

Firm Level Entrepreneurship and Operations Management – Enabling Flexible Responses to Changing Market Demands

Abstract

Only recently researchers have started to focus on the interface of production and operations management and (corporate) entrepreneurship. The present study builds on this developing research stream and develops and empirically analyzes a model that illustrates how a firm's entrepreneurial orientation transforms into performance via the mediating factor of manufacturing flexibility (conceptualized as manufacturing range and manufacturing flexibility). Data from German manufacturing firms suggest a positive impact of entrepreneurial orientation on the dimensions of manufacturing flexibility, these, however, go along with ambiguous impact on firm performance. Consequently, measures are suggested to help firms to benefit from entrepreneurial orientation as a general strategic posture and the resulting manufacturing flexibility on the production floor, thus allowing for continuous success and growth.

Keywords

Entrepreneurial orientation, operations management, manufacturing flexibility, firm level performance

1. Introduction

Existing research in management informs us about a plethora of optimization potentials in many different areas. For instance, management input areas such as entrepreneurship, strategy, procurement, production and operations, marketing and

sales, or specialized fields such as human resources, finance or information management are often analyzed with respect to their impact on output factors representing various forms of firm level performance (e.g. Ansoff, 1965; Gupta and Govindarajan, 1984; Ahmed, Montagno and Firenze, 1996; Kunesch 1996; Porter, 1998; Lumpkin and Dess, 2001; Gupta, Verma and Victorino, 2006). However, combined explorative or explanatory models developed for different areas of management are discussed less often.

With the present paper, we aim to contribute to this apparent general gap in the literature. More specifically, we investigate the impact of two concepts from (only) seemingly separated areas of business research on firm level performance, i.e. a firm's entrepreneurial orientation (EO) and its manufacturing flexibility. Both concepts can be considered proxies for overall strategic posture and operational excellence, respectively, and are thus considered together in a unified model. The theoretical reason for this approach is the observation that a relatively broad concept such as EO should rather be considered an abstract strategic posture than concrete firm behaviour and thus first needs to transform into solid action (e.g., on the production floor) before it can exert positive impact on a firm's performance. In other words: The mixed empirical results with respect to the nature of the EO-performance relationship (Rauch et al., 2009) cannot only be explained through various moderating variables such as different internal and environmental conditions – there is an EO-performance gap as well (Wiklund, 1999) that researchers can only overcome by considering mediating variables. Based on the proposition that EO can successfully induce operational excellence that in turn enhances firm level performance, in this paper we develop a

mediation model which is theoretically grounded and empirically tested. Our empirical results suggest that entering manufacturing flexibility (i.e. a firm's overall manufacturing range and its ability to adjust this range) as a mediating operations management variable into the equation is actually meaningful.

The paper is adopting the following structure. Next to these introductory remarks, we discuss in section two the existing theoretical background debated in the academic literature and argue for our main hypothesis. Subsequently, in section three we describe our empirical analysis which is based on survey data among German manufacturing firms. Section four discusses in detail the implications of our statistical analysis for actual management and further research; we conclude the paper in section five.

2. Theoretical Background

If strategic leaders and the culture of a given firm together generate a strong motion to innovate, to accept risks and aim for new entrepreneurial opportunities, one can speak of a firm which is characterized by EO (Dess and Lumpkin, 2005). Scholars have paid attention to this phenomenon since the 1970s (e.g., Mintzberg, 1973; Khandwalla, 1977) – alternative terms frequently used in the literature describing EO are for instance entrepreneurial proclivity (Matsuno et al., 2002), entrepreneurial posture (Covin and Slevin, 1991) or entrepreneurial management (Stevenson and Jarillo, 1990). To build EO into an organization is essentially a task of strategic decision makers.

Analytically, there is a strong consensus that EO consists of five distinct dimensions, although most researchers resort to the first three dimensions when operationalizing the construct for empirical research (Rauch et al., 2009). These first three EO dimensions of

the EO construct were developed by Miller (1983) and address risk-taking, innovativeness and pro-activeness ('pioneering' in his terminology) of a firm. While today most studies treat EO as an independent variable, Miller originally sought to identify the antecedents of entrepreneurial behaviour on the firm level. Risk taking describes firms which act and decide although they are faced with insecure outcomes of their initiatives. In general, the tendency to accept risky conditions on the organizational level can be facilitated by a high fault-tolerance. Second, innovativeness addresses the capability and willingness to develop and execute new initiatives (for instance towards new products or new markets) and is usually achieved by high R&D-investments. Third, pro-activeness describes organizations showing precautionary initiative-taking behaviour. In the early 1990s the focus of EO research changed and the three original dimensions were treated for the first time as a combined independent variable which was linked to performance as the variable to explain (Covin and Slevin, 1991).

Lumpkin and Dess (1996) extended the construct by adding two further dimensions, i.e. competitive aggressiveness and autonomy. Firms acting competitively aggressive show a strong urge to beat competitors or to even squeeze them out of the market. An essential presupposition of such behaviour is the allocation of competitive resources for these purposes by the firm's decision makers. Last, the autonomy dimension of the EO construct pertains to the degree to which individuals are allowed to autonomously pursue entrepreneurial opportunities. Autonomy is said to be facilitated by for instance flat hierarchies or a high degree of delegation within an organization. This particular dimension of EO has received comparatively less attention in empirical research; only

recently, a validated scale to measure the level of autonomy in a given firm has been suggested (Lumpkin et al., 2009).

Apparently, the EO construct transfers some of the well known categories describing the individual entrepreneur to the organizational level – such as an individual's attitude towards risk or for instance McClelland's need for achievement (1976) of individuals which overlaps with competitive aggressiveness and pro-activeness on the organizational level. And just as entrepreneurship researchers of the past have been trying to correlate an individual's traits with entrepreneurial behaviour and even – regrettably for the most time unsuccessful – to entrepreneurial success, today's entrepreneurship researchers aim at elucidating the role of organizational EO as an independent variable.

Several theoretical contributions propose a positive EO-performance relationship (e.g., Covin and Slevin, 1991; Lumpkin and Dess, 1996). In doing so the EO construct is – most of the time – treated as a unidimensional construct, i.e. a construct where all of the above mentioned dimensions are highly correlated to each other and are of equal importance. Consequently, all five aspects of EO are said to converge to exert positive influence on business performance. Only recently this view has been challenged (Dess and Lumpkin, 2005) by the notion that investigating the five EO dimensions and their respective influence on performance one by one might prove promising in some cases as well. To be sure, there are not only theoretical papers, but several empirical studies as well sustaining these assertions and showing that EO firms can indeed perform better in the market (e.g., Zahra, 1991; Zahra and Covin, 1995; Wiklund, 1999). Moreover, Zahra et al. (1999) suggest (after reviewing 25 years of firm-level

entrepreneurship research) that there is substantial evidence for a link between EO and performance and that firms with EO achieve in fact superior performance.

However, despite these numerous theoretical and anecdotal assertions the relationship between EO and performance is at least questionable due to some contradictory empirical findings. A recent meta-analysis of more than 50 empirical studies (Rauch et al., 2009) shows EO only to be moderately linked to performance, although to a degree that warrants further investigation. Moreover, the positive empirical findings mentioned above are at the same time challenged by a number of studies in which a significant relationship between EO and performance is not evidenced in the data (e.g., Auger et al., 2003). Some studies even argue theoretically that EO strategy-types may be linked to low performance (Hart, 1992).

Such arguments are in fact not really astonishing if one considers the tendency in research only to publish positive empirical findings. In addition, Rauch et al. (2009) show that most empirical studies on EO are cross sectional in nature and therefore run the risk of falling for survivor bias. Especially firms scoring high on the risk taking dimension of EO might be responsible for this kind of bias. Moreover, although it is, for instance, a legitimate goal to thwart organizational inertia with higher entrepreneurial orientation, firms pursuing this goal too forcefully tend to face continuous liabilities of newness (Stinchcombe, 1965). That is, they constantly transfer (at least parts of) the organization towards a condition which is comparable to the risky beginning of the organizational life cycle. Consequently, firms steering every dimension of EO to the hilt might expose themselves artificially to a dangerous situation.

For these reasons, the assumption of a straightforward correlation between EO and performance seems to be too simple. Not only do differences in research design (e.g., the operationalization of EO) and methodological idiosyncrasies lead to mixed empirical findings – admittedly the EO-performance relationship is moderated by a variety of possible influences (Lumpkin and Dess, 1996; Rauch et al., 2009). For instance, the model of entrepreneurship as firm behaviour by Covin and Slevin (1991) considers different internal, external and strategic variables influencing EO directly and at the same time moderating its relationship to performance. Guth and Ginsberg (1990) suggest an alternative framework consisting of strategic leadership, organisational and environmental aspects.

Although certainly warranted, the search for additional moderators of the EO-performance relationship neglects one specific of EO and this is its comparatively general nature. Rauch et al. (2009: 763) highlight that “EO represents the policies and practices that provide the basis for entrepreneurial decisions and actions”; in other words, before EO can impact on a firm’s performance, concrete actions need to be considered (Wiklund, 1999) that help to transform this particular strategic posture into, hopefully, superior performance. Technically speaking, researchers do not only need to consider moderating variables to elucidate the EO-performance relationship; to paint a more complete picture, mediating variables need to be analyzed as well.

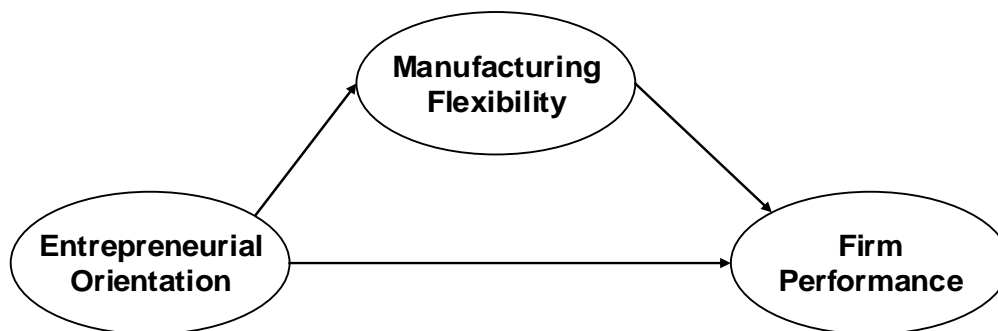
Consequently, our key argument here is that given that EO is predominantly a strategic posture (that is, doing the right things) and thus cannot directly determine firm level performance, a concept is necessary that allows bridging this gap. We propose as one such possibility the way a firm organizes its operations and production (that is, doing

things right); in particular we consider the concept of manufacturing flexibility (Slack, 1987; Swafford et al., 2006a; Swafford et al., 2006b; Chou et al., 2010) in our model.

There is ample research and literature concerning the relationship of operational management and firm performance as described in the overview provided by De Toni and Tonchia (1998). Setting up operations in a rational way comes along with significant competitive advantages, for instance, Ahmed et al. (1996) are able to provide evidence that adopting specified production strategies enhances performance significantly. However, firms need to focus, as pursuing more than two strategies at the same time does not show increasing performance effects. Against the background of EO, we consider one particular operations management concept that has shown in many prior studies to positively impact on firm performance to be especially interesting. This is a firm's manufacturing flexibility. Manufacturing flexibility can be understood as the combination (Swafford et al., 2006a; Swafford et al., 2006b; similar Pereira et al., 2009; Chou et al., 2010) of the number of different states – especially levels, positions, or options – that can be achieved with existing resources (manufacturing range) and the ability to efficiently change from one state to another (manufacturing adaptability). Both constructs, manufacturing flexibility and EO, respectively, are related to change in a particular organization and are thus suitable to be analyzed from a unified perspective. Bordoloi et al. (1999) were among the first to introduce a standard definition of manufacturing flexibility and highlighted the requirement that the concept renders useless unless resources utilized are considered as well. In other words, flexibility needs to be achieved in an efficient way at minimum total cost. If this is achieved, manufacturing flexibility impacts positively on firm performance (Vokurka and O'Leary-

Kelly, 2000; Anand and Ward, 2004; Camisón and Villar, 2010). However, a fit with environmental influences and internal strategic, organizational, and technological requirements needs to be established. For instance, manufacturing flexibility seems to be a suitable answer to increasingly volatile markets (Anand and Ward, 2004), which can be said of EO as well (Rauch et al., 2009).

Figure 1 Theoretical Model: The Mediating Role of Manufacturing Flexibility in the EO-Performance relationship



Moreover, first empirical studies point towards the fact that EO and manufacturing flexibility are related concepts. In the context of small and medium sized enterprises (SMEs), Messeghem (2003) underlines the fact that strategic entrepreneurial behaviour, measured as EO, helps to shape how SMEs actually manage their day-to-day-business. His empirical results suggest that firms characterized by a high level of EO place considerable attention on efficiency in productions and operations management. Furthermore, Chang et al. (2007) survey manufacturing companies from the ICT sector and provide evidence that the various dimensions of EO positively impact on flexibility variations such as new product flexibility, product mix flexibility and volume flexibility.

Figure 1 summarizes our line of argumentation and illustrates our general research model. Against this background, this study's main hypothesis emerges.

Hypothesis 1. *The relationship of entrepreneurial orientation and firm level performance is mediated by manufacturing flexibility.*

3. Empirical Study

3.1 Data Collection and Data Quality

To explore our research question we surveyed the manufacturing industry in the German federal state of North Rhine-Westphalia (NRW) being one of Germany's economically most important regions. If considered an independent state, this region's gross domestic product would place it 15th in the world surpassing countries such as Russia or the Netherlands (Ministry of Economic Affairs and Energy of the State of North Rhine-Westphalia, 2010). In particular, we focused on the three most important sub-industries of NRW's manufacturing industry, i.e. electronics, chemicals and mechanical engineering, which taken together account for the majority of manufacturing activities in this federal state. Based on contact information provided by the Chamber of Commerce we drew a random sample and contacted every firm by phone in order to verify the contact information and to introduce the research project. All in all, we were able to establish contact with the top-management of 531 firms. 244 firms (45.95 percent) agreed to participate in this research and we subsequently received 115 usable responses to our web-based questionnaire. This corresponds to a response rate of 47.13 percent with respect to the email invitations that were sent out and a 21.66 percent response rate to the original sample. Although these values are absolutely in

keeping with the requirements of surveys targeted at top executives (Baruch, 1999), researchers still decided to test for a potential non response bias (Armstrong and Overton, 1977; Werner et al., 2007). For the items and control variables utilized in this study, the first third of respondents was compared to the last third utilizing t-tests. Based on this wave analysis, we had no indication that our data might be considerably affected by non-response. Common method bias equally did not seem to be an issue with this data, given that the research design employed different response formats (Podsakoff et al., 2003) such as semantic differentials and Likert scales to avoid this bias *ex ante*. Moreover, Harman's *post-hoc* one factor test (1976) resulted in more than one factor, with the first factor accounting for merely 17.61 percent of the explained variance. Finally, given that missing values were few and Little's MCAR-test (Little and Rubin, 2002) turned out to be insignificant, missing values were imputed through the application of the expectation-maximization algorithm to the survey data.

3.2 Measures

Entrepreneurial orientation was measured utilizing a seven-point semantic differential. Based on the original nine-item-scale developed by Covin and Slevin (1989) we incorporated the refinements (one additional item) suggested by Lumpkin and Dess (2001), which, for instance, were applied by Stam and Elfring (2008) as well. To measure manufacturing flexibility, we resort to scales suggested by Swafford et al. (2006a; 2006b). Following them, manufacturing flexibility can be seen as consisting of two separate constructs, i.e. a firm's manufacturing range and its manufacturing adaptability. Both operations management constructs were measured on seven-point-Likert-scales ranging from "low" to "high"; while manufacturing range was measured

with four single items, for manufacturing adaptability two five-item-scales related to cost and time were combined. Performance was measured as subjectively perceived satisfaction with several distinct performance indicators to reflect the multidimensionality of this construct (Stam and Elfring, 2008). Additionally, the performance items were weighted with their relative importance as indicated by the respondents (Gupta and Govindarajan, 1984). Researchers included sales level, sales growth, market share, growth of market share, profit, cash flow, return on investment, customer satisfaction, quality of product/service, and competitiveness to create the respective formative construct. Finally, in our statistical analysis we controlled for potential effects of firm age and firm size given that younger and smaller firms usually tend to face more severe challenges to capitalize on market opportunities (Stam and Elfring, 2008). For that reason we include the logarithm of the number of years since firms were established and, to reflect firm size, the logarithm of the number of employees as reported by the top-management in our survey.

3.3 Results

To test the theoretical arguments, researchers resorted to an appropriate method of structural equation modelling, i.e. the partial least squares (PLS) approach (Wold, 1985; Chin, 1998). All estimations were carried out utilizing the software package SmartPLS 2.0 (Ringle et al., 2005). The main reason for preferring this structural equation modelling approach over other concepts is that given its non-parametric nature PLS is especially suitable to analyse comparatively small data sets. Moreover, it is generally recommend to decide for PLS if the study contains some explorative component. While we were able to provide good theoretical reasons to assume a significant mediating role

of manufacturing flexibility *in general*, relationships are theoretically not as clear-cut with respect to the sub-dimensions of manufacturing flexibility, i.e. the construct measured here, manufacturing range and manufacturing adaptability. The data analysis process involved two steps. First, we estimated a reduced direct effects model containing merely firm age, firm size and entrepreneurial orientation as explanatory variables, second, a full model was calculated including the hypothesized mediating variables as well.

Table 1 (Latent) Variable Correlations and Construct Reliability Measures

	CR	AVE	1.	2.	3.	4.	5.	6.
1. Age	-/-	-/-	-/-					
2. Size	-/-	-/-	.43	-/-				
3. Entrepreneurial Orientation	.88	.55	.07	.13	.74			
4. Manufacturing Adaptability	.93	.72	.08	.23	.21	.84		
5. Manufacturing Range	.91	.72	.18	.11	.30	.15	.84	
6. Performance	-/-	-/-	-.07	-.21	.18	-.36	.26	-/-

Bold diagonal elements are the square root of AVE. SD = Standard Deviation; CR = Composite Reliability; AVE = Average Variance Extracted.

To estimate the models, the path-weighting scheme was employed (Lohmöller, 1989; Chin 1998) and to determine the significance of each estimated path a standard

bootstrapping procedure was applied with 200 re-samples consisting of the same number of cases as in the original sample. The results of this procedure should be evaluated in three steps starting with a quality assessment of the measurement models, continuing with an assessment of the quality of the inner (structural) models, and finally an inspection of the construct relationships.

Concerning the assessment of the measurement models we find very favourable results indicating sufficient quality. First, all item measures load satisfactory on their respective constructs and item discriminant validity is present as well, as all items load the highest on their intended constructs and no-item loads higher on other constructs. Second, construct reliability exceeds the usual threshold values as well (Table 1), as the values of composite reliability (CR) and average variance extracted (AVE) are all well beyond .7 or .5, respectively (Chin, 1998). Moreover, the measured constructs fulfil the requirements of the Fornell-Larcker-Criterion as well (Fornell and Larcker, 1981) suggesting sufficient construct discriminant validity (AVE of reflective constructs > squared latent variable correlations or square root of AVE of reflective constructs > latent variable correlations – see Table 1).

Assessing the structural models (Table 2), an inspection of the direct effects model reveals that entrepreneurial orientation seems to exert a direct influence on firm performance ($\beta = .27, p \leq .05$) and controlling for firm size seems to add to the explanation of the dependent variable as well, as larger firms in the sample appear to outperform smaller firms ($\beta = .32, p \leq .05$). This picture, however, changes significantly once the mediating variables are included in the equation (Table 2 – model 2).

Table 2 Results of the PLS Estimation

Independent Variable → Dependent Variable	Model 1 (Direct Effects Model)			Model 2 (Mediation Model)		
	<i>B</i>	<i>Q</i> ²	<i>R</i> ²	<i>β</i>	<i>Q</i> ²	<i>R</i> ²
Age → Performance	-.04			-.04		
Size → Performance	.32*			-.16		
Entrepreneurial Orientation → Performance	.27*	.04	.19	.21		
Manufacturing Adaptability → Performance				-.40**		
Manufacturing Range → Performance				.29*	.05	.29
Age → Manufacturing Adaptability				-.02		
Size → Manufacturing Adaptability				.21**		
Entrepreneurial Orientation → Adaptability				.18*	.06	.09
Age → Manufacturing Range				.16*		
Size → Manufacturing Range				.00		
Entrepreneurial Orientation → Manufacturing Range				.28**	.08	.12

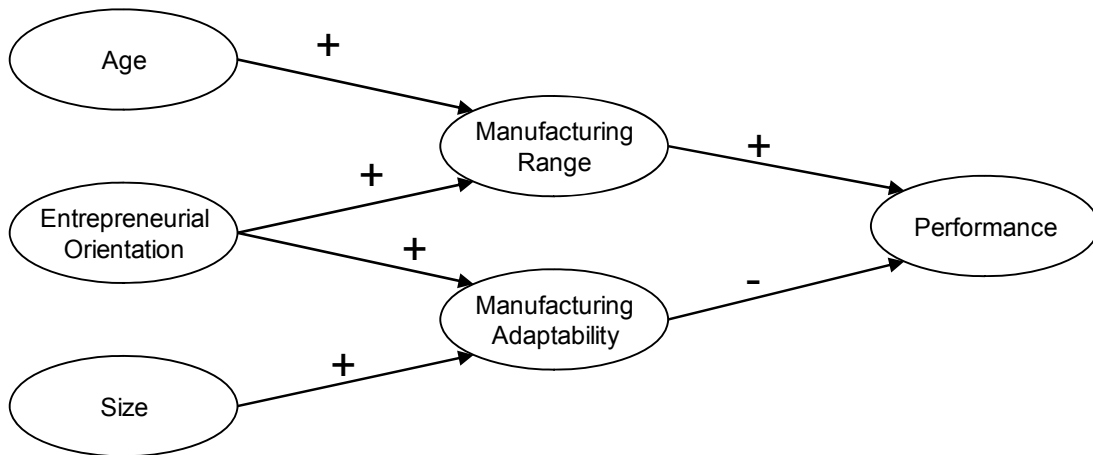
* $p \leq .05$; ** $p \leq .01$.

Compared to model 1, the prognostic relevance as indicated by the Stone-Geisser-Criterion Q^2 slightly rises from .04 to .05 for firm performance; equally the variance explained in performance (R^2) rises substantially from .19 to .29. Against this background a closer inspection of the inner model makes sense. We do not find performance effects of age or size; however, the results indicate that older firms tend to have a wider manufacturing range ($\beta = .16$; $p \leq 0.05$). Age, then again, does not significantly enhance adaptability ($\beta = -.02$; n.s.). Vice versa, larger firms do not necessarily provide a larger manufacturing range ($\beta = .00$; n.s.), but seem to be more capable of adjusting their manufacturing as firm size significantly impacts on manufacturing adaptability ($\beta = .21$; $p \leq 0.01$). Hence, including both control variables into the model seems appropriate.

Turning to the effects of entrepreneurial orientation on firm performance, we find support for our hypothesis that the relationship of entrepreneurial orientation and firm performance is mediated by the two manufacturing variables. Entrepreneurial orientation does not significantly affect firm performance directly anymore ($\beta = .21$, n.s.); it does, however, significantly add to the explanation of both manufacturing range ($\beta = .28$, $p \leq .01$) and manufacturing adaptability ($\beta = .18$, $p \leq .05$). Moreover, both manufacturing flexibility dimensions significantly affect firm level performance; manufacturing range does so in a positive way ($\beta = .29$, $p \leq .05$), while the data suggest a negative influence of manufacturing adaptability at the same time ($\beta = -.40$, $p \leq .01$). Taken together, the analysis supports our hypothesis as the total effect of EO on performance mediated over the manufacturing flexibility variables is – despite the negative effect of manufacturing adaptability – still positive (.08). The manufacturing

flexibility dimensions are thus indeed bridging the theoretical gap among EO and performance. Figure 2 highlights the significant model relationships.

Figure 2 Significant Model Paths



A post hoc analysis of potentially moderating environmental factors reveals that the model is robust over a number of different perceptions of the firm's environment. Neither the inclusion of perceived market turbulence, technological turbulence nor competitive intensity (Jaworski and Kohli, 1993) alter the results qualitatively.

4. Discussion

4.1 *The mediating role of manufacturing flexibility*

Our statistical analysis suggests that manufacturing flexibility on the one hand can result from superior levels of EO within a given firm, but on the other hand needs to be managed quite carefully. This is because of the concept's ambiguous impact on firm performance – a wide manufacturing range seems to impact positively on firm performance whereas high levels of manufacturing adaptability turned out to be

negative with respect to firm performance. Even if the total effect of EO on performance is still positive, it is too small to recommend purely managing for high levels of EO to reap its potential benefits. Managers need to make sure to take the upper paths in the model, i.e. they need to control that entrepreneurial endeavours rather result in a wide manufacturing range but not in excessive levels of manufacturing adaptability.

The operationalization of EO utilized in the present study considered the three classic subdimensions of innovativeness, risk taking and proactiveness. The results suggest that the strategic decision to behave in an innovative way and to do so proactively helps to enhance flexibility on the production floor. While risk taking cannot be considered a sine qua non but rather a sufficient condition that needs to be accepted by entrepreneurial firms that strive for innovation; innovativeness and proactiveness indeed help to achieve manufacturing flexibility. The reason for this is clear: If firms pursue the strategic goal of being innovative and foster proactive behaviour by all employees (blue collar as well as white collar), ideas for new products, product variants and processes are suggested and developed all over the firm and result in a higher flexibility. However, our results suggest that this flexibility is a “double-edged sword” – parts of it are desirable, parts of it are not.

The desirable part of manufacturing flexibility is a wide manufacturing range which has a positive connection to firm level performance. The reason for this positive connection is based on the fact that usually larger product portfolios with more product variants go along with increased turnover and profit potentials. Of course, managers need to control all listed products rigorously and constantly with respect to their marginal return in order to avoid negative profit margins for any single product in the manufacturing range. Such

products would have to be excluded as soon as possible in order to keep up the positive connection of manufacturing range and firm performance. Obviously, the companies in our sample excel at that challenge. On the other hand, the undesirable part of manufacturing flexibility can be found with excessive levels of manufacturing adaptability. This strong negative influence on firm level performance most likely results from the commonplace dilemma of unpaid capacities: For most products and markets the pure supply of production potential is not met by a corresponding level of demand. Exceptions may be very volatile markets such as the fashion industry or the pharmaceutical industry; however, this does not apply to the present sample. As the surveyed industries are quite traditional manufacturing industries that predominantly offer capital goods, it is safe to assume that providing production capabilities is not particularly rewarded by customers. Consequently, a negative performance impact results.

4.2 Managerial Implications

Generally speaking, the results of this study can help management to understand how to effectively bridge the apparent gap between strategic concepts such as EO and concrete operations and production management. Interestingly enough, our results are in absolute keeping with already established links between strategic management and production and process operations. Similar to the field of quality management, top management needs to commit to key issues such as EO, market orientation or customer orientation, and these general orientations need to be “translated” into operational decisions on the production floor. We therefore urge decision makers to

adopt similar methods as in quality management to ensure that EO will be converted into operational performance, e.g. “EO circles” could be established.

More specifically, when doing so, management is well advised to strongly support the established positive performance accelerator of enhanced EO via manufacturing range to firm performance. Management should for example encourage production personnel to suggest product variations and process changes in order to enlarge the overall manufacturing range – typical training profiles could be similar to the three EO subdimensions that were utilized in our research (i.e. risk taking, proactiveness, innovativeness). For example, managers should train and encourage their production teams to think and act even more “out of the box” than they might do today.

Regarding manufacturing adaptability, managers are best advised to constantly check and recheck production floor initiatives that aim to enlarge manufacturing adaptability as our results revealed that in many cases excessive levels of manufacturing adaptability are potentially detrimental to companies’ success and growth. Therefore, a careful and rigorous evaluation and selection process should be established in order to avoid negative performance consequences of enlarged manufacturing adaptability. This evaluation system could for example include references to products, markets and customers and should allow identifying the real “value for money” of such initiatives; i.e. the actual willingness to pay of customers for enlarged levels of manufacturing adaptability needs to be determined.

This twofold approach provides a very good fit to existing practical operations management knowledge: Management should try to foster proactive decision making by

production personnel as well as innovative thinking on the production floor. However, given the ambiguous character of manufacturing flexibility, this should be conducted in a controlled manner that primarily leads to new standardized products to be implemented in an extended manufacturing range, while simultaneously high levels of manufacturing adaptability should be avoided as these could decrease overall performance in (mainly) small and medium sized manufacturing companies.

4.3 Limitations and Directions for Future Research

Given the nature of the analyzed sample, the management implications of this study have to be restricted to manufacturing industries – in service industries the resulting picture could diverge extremely from the results presented here, as in such industries manufacturing adaptability might positively correlate with firm performance due to different yield management restrictions and the impossibility to store services. Moreover, a cross-sectional research design clearly comes along with causal limitations. However, the nature of the respective constructs under investigation and the model itself with its hypothesized causal chain starting with a general strategic posture (EO) that leads to concrete action (manufacturing flexibility), which in turn impacts on firm performance makes issues such as reverse causality very unlikely. Still, some researchers have suggested that even the very general EO-performance relationship might be interpreted vice versa (Rauch et al., 2009) such that superior performance allows additional entrepreneurial endeavours on the firm level. Future research might thus employ even more rigorous and elaborate research designs – although even longitudinal designs might fall for the *post hoc ergo propter hoc* fallacy and assume causality that in actual fact would not exist. Second, the sample might be considered

comparatively small, but given that the usual tests for potential biases did not indicate the occurrence of such biases and given that with the PLS approach to structural equation modelling a method was chosen that allows to analyze such data with sufficient power, valid conclusions still can be drawn from this sample. Last, manufacturing flexibility is not the only possible form of flexibility in operations management – future research should therefore consider various other forms and contexts of flexibility on the production floor. For instance, production on demand, opportunistic production management, rapid prototyping production systems, flexible reconfigurations of “virtual” capacities or bundles of competencies in production networks, the distinction between internal (competencies) and external (capabilities) flexibility (Zhang et al., 2003; Koste et al., 2004; Corsten et al., 2005; Ahlert et al., 2009; Camisón and Villar, 2010) are all promising concepts that might help to further illustrate the interesting relationship of entrepreneurship and operations management in general.

5. Conclusion

The present study supports the main hypothesis stating that manufacturing flexibility should be considered a mediating factor between EO and firm level performance. However, the two subdimensions of manufacturing flexibility exert positive and negative performances effects at the same time. Consequently, measures were suggested that can help firms to maximize the positive performance impact of EO and simultaneously help to avoid the pitfalls of too much manufacturing flexibility in undesired areas. Future research can build on these results by elaborating on the potentially mediating role of other forms of flexibility.

References

Ahlert, K.-H., H. Corsten, R. Gössinger. 2009. Capacity management in order-driven production networks – A flexibility-oriented approach to determine the size of a network capacity pool. *International Journal of Production Economics*, 118 (2), 430-441.

Ahmed, N. U., R. V. Montagno, R. J. Firenze. 1996. Operations Strategy and Organizational Performance: An Empirical Study. *International Journal of Operations & Production Management*, 16 (5), 41-53.

Anand, G., P. T. Ward. 2004. Fit, Flexibility and Performance in Manufacturing: Coping with Dynamic Environments. *Production and Operations Management*, 13 (4), 369-385.

Ansoff, H.I. 1965. *Corporate Strategy*. McGraw-Hill, New York.

Armstrong J. S., T. S. Overton. 1977. Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14 (3), 396-402.

Auger, P., A. Barnir, J. M. Gallaughier. 2003. Strategic orientation, competition, and internet-based economic commerce. *Information Technology and Management*, 4 (2-3), 139-164.

Baruch, Y. 1999. Response rate in academic studies — A comparative analysis. *Human Relations*, 52 (4), 421-438.

Bordoloi, S. K., W.W. Cooper, H. Matsuo. 1999. Flexibility, Adaptability, and Efficiency in Manufacturing Systems. *Production and Operations Management*, 8 (2), 133-150.

Camisón, C., A. Villar. 2010. An examination of the relationship between manufacturing flexibility and firm performance. *International Journal of Operations & Production Management*, 30 (8), 853-878.

Chin, W. W. 1998. The partial least squares approach to structural equation modelling. G. A. Marcoulides, ed. *Modern methods in business research*. Erlbaum, Hillsdale, 295-336.

Chang, S., R. Lin, F. Chang, R. Chen. 2007. Achieving Manufacturing Flexibility through Entrepreneurial Orientation. *Industrial Management & Data Systems*, 107 (7), 997-1017.

Chou, M. C., G.A. Chua, C.-P. Teo. 2010. On range and response: Dimensions of process flexibility. *European Journal of Operational Research*, 207 (2), 711-724.

Corsten, H., R. Gössinger, N. Wolf. 2005. Flexibility-driven order releases in job-shop production. *Technovation*, 25 (8), 815-830.

Covin, J., D. P. Slevin. 1991. A Conceptual Model of Entrepreneurship as Firm Behavior. *Entrepreneurship Theory and Practice*, 16 (1), 7-24.

Covin, J. G., D. P. Slevin. 1989. Strategic management of small firms in hostile and benign environments. *Strategic Management Journal*, 10 (1), 75-87.

De Toni, A., S. Tonchia. 1998. Manufacturing flexibility: a literature review. *International Journal of Production Research*, 36 (6), 1587-1617.

Dess, G. G., G. T. Lumpkin. 2005. The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship. *Academy of Management Executive*, 19 (1), 147-156.

Fornell, C., D. F. Larcker. 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18 (2), 39-50.

Gupta, A. K., V. Govindarajan. 1984. Business unit strategy, managerial characteristics, and business unit effectiveness at strategy implementation. *Academy of Management Journal*, 27, 25-41.

Gupta, S., R. Verma, L. Victorino. 2006. Empirical Research Published in *Production and Operations Management* (1992–2005): Trends and Future Research Directions. *Production and Operations Management*, 15 (3), 432-448.

Guth, W., A. Ginsberg. 1990. Guest Editors' Introduction: Corporate Entrepreneurship. *Strategic Management Journal*, 11 (Special Issue), 5-15.

Harman, H. H. 1976. *Modern factor analysis*. University of Chicago Press, Chicago.

Hart, S. L. 1992. An integrative framework for strategy-making processes. *Academy of Management Review*, 17 (2), 327-351.

Jaworski, B. J., A. K. Kohli. 1993. Market orientation: Antecedents and consequences. *Journal of Marketing*, 57 (3), 53–70.

Khandwalla, P. 1977. The design of organizations. Harcourt Brace Jovanovich, New York.

Koste, L. L., M. K. Malhotra, S. Sharma. 2004. Measuring dimensions of manufacturing flexibility. *Journal of Operations Management*, 22 (2), 171-196.

Kunesch, H.W. 1996. Planning and Control Systems in Material Management – An Empirical Study. *Production Planning & Control*, 7 (2), 205-211.

Little, R. J., D. B. Rubin. 2002. Statistical analysis with missing data. Wiley, Hoboken.

Lohmöller, J. 1989. Latent variable path modelling with partial least squares. Physika, Heidelberg.

Lumpkin, G. T., G. G. Dess. 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 21 (1), 135-172.

Lumpkin, G. T., G. G. Dess. 2001. Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle. *Journal of Business Venturing*, 16 (5), 429-451.

Lumpkin, G. T., C. Cogliser, D. Schneider. 2009. Understanding and Measuring Autonomy: An Entrepreneurial Orientation Perspective. *Entrepreneurship Theory and Practice*, 33 (1), 47-69.

Matsuno, K., J. T. Mentzer, A. Özsoy. 2002. The Effects of Entrepreneurial Proclivity and Market Orientation on Business Performance. *Journal of Marketing*, 66 (7), 18-32.

McClelland, D.C. 1976. The achieving society. John Wiley & Sons, New York.

Messeghem, K. 2003. Strategic Entrepreneurship and Managerial Activities in SMEs. *International Small Business Journal*, 21 (2), 197-212.

Miller, D. 1983. The correlates of entrepreneurship in three types of firms. *Management Science*, 29 (7), 770-791.

Ministry of Economic Affairs and Energy of the State of North Rhine-Westphalia. 2010. Business location NRW. www.economy.nrw.de/standortnrw/index.php. Accessed 16th April 2010.

Mintzberg, H. 1973. Strategy Making in Three Modes. *California Management Review*. 16 (2), 44-53.

Pereira, J., K. Takahashi, L. Ahumada, F. Paredes. 2009. Flexibility dimensions to control the bullwhip effect in a supply chain. *International Journal of Production Research*, 47 (22), 6357-6374.

Podsakoff P. M., S. B. MacKenzie, J. Y. Lee, N. P. Podsakoff. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88 (5), 879-903.

Porter, M.E. 1998. *Competitive Strategy. Techniques for Analyzing Industries and Competitors*. Free Press, New York.

Rauch, A., J. Wiklund, G. T. Lumpkin, M. Frese. 2009. Entrepreneurial orientation and business performance: Cumulative empirical evidence. *Entrepreneurship Theory and Practice*. 33 (3), 761-788.

Ringle, C. M., S. Wende, A. Will. 2005. Smart PLS 2.0 M3. <http://www.smartpls.de>.

Slack, N. 1987. The Flexibility of Manufacturing Systems. *International Journal of Operations & Production Management*, 7 (4), 35-45.

Stam, W., T. Elfring. 2008. Entrepreneurial orientation and new venture performance: The moderating role of intra- and extraindustry social capital. *Academy of Management Journal*, 51 (1), 97-111.

Stevenson, H. H., J. C. Jarillo. 1990. A Paradigm of Entrepreneurship: Entrepreneurial Management. *Strategic Management Journal*, 11 (Special Issue), 17-27.

Stinchcombe, A. L. 1965. Organizations and social structure. J. G. March, ed, *Handbook of Organizations*. Rand-McNally, Chicago, 153-193.

Swafford, P. M., S. Ghosh, N. Murthy. 2006a. The antecedents of supply chain agility of a firm: Scale development and model testing. *Journal of Operations Management*, 24 (2), 170-188.

Swafford, P. M., S. Ghosh, N. Murthy. 2006b. A framework for assessing value chain agility. *International Journal of Operations & Production Management*, 26 (2), 118-140.

Vokurka, R. J., S. W. O'Leary-Kelly. 2000. A review of empirical research on manufacturing flexibility. *Journal of Operations Management*, 18, 485-501.

Werner S., M. Praxedes, H. G. Kim. 2007. The reporting of nonresponse analyses in survey research. *Organizational Research Methods*, 10 (2), 287-295.

Wiklund, J. 1999. The sustainability of the entrepreneurial orientation-performance relationship. *Entrepreneurship Theory and Practice*, 24 (1), 37-48.

Wold, H. 1985. Partial least squares. S. Kotz, N. L. Johnson, eds. *Encyclopedia of statistical science*. Wiley, New York, 581-591.

Zahra, S. A., D. F. Jennings, D. F. Kuratko. 1999. The Antecedents and Consequences of Firm Level Entrepreneurship: The State of the Field. *Entrepreneurship Theory and Practice*, 24 (2), 45-66.

Zahra, S. A. 1991. Predictors and financial outcomes of corporate entrepreneurship: An exploratory study. *Journal of Business Venturing*, 6 (4), 259-285.

Zahra, S. A., J. G. Covin. 1995. Contextual influences on the corporate entrepreneurship performance relationship. A longitudinal analysis. *Journal of Business Venturing*, 10 (1), 43-58.

Zhang, Q., M. A. Vonderembse, J.-S. Lim. 2003. Manufacturing flexibility: defining and analyzing relationships among competence, capability, and customer satisfaction. *Journal of Operations Management*, 21 (3), 173-191.

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