and is not limited to only new ventures (Kraus, Kauranen, & Reschke, 2011). It includes the proactive search of new business models and products in established firms. Miller (1983: 771) suggested that entrepreneurial firms are engaged in “product-market innovation”, undertake “somewhat risky ventures, and” are “first to come up with “proactive” innovations, beating competitors to the punch”. Specifically, the concept of EO directs the entrepreneurial attitude within firms (Kraus, Rigtering, Hughes, & Hosman, 2012; Lumpkin & Dess, 1996) and refers to strategy decision-making, behaviors, and management styles on a corporate level (Anderson, Covin, & Slevin, 2009) that drives success (Rauch et al., 2009).

Drawing on Miller (1983) EO basically consists of three dimensions “innovativeness”, “risk taking” and “proactiveness”. These were adopted by several researchers (e.g. by Covin & Slevin 1989). Lumpkin and Dess (1996) added the dimensions of ‘competitive aggressiveness’ and ‘autonomy’, forming a five-dimensional construct. Within our study we focus on the widely applied three-dimensional conceptualization of Covin and Slevin (1989).

2.1.1 Entrepreneurial Orientation and New Product Superiority within Supply Chains

New product superiority regards to level of product innovativeness and the benefits that the developed product creates for customers, especially in relation to competing products (Lee & Colarelli O'Connor, 2003). Supply chain partnerships allow the leverage of synergistic effects between firms and thus is a source of innovation in general (Wang et al., 2011) and high new product superiority specifically (Bouncken & Pesch, 2014). EO is important for achieving those effects within supply chain partnerships as it, first, helps to find new partners for new business models or innovations, second, attracts partners which are entrepreneurial orientated
itself, and, third, fuels maintaining of the partnership. The three dimensions of EO stress its specific contribution to performance in supply chain partnerships.

**Innovativeness:** Innovative firms have a virtue to be creative, to experiment, and to support new ideas (Kyrgidou & Spyropoulou, 2013) and thus depart from existing solutions and practices (Dess & Lumpkin, 2005; Hong, Song, & Yoo, 2013). Innovativeness can improve firms’ financial and market position (Rubera & Kirca, 2012). Such firms have a high reliance on technical trained personal (Miller & Friesen, 1982) and are more likely to attract creative employees (Kyrgidou & Spyropoulou, 2013). Beyond that, innovativeness improves the ability to recognize and exploit promising opportunities, resulting from changing market conditions (Hult, Hurley, & Knight, 2004). Within supply chains such firms are the initiator of the joint new product development process by delivering novel ideas or even components into the partnership. Further developed, those ideas are the nucleus of every innovation. Furthermore, as seen in times when most personal computers were promoted as having ‘intel insight’, the innovative firm’s image (here intel) also radiates on the partnering firms (here personal computer sellers such as Lenovo or Dell) promoting their products as being more innovative. At least the innovative firm’s personal capabilities can also be tapped by partnering firms as normally interorganizational innovation project groups are built.

**Proactiveness:** To meet venture opportunities as the first, proactive firms carefully monitor changes within the market which enhances their ability to seize new opportunities and to identify future trends (Dess & Lumpkin, 2005; Lumpkin & Dess, 1996; Miller, 1983). Thus, proactive firms eliminate operations which are at the end of their life cycle (Lumpkin & Dess, 1996) allowing them to work upon state of the art operations or those on new frontiers. Within supply chains, seen individually, proactive behavior enhances communication and interactions between suppliers and buyers as proactive partners feel free to comment occurring problems
and propose solutions. This, first, helps timely curing disagreements between the supply chain’s partners which strengthens interorganizational trust and, second, allows developing superior products as bugs are recognized very early. Furthermore, proactive behavior helps firms which are not member of a supply chain, yet, to talk to potential supply chain partners, et vice versa.

**Risk-taking:** Risk-taking firms are willing to take risks on an outstanding level (Lumpkin & Dess, 1996). First, they venture “into the unknown” (Baird & Thomas, 1985: 231) as risk-taking firms’ take actions where outcomes and probabilities are uncertain or only partly known. Second, risk-taking managers make large resource commitments (Miller & Friesen, 1982) and incurring debts (Lumpkin & Dess, 1996). As experimentation per se comprises the possibility to fail (Anderson et al., 2009) and thus all new product development projects are of risky and fuzzy nature (Schröder, 1996) the entrepreneurial firms’ risk-taking behavior favors the commitment to new product development. Through higher commitment and higher risk-affinity more and costlier projects will be undertaken which raises the likelihood of generating outstanding innovations. Furthermore, new product superiority is favored as failed projects will also enhance strategic knowledge conducing as lessens-learned for other projects (Anderson et al., 2009). In essence, when being risk-taking and proactive such firms are popular supply chain partners as they courageously follow innovative ideas in order to generate new products or services on this basis being quasi the engine of the supply chain’s new product development process. Hereby they follow own ideas but also those of the others without any danger that they thwart latter ones. Within this process risk-taking and proactive firms seek for possibilities to implement novel ideas and do not search procrastinatively for all possible drawbacks of the novel ideas. Thus, entrepreneurial orientated firms have a more profi-
cient NPD-process (Hong et al., 2013) and within supply chains contribute to those partnerships with novel ideas and help to generate novel products out of these.

Hypothesis 1 Entrepreneurial orientation increases new product superiority within supply chain partnerships.

2.1.2 Entrepreneurial Orientation and Age

Organizations apply search strategies and organizational routines for the generation of innovation (Cyert & March, 1963; Hannan & Freeman, 1984; Nelson & Winter, 1982). As these routines are costly built (Hannan & Freeman, 1984; Nelson & Winter, 1982) change appears less in older firms (Balasubramanian & Lee, 2008) and in return organizational inertia emerge: Older firms become more conservative, trapped within their routines (Guillén, 2002; Hannan & Freeman, 1993) and important early practices and decisions persist so that organizational capabilities can mismatch changing environmental demands (Sørensen & Stuart, 2000). Organizational inertness negatively effects overall performance (Boeker, 1997; Szulanski, 1996) and can affect new product development for several reasons. Older firms focus more on exploitation than exploration (Lavie & Rosenkopf, 2006), maintaining their existing business models but not searching for new opportunities. They are also more risk-averse than younger firms (Li & Tang, 2010), neglecting the necessary investments into new product development. Older firms tend to have a lower degree of product innovativeness as they focus more on incremental change than on radical innovation (Henderson & Clark, 1990) and might overlook the potential of disruptive innovations. Still, there is empirical evidence that older firms generate a higher quantity of patents because of their well-established internal routines (Sørensen & Stuart, 2000). However, the quality of these patents is lower than the patent quality of younger firms (Balasubramanian & Lee, 2008) and less new products are
launched (Hansen, 1992). In essence, we argue that older firms achieve lower product innovativeness than younger firms. Within supply chains the older firms’ inertness affects the common new product development process negatively as they thwart the whole partnership.

Hypothesis 2a: Firm age decreases new product superiority within supply chain partnerships

EO can overcome firms’ internees, since all three dimensions of EO lead to a critical reflection and adjustment of established organizational processes and practices. Innovativeness and proactiveness support experimentation and the development of new organizational processes and practices. Since their application can be risky and even lead to failure, firms have to be willing to take moderate risks. Thus, we argue that EO helps older firms to achieve high product innovativeness on the basis of their experience through an appropriate adjustment of their processes and practices. Again, this interaction also affects the whole supply chain’s development activities as the old firm’s thwarting character is reversed, yet.

Hypothesis 2b: Firm age positively moderates the effect of entrepreneurial orientation on new product superiority within supply chain partnerships.

2.1.3 Entrepreneurial Orientation and Inlearning

The knowledge based view of the firm (Grant, 1996; Kogut & Zander, 1992; Spender, 1996) stresses knowledge a strategic resource being a driver of firm’s competitiveness (Azadegan, 2011) and of new product development (Cousins, Lawson, Petersen, & Handfield, 2011). Implicit, explicit, and specifically technology knowledge triggers novel ideas and solutions in the fuzzy front end of the new product development process. Furthermore, the development of
products that fit customer’s expectations and the successful product lunch requires marketing know-how and an appropriate understanding about customers’ preferences (Inkpen, 1997).

Taping the knowledge of supply chain partners and thereby overcoming firm’s limited knowledge base leads to better technology decisions especially in complex industries (Ragatz, Handfield, & Scannell, 1997). As such it improves firms’ innovativeness (Azadegan, 2011). The interfirm learning process consists of the exchange and interpretation of the external knowledge and its integration into the own knowledge base (Bouncken & Kraus, 2013). We use the term inlearning to stress the unilaterality of one firm learning from others to generate private benefits. It explains the internalization of partners’ knowledge for improved new technologies, organizational routines, and/or processes (Lui, 2009). Since individuals’ interpretation of external knowledge is influenced through the organizational context (Holmqvist, 2004) inlearning can however lead to a new application of the external knowledge or even to the development of new knowledge.

Several empirical studies indicate that inlearning enhances the likelihood of product innovation (Nielsen & Nielsen, 2009) and the innovation performance (Cousins et al., 2011; Jiang & Li, 2009). Inlearned technological know-how and market and customer expertise can be used to improve internal innovation processes and routines (Lui, 2009) and enables the development of realistic technological goals and market orientated product characteristics (Cousins et al., 2011). Thus, inlearning improves new product superiority through the complementation of firms knowledge base and the construction of a better understanding of technological challenges and customers’ expectations.

Hypothesis 3a: Inlearning increases new product superiority within supply chain partnerships.
Inlearning boosters also the positive effect of EO on new product superiority. Creative processes for developing new knowledge are the heart of innovativeness (Lumpkin & Dess, 1996), that root in the recombination of existing knowledge (Phelps, 2010). It also supports creative processes (Jiang & Li, 2009) since it enhances the recombination potential through extending firms knowledge base (Phelps, 2010). Inlearned knowledge might also be ambiguous (Simonin, 1999), context-bound, highly firm specific, and even tacit (Lam, 1997) and thus triggers processes of interpretation and sensemaking to understand the logical linkages between causes and effects of this knowledge (Weick, 1995). These processes might strengthen the positive effects of being innovative, since they might lead to novel interpretations as well applications of the inlearned knowledge. Inlearning is also crucial for EO as being proactive without an appropriate understanding of technological and market challenges might be counterproductive for the development of superior products.

On the other hand, EO and in particular moderate risk-taking might improve inlearning. Knowledge exchange (e.g. Becerra, Lunnan, & Huemer, 2008; Lee & Johnson, 2010), recombination and experimentation processes as well new product development are fuzzy and risky (Schröder, 1996). Risk avoidance behavior impedes the creative application of the inlearned knowledge in the new organizational context Risk-taking firms are not only willing to take more risks (Lumpkin & Dess, 1996), but they are also able to manage those risks in a better way (Liu, Luo, & Shi, 2002).

Hypothesis 3b: Inlearning positively moderates the effect of entrepreneurial orientation on new product superiority within supply chain partnerships.
2.1.4 Entrepreneurial Orientation and Technological Uncertainty

Uncertainty is a multidimensional construct having several sub-dimensions. One of those is technological uncertainty (Dickson & Weaver, 1997) which refers to the inability to completely understand technological environments (Song & Montoya-Weiss, 2001). The identification and evaluation of future necessities is challenging (Fynes, de Búrca, & Marshall, 2004), since this lack of environmental or even technological understanding makes future outcomes hardly predictable. This cannot only lead to wrong decisions during new product development processes. It can also reduce firm’s tendency to invest in radical technological developments (Bouncken & Kraus, 2013). As uncertainty is one factor leading to environmental hostility (Mintzberg, 1979) the resulting inability to predict future outcomes might even peril firms’ survival.

Hypothesis 4a: Technological uncertainty decreases new product superiority within supply chain partnerships.

However, the firm’s response to this uncertainty is influenced how managers perceive the uncertainty (Downey, Hellriegel, & Slocum, 1977; Weaver, Dickson, Gibson, & Turner, 2002). Such perceptions affect organizational performance in general (Huber, O’Connell, & Cummings, 1975) and new product superiority specifically.

Entrepreneurial firms, are risk-taking and thus venture into unknown markets and commit large resources to uncertain outcomes (Lumpkin & Dess, 2001). Their proactive behavior helps to perform better within dynamic and thus uncertain and changing conditions (Lumpkin & Dess, 2001) as entrepreneurial firms do not wait till the fog of uncertainty has lifted. Entrepreneurial firms such as Google or Apple for example, have the courage and willingness to create and develop new products even in highly uncertain environments. EO affects uncertain-
perception (Weaver et al., 2002) as managers frame the perceived uncertainty more as an opportunity (Palich & Ray Bagby, 1995; Weaver et al., 2002). Strengthening the firm’s EO has been viewed as a strategic ‘response’ to uncertain environments (Webster Jr, 1981). Within supply chain partnerships entrepreneurial oriented firms have the function of a captain steering the partnership through the mist of technological uncertainty.

Hypothesis 4b: Technological uncertainty positively moderates the effect of entrepreneurial orientation on new product superiority within supply chain partnerships.

Figure one presents our hypothesized model.

3 Empirical Study

3.1 Method

3.1.1 Sample Characteristics

About 7500 randomly selected companies with major business operations within Germany were identified as the population of our study. In spring 2013, we asked managers of these firms to participate in our pencil & paper survey. Following the key informant approach (Campbell, 1955), we contacted top and middle managers, that were knowledgeable about their firm’s supply chain activities. We achieved 171 thoroughly filled out questionnaires. We also complemented these data with secondary data about each firm’s employees and age, collected from the Hoppenstedt and Amadeus firm databases.

In our sample, the average sales volume was 793 million Euros. The median sales are clear below (14 million Euros). The same applies for the number of employees (average: 3181;
median: 100) as the sample consists mainly of small and medium sized firms. The firms worked in the investigated supply chain partnership on average for 11 years (median: 10 years) and mean of firm age is 43 years (median: 32 years). Although the investigation focuses on firms having major business operations with Germany, the sample is international, since firms’ headquarters are located all over the globe: 54% Germany, 31% in other European countries and 15% in Asia.

We used the logarithm of employees as control, which can be linked with slack resources (Cyert & March, 1963; Thompson, 1967). In some industries, a positive relation between size and change is likely up to a certain amount because small firms have a smaller resource base for change (Haveman, 1993). Furthermore the logarithm of partnership duration was used as control because partnerships can change over time (Doz, 1996).

### 3.1.2 Measures

The study used established constructs, all operationalized on five-point Likert-type scales. Most studies (almost 77% within a meta-study by Rauch et al 2009), which investigate correlations between firm performance and EO, take EO as an one-dimensional construct (Rauch et al., 2009). We follow these studies emphasizing that EO is a holistic construct. Therefore, we applied the higher-order construct referring to Eggers, Kraus, Hughes, Laraway and Snycerski (2013) for measuring EO. The higher-order construct is built by the three lower-order constructs risk-taking, innovativeness and proactiveness. All three lower-order constructs are using three items (see table 1) on the measurement layer. The complete hierarchical component model is built as reflective-formative type as we use a reflective measurement model and the three lower-order constructs are formative with respect to the higher-order construct of EO. We applied reflective measurement models for inlearning, new product superiority and
technological uncertainty The scale of inlearning was adapted from Bouncken and Kraus (2013), including three items (see table 1). The three-item technological uncertainty scale (see table 1) is borrowed from Lewis, Welsh, Dehler, & Green (2002). Firm age was computed as the years passed between firm founding and 2013. As endogenous construct new product superiority is used. Its scale (see table 1) was adapted from Lee and Colarelli O'Connor (2003) and asks respondents to rate the newness and uniqueness of products for customers developed within the partnership. While EO and age refer to the firm level, inlearning and new product superiority regard to a special supply chain partnership. For this purpose our key informants had to select a supply chain partnership that is highly relevant for their firm.

In order to limit common method bias we followed Podsakoff, MacKenzie, Lee, and Podsakoff (2003) and, first, assured all respondents’ confidentiality and anonymity during data collection for reducing the social desirability effect and the evaluation apprehension. Second, we applied the Harmon’s single-factor test for checking the presence of common method bias by conducting a factor analysis with all items (Podsakoff & Organ, 1986). Here, five factors with eigenvalues over 1 were identified with the largest accounting for 26% of the variance. Furthermore, Rauch et al. (2009) describe that there is no evidence that either common method variance, social desirability or memory decay were a serious threat to the correlation between EO and performance when comparing financial, perceived nonfinancial and archival performance results within their meta-analysis.

For systematically evaluating our measurement model we used the criteria recommended by Hair, Hult, Ringle, and Sarstedt (2013) for PLS-SEM (see table 1). First, we tested internal consistency reliability. All constructs except risk-taking and innovativeness have Cronbach’s
\( \alpha \)-values greater than 0.7 as recommended by Nunnally (1978). The value of risk-taking is 0.642 and the value of innovativeness is 0.692. Both values are still acceptable (Hair et al., 2013; Murphy & Davidshofer, 1988) since composite reliability, which is seen as the more suitable criterion for internal consistency (Hair et al., 2013), exceeds for all variables the critical threshold of 0.7 (Fornell & Larcker, 1981). Second, we carefully tested convergent validity, by applying the average variance extracted (AVE). The threshold of AVE is 0.5 (Fornell & Larcker, 1981). This is fulfilled for all constructs except technological uncertainty (0.494). However, here the critical threshold is missed by only 0.006 so that the construct shall remain in our analysis. Next, we checked discriminant validity by the Fornell-Larcker-Ratio which shall be lower than 1 (Fornell & Larcker, 1981). This is adhered by our data.

Formative constructs have to be tested for multicollinearity issues, the indicators’ contributions to index formation (Hair et al., 2013) and content validity. Multicollinearity-problems are tested by computing the variance inflation factor. Here all constructs have values between the critical thresholds of 0.20 and 5 (Hair, Ringle, & Sarstedt, 2011). For testing the items’ contribution to index formation we investigated the significance of the formative model paths between the low and high-order construct. All paths were highly significant (see table 2). Contend validity is given as we used an established scale.

3.2 Results

The model was tested by applying the partial least squares structural equation modeling (PLS-SEM) approach, developed by Wold (1980). For calculating data we applied the SmartPLS 2.0 M3 software package (Ringle, Wende, & Will, 2005) The PLS-SEM approach seem to be suitable for our study for several reasons. First, the aim of our study is more on archiving an
initial understanding of EO than on confirming theories. Here PLS-SEM exceeds the covariance based approach (Fornell & Bookstein, 1982). Second, PLS-SEM offers a higher statistical power both when having more complex models and when having smaller samples sizes (Reinartz, Haenlein, & Henseler, 2009).

In our estimations mostly calculation parameter settings by Hair et al. (2013) were followed, e.g. when using 5,000 bootstrap samples and 171 cases. The higher order construct was computed using the repeated indicator approach as suggested by Hair et al. (2013). Throughout all models the explained variance R² and the adjusted R² were computed. Using the thresholds of Hair et al. (2011) the adjusted R² of model II (R² = .211) and model III (R² = .287) reflect a weak variance explanation as adjusted R² are greater than .25. Only within the control model variance explanation was under the weak-level (R² = .015). Furthermore predictive relevance was successfully tested for all models as all Q²-values are above 0 (Chin, 1998).

All results are presented in table 3. In model I we estimated the standardized path coefficients of our controls. Partnership duration has a significantly positive effect on new product superiority (β = .455; p < .001). However, the effect of the number of employees is insignificant.

Within model II (see table 3) our basic model was tested. We postulated a positive relation between EO and new product in our first hypothesis. Results support this assumed relation (β = .355; p < .001). Furthermore, following Chin (1998) the effect size (f²) can be classified as medium (f²= .257) (Chin, 1998). In model III (see table 3) we tested the interactions between

5 Medium effect sizes have to exceed .15 and reach to f²-values of .35 (Chin, 1998).
EO orientation and its cobweb with respect to new product superiority. Hypotheses 2a postulates a negative effect of firm age on new product superiority. As the effect is insignificant, we have to reject this hypothesis. Next, hypothesis 2b states a positive interaction effect of firm age and EO on new products superiority. Again, this hypothesis is not supported by our results as we surprisingly find a negative interaction ($\beta = -.116; p < .1$). However, the effect size is below the weak level. The simple slope plot (see figure 2) indicates that at low EO levels older firms are more successful than younger ones with higher levels. However, both slopes are rising but the one for younger firms has a much steeper incline.

Hypothesis 3a supposed that inlearning facilitates new product superiority which is supported ($\beta = .213; p < .01$) on a weak effect size level ($f^2 = .106$). Hypothesis 3b states that the interaction of inlearning and EO has a positive effect on new product superiority. We find support for this interaction effect ($\beta = .189; p < .05$). Again the effect size is weak ($f^2 = .051$). The simple slope plot (figure 3) shows that with low inlearning EO decreases new product superiority whereas it increases new products superiority under high inlearning. Hypothesis 4a and 4b postulate that technological uncertainty has a negative effect on new products superiority but as interaction with EO a positive effect. Both hypothesis are supported by our results (linear term: $\beta = -.167; p < .05$; interaction: $\beta = .252; p < .05$) but both have weak effect sizes (linear term: $f^2 = .052$; interaction: $f^2 = .028$). Figure 4 shows the simple slope plot. It is obvious that with stronger technological uncertainty EO becomes more attractive.
4 Discussion

Prior research has shown that new product development is a resource and capability intensive process involving different determinants. We extend this research by introducing EO as a crucial determinant of new product development within supply chain partnerships embedded in a cobweb of firm age, inlearning, and technological uncertainty. Our study indicates that EO is a strong driver of new product development success within those partnerships. EO helps to overcome the destructive effects of technological uncertainty. Our results show that technological uncertainty itself decreases new product superiority, whereas the interaction effect of EO and technological uncertainty has positive effects. We reason that managers of highly entrepreneurial orientated firms perceive this uncertainty more as a unique chance to create something novel. In line with previous studies, our results show that learning from the supply chain partner is an important determinant of new product development performance. Inlearning allows the complementation and refinement of firms’ own knowledge base. We also found empirical evidence that EO increases new product superiority under high inlearning, whereas under low inlearning a negative relationship between EO and new product superiority exists. Surprisingly firm age has no significant effect on new product superiority. This insignificant effect can have several reasons. First, as written above, firm age is a double edge sword associated, both, with inertness and improved internal routines and capabilities (Sørensen & Stuart, 2000). We argued that the destructive effects of inertness exceed the advantages of the gained experiences. However, our results indicate that both effects seem to compensate each other. Nevertheless, we found a negative interaction of EO with firm age: In combination with EO a liability of adolescence emerges. Thus, entrepreneurial orientated old firms can in comparison with entrepreneurial orientated young firms only gain a limited advantage of EO as they are too stuck within their routines.
We extend prior research regarding several points. First, we analyzed EO in the context of supply chain partnerships and showed its importance for new product development performance in terms of new product superiority. Second, we investigated the effects of EO in the light of different contextual factors. In particular, under high technological uncertainty EO can booster new product superiority. Furthermore, inlearning can strengthens the positive effects of EO, whereas the effect in context of age is limited.

Our results imply that EO is a highly relevant topic for innovation management and supply chain management. However, the pressing question rises how managers can improve EO in their functions. This can include changing general values like risk avoidance or organizational routines and practices. For instance firms can enhance EO through appropriate job specifications or especially employee appraisals. Another possibility might be the targeted employment of individuals that are innovative, proactive and willing to take moderate risks. However, as highlighted by the negative interaction between firm age and EO, there are situations in which EO has to be adjusted but the firm either is not able to change its values and routines well enough or these routines should not be changed. Nevertheless the negative relation on new product superiority shows the importance to find solutions within these situations. In line with the contingency approach, one appropriate solution might be to improve EO not within the whole firm but within specific organizational units. Literature on disruptive innovation refers that those innovations are, among others, victim of established firm’s inertia. However, literature shows up that venturing units create a space where such new technologies can be developed in-house without being threatened by the firm’s inertness (Christensen & Overdorff, 2000; Christensen & Raynor, 2003). Thus, corporate venturing capital allows for experimenting with new capabilities, technologies and markets (Chesbrough, 2002) so that inert and thus risk-averse firms have obtained a window of opportunity: When those new technologies be-
come commercial successful they have a stake in young firms which have generated adequate knowledge and capabilities.

However, our results have to be seen in light of some limitations inherent in every empirical work. First, results of our study are based upon a manufacture industry survey. Our findings could be limited to industries beyond the engineering and technology industries, such as services and non-profits. Future research should therefore validate our findings in other industries. Second, due to limitations of time and access, our findings relied on data from just one side of the supply chain partnership. The received information is therefore one-sided in that they represent the perceptions of only one of the two collaboration firms. We therefore recommend using additional data from both alliance partners to avoid possible distortions. Furthermore, by exclusively using cross-sectional studies, it is difficult to proof causality. Therefore, future research should apply a longitudinal examination to take appropriate account for the inherent dynamic of supply chain partnerships.

5 Conclusion

In this study we brought light into the effects of EO on new product superiority within supply chain partnerships and the cobweb woven around this relation. We showed up that EO is able to raise new product superiority within those partnerships and that this effect positively interacts with inlearning and technological uncertainty but negatively with firm age. Thus, being entrepreneurial orientated is one way to cope with the negative effects of technological uncertainty and enhance the positive effects of inlearning.
# Tables and Figures

## Table 1: Measurement model

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Outer Loadings</th>
<th>Indicator reliability</th>
<th>Cronbach’s-α</th>
<th>Composite Reliability</th>
<th>AVE</th>
<th>Fornell-Larcker</th>
<th>Variance inflation factor</th>
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<td>0.20 &lt; VIF &lt; 5&lt;sup&gt;f&lt;/sup&gt;</td>
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<td>Innovativeness</td>
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<tr>
<td></td>
<td>We consider ourselves as an innovative company.</td>
<td>0.849</td>
<td>0.721</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Competitors in this market recognize us as leaders in innovation.</td>
<td>0.827</td>
<td>0.684</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proactiveness</td>
<td>We work to find new businesses or markets to target.</td>
<td>0.868</td>
<td>0.753</td>
<td>0.714</td>
<td>0.840</td>
<td>0.638</td>
<td>0.471</td>
<td>1.472</td>
</tr>
<tr>
<td></td>
<td>We consistently look for new business opportunities.</td>
<td>0.777</td>
<td>0.604</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Our marketing efforts try to lead customers, rather than respond to them.</td>
<td>0.746</td>
<td>0.557</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>We value new strategies/plans even if we are not certain that they will always work.</td>
<td>0.718</td>
<td>0.516</td>
<td>0.642</td>
<td>0.807</td>
<td>0.583</td>
<td>0.227</td>
<td>1.716</td>
</tr>
<tr>
<td></td>
<td>To make effective changes to our offering, we are willing to accept at least a moderate level of risk of significant losses</td>
<td>0.790</td>
<td>0.624</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>We encourage people in our company to take risks with new ideas.</td>
<td>0.780</td>
<td>0.608</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlearning</td>
<td>Thanks to the knowledge acquired/learnt from our partner, we can tackle challenges more quickly.</td>
<td>0.896</td>
<td>0.803</td>
<td>0.859</td>
<td>0.912</td>
<td>0.775</td>
<td>0.099</td>
<td>1.800</td>
</tr>
<tr>
<td></td>
<td>We often draw on the knowledge of our partner and thus learn to solve problems more quickly.</td>
<td>0.878</td>
<td>0.771</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thanks to the knowledge learnt from our partner, we can accomplish projects more quickly.</td>
<td>0.866</td>
<td>0.750</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>New Product Superiority</td>
<td>In the vertical alliance our innovations/new products incorporate technology that is new to customers.</td>
<td>0.912</td>
<td>0.832</td>
<td>0.878</td>
<td>0.925</td>
<td>0.803</td>
<td>0.292</td>
<td>1.533</td>
</tr>
<tr>
<td></td>
<td>In the vertical alliance our innovations/new products offer benefits that are new to the customers.</td>
<td>0.912</td>
<td>0.832</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the vertical alliance our innovations/new products introduce many completely new features to the market.</td>
<td>0.864</td>
<td>0.746</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Uncertainty</td>
<td>In the development and introduction of innovations there is very high uncertainty about staffs’ familiarity with the science and technology used in the project.</td>
<td>0.804</td>
<td>0.646</td>
<td>0.779</td>
<td>0.739</td>
<td>0.494</td>
<td>0.036</td>
<td>1.783</td>
</tr>
<tr>
<td></td>
<td>In the development and introduction of innovations there is very high uncertainty about technological feasibility.</td>
<td>0.508</td>
<td>0.258</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>In the development and introduction of innovations there is very high uncertainty about functionality of products.</td>
<td>0.759</td>
<td>0.576</td>
<td></td>
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</table>

*Measurement model fit:*  
a: Hair et al. (2013); b: Bagozzi and Baumgartner (1994); c: Nunnally (1978); d: Bagozzi and Yi (1988); e: Fornell & Larcker (1981:46); f: Hair et al. (2011)
Table 2: Lower order effects

<table>
<thead>
<tr>
<th>Paths</th>
<th>Standardized β-Coefficients</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Model I</td>
<td>Model II</td>
<td>Model III</td>
</tr>
<tr>
<td><strong>Direct Effects (Low-Order)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovativeness → Entrepreneurial Orientation</td>
<td>0.508***</td>
<td>0.515***</td>
<td></td>
</tr>
<tr>
<td>Proactiveness → Entrepreneurial Orientation</td>
<td>0.412***</td>
<td>0.424***</td>
<td></td>
</tr>
<tr>
<td>Risk-Taking → Entrepreneurial Orientation</td>
<td>0.350***</td>
<td>0.341***</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Results

<table>
<thead>
<tr>
<th>Paths</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stand. β-</td>
<td>(f² Effect</td>
<td>Stand. β-</td>
</tr>
<tr>
<td></td>
<td>Coefficients</td>
<td>Sizes)</td>
<td>Coefficients</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In (Partnership Duration) → New Product Superiority</td>
<td>-0.033***</td>
<td>-0.018</td>
<td>-0.031</td>
</tr>
<tr>
<td>Log(Number of Employees) → New Product Superiority</td>
<td>0.164</td>
<td>0.091</td>
<td>0.102 †</td>
</tr>
<tr>
<td><strong>Direct Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial Orientation (EO) → New Product Superiority</td>
<td>0.455***</td>
<td>(0.257)</td>
<td>0.148</td>
</tr>
<tr>
<td>Firm Age → New Product Superiority</td>
<td></td>
<td></td>
<td>0.039</td>
</tr>
<tr>
<td>Inlearning → New Product Superiority</td>
<td></td>
<td></td>
<td>0.213**</td>
</tr>
<tr>
<td>Technological Uncertainty → New Product Superiority</td>
<td>-0.167*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moderating Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm Age X EO → New Product Superiority</td>
<td></td>
<td></td>
<td>-0.116 †</td>
</tr>
<tr>
<td>Inlearning X EO → New Product Superiority</td>
<td></td>
<td></td>
<td>0.189*</td>
</tr>
<tr>
<td>Technological Uncertainty X EO → New Product Superiority</td>
<td>0.252*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.026</td>
<td>0.225</td>
<td>0.333</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.015</td>
<td>0.211</td>
<td>0.287</td>
</tr>
<tr>
<td>Q²</td>
<td>0.017</td>
<td>0.177</td>
<td>0.251</td>
</tr>
</tbody>
</table>

Standardized path coefficient significant at †p<0.1, *p < 0.05; **p < 0.01; ***p < 0.001

Effect size at weak level $f^2 > 0.02$, at medium level $f^2 > 0.15$ and at high level $f^2 > 0.35$ (Chin, 1998)
Figure 1: Hypothesized Model

Entrepreneurial Orientation

- Innovativeness
- Proactiveness
- Risk-Taking

Cobweb:
- Firm Age
- Inlearning
- Technological Uncertainty

New Product Superiority

Controls:
- ln(Alliance Duration)
- Log(Number of Employees)
Figure 2: Simple slope plot of the interaction between entrepreneurial orientation and firm age
Figure 3: Simple slope plot of the interaction between entrepreneurial orientation and inlearning.
Figure 4: Simple slope plot of the interaction between entrepreneurial orientation and technological uncertainty
7 References


