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Rosemarie Kay, Sebastian Nielen and Christian Schröder

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Herausgeber
Institut für Mittelstandsforschung Bonn
Maximilianstr. 20, 53111 Bonn
Telefon +49/(0)228 / 72997 - 0
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SMEs´ Responses to Potentially Disruptive Innovations:

Does Strategic Entrepreneurship Provide an Explanation?

Rosemarie Kay, Sebastian Nielen and Christian Schröder[1]

December 2018

Abstract: This study analyses how established SMEs respond to potentially disruptive innovations and business models in the course of increasing digitization. Drawing on the strategic entrepreneurship approach we argue that SMEs showing strategic entrepreneurial behaviour are more likely to respond to potentially disruptive innovations and business models proactively. We find that established SMEs recognizing disruptive innovations and business models as a business opportunity apply significantly more frequently strategic measures to exploit these opportunities. Observing and evaluating relevant new technologies and developments is a key determinant of belonging to the group of SMEs demonstrating strategic entrepreneurial behaviour. In our sample only a minority belongs to the group of proactive established SMEs.

Keywords: SMEs, Strategic Entrepreneurship, Digitization, Disruptive Innovations, New Business Models

JEL-Codes: L26, L21, M21

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[1] Dr. Rosemarie Kay, Institut für Mittelstandsforschung (IfM) Bonn, Maximilianstr. 20, 53111 Bonn, E-Mail: kay@ifm-bonn.org.
Dr. Sebastian Nielen, Institut für Mittelstandsforschung (IfM) Bonn, Maximilianstr. 20, 53111 Bonn, E-Mail: nielen@ifm-bonn.org.
Dr. Christian Schröder (corresponding author), Institut für Mittelstandsforschung (IfM) Bonn, Maximilianstr. 20, 53111 Bonn, Tel.: 0228/72997-43, E-Mail: schroeder@ifm-bonn.org.

1. Introduction

In the course of the ongoing process of digitization, disruptive product and business model innovations occur more and more. For established small and medium sized enterprises (SMEs), these developments come along with both opportunities and risks. On the one hand, competitors - newcomers to the market or established companies themselves - may bring new (disruptive) products or business models onto the market resulting possibly in a reduction of established SMEs' market shares or lower profit margins. On the other hand, new information and communication technologies and related business models may also provide established SMEs new business opportunities e.g. through developing or improving products and services and an easier access to new markets.

For established SMEs it is one of the main challenges to find a promising way to handle sucessfully the rapid change induced by the emergence of new global players like Amazon, Uber and Arbnb. These firms changed the rules of the game and reshaped their respective industries in building up virtual platforms that reduced information and transaction costs as well as barriers to market entry (Andersson/Eriksson 2018). The emergence of disruptive innovations and new business models does probably not have the same impact on all business sectors alike. However, the underlying internet based technologies are general purpose technologies. They therefore profoundly affect, at least in the midium to long run, the way of value creation as well as customer preferences on the whole (Bleicher/Stanley 2016, Kagermann 2015, Loebbecke/Picot 2015). So it might be critical for a SME's prospects to enhance its knowledge base concerning game changer technologies. In so doing it might be able to evaluating their impact on its current business model and drawing conclusions about appropriate strategic meassures. Given the fact that SMEs represent more than 99 % of all firms in Europe it is of macroeconomic importance how SMEs are mastering the ambidexterity of exploring and exploiting opportunities in the context of disruptive product and business model innovations.

Surprisingly, there is little empirical evidence on whether and to what extend SMEs recognize these new technologies as a business opportunity and can use this knowledge for reshaping their existing business model - while running the day to day business effectively (Cozzolino et al. 2018). Against this background, this paper focuses on SMEs and their varying responses to emerging opportunities and risks of digitization. We argue that the strategic entrepreneurship approach is appropriate to explain how established SMEs deal with potentially disruptive de

velopments. In this paper we therefore aim to explore if SMEs' assessment and review activities concerning innovation and future trends drive the perception of "game-changer" technologies and thus the subsequent implementation of strategic measures. This nexus of opportunity seeking and advantage seeking behaviour is distinguishing for being a strategic entrepreneur (Hitt/Wright 2017, Hitt et al. 2001, Ireland et al. 2003, Ireland/Webb 2007 and 2009, Kuratko/Audretsch 2009). In this vein we also follow the proposition of scholars to advance the strategic entrepreneurship concept (e.g. Mazzei 2018, Simsek et al. 2017). Our empirical work shed some light on the behavior of SMEs in the context of the ongoing digitization and provides additional empirical evidence for a better understanding of how firms tackle the challenges caused by disruptive innovations and new business models.

We conducted an empirical analysis based on a sample of 268 SMEs located in Germany. Applying a path model approach we examine if external search activities affect opportunity seeking behavior and if opportunity seeking behaviour in turn is positively interrelated with advantage seeking behavior. We found that one-fifth of the analysed SMEs regard disruptive innovations and business models as a business opportunity. These SMEs take significantly more often strategic measures in dealing with the increasing digitization, compared to the remaining SMEs. More precisely, they set up pilot projects to gain experience, they cooperate with competitors, they work closely with their customers and suppliers, seek advice by external specialist or they invest in research and development activities to exploit the recognized opportunities. Observing and evaluating relevant new technologies and developments is a key determinant for belonging to the group of SMEs which demonstrate strategic entrepreneurial behaviour.

We organised the paper as follows. In section two we present our theoretical framework and develop our hypotheses. Section three contains the description of our dataset and descriptive statistics, while we present our empirical results section four. In the last section we discuss our findings and draw some conclusions.

2. Theoretical framework and hypotheses

Technology by itself has no economic value. It needs to be commercialized in some way via a business model (Chesbrough 2010). Although all businesses, either explicitly or implicitly, employ a particular business model firms differ in their ability to commercialize new technologies by adapting their respective business model (Teece 2010, p. 191). Thereby, busi-

ness model innovation is required in responding to changing sources of value creation, namely by rearranging the established ways of doing business (Zott/Amid, 2010; Schneider/Spieht 2013).

Following Teece's (2010, p.191) proposition that "a business model describes the design or architecture of the value creation, delivery and capture mechanisms employed" one can argue that firms which do not adjust or reinvent their current business model in the face of an upcoming comprehensive technological change endanger their competitiveness. Such a technology and hence a key driver for business model innovation is the broadband internet, enabling ubiquitous communications and cheap ways to receive and send rich amounts of useful information (McGrath 2009). Complementary developments in information and communication technologies (ICT) enable the exploitation of opportunities provided by broadband internet. Thus, complementary ICT change the business environment in a dynamic and significant way. As a result, firms need to ask themselves both how these technology driven changes threaten their current business model concerning customer needs, the firm's value proposition and the value constellation as well as what does it need to innovate the own business model (Andersson/Eriksson 2018, Paap/Katz 2004, p. 14).

Business model innovation means the discovery of a slightly or fundamentally different business model in an existing business (Markides, 2006, Zott/Amit 2010). It aims at consciously renewing a firm's core business logic rather than limiting its scope of innovation on single products or services. Furthermore, it builds on the business model's capacity to integrate all of the firm's current business model elements, its external environment, and its interfaces with customers and partners (Schneider/Spieth 2013, p.4). Though business model innovation is not costless as e.g. intra-organizational adjustment costs may occur investments in research and development (R&D) activities are often higher (Zott/Amid 2010).

Moreover, Chesbrough (2010) argue that firms have at least as much value to gain from business model innovation as from developing a new technology. Pohle/Chapman (2006) show by interviewing 765 corporate and public sector leaders that business model innovation is important for remaining competitive or seeking growth by entering new industries. Based on a survey of about 500 firms, Aspara et al. (2010) find that small firms whose strategic emphasis is on business model innovation exhibit, on average, stronger profitabel growth, compared to small firms which do not persue such a strategic approach. So SMEs are in a position to pur-

sue business model innovations, despite being more often resource constrained, compared to big companies.

A suitable theoretical foundation of the business model innovation process provides the strategic entrepreneurship perspective (Schneider/Spieth 2013). Strategic entrepreneurship is based on the integration of entrepreneurship and strategic management (Hitt et al. 2001). Strategic entrepreneurs are able to both create wealth by identifying opportunities in their external environment as well as to build up sustainable competitive advantages to exploit those opportunities (Ireland et al. 2003, p. 966). Strategic entrepreneurship is an approach for pursuing superior performance through both incremental and discontinuous innovation as well as a blend of strategic and entrepreneurial activities (Mazzei 2018, p. 657). We draw on these two elements - the entrepreneurial and the strategical - to explain how SMEs deal with upcoming opportunities induced by new technologies and disruptive business models.

Hitt et al. (2001) define entrepreneurship as the identification and exploitation of previously unexploited opportunities. Such unexploited opportunites arise from change - be it the development of new knowledge by individuals and organizations or changes in the environment. Comprehensive changes induced by general purpose technologies like ICT and broadband internet offer new opportunities for firms to benefit from these changes. (Grégoire et al. 2010, p. 414f.). However, the question remains what is a promising way to explore these opportunities.

Gielnik et al. (2014) highlight the role of active information search for business opportunity identification. They found that active information search enhances the positive effect of divergent thinking on business opportunity identification. Divergent thinking is the individual's general ability to generate multiple and original ideas. It enables the individual to combine various pieces of information to generate innovation (Gielnik et al., p. 351). Baron (2005) argues that active search activities in combination with entrepreneurial experience and changes in the external world help to "connect the dots" hence to identify opportunities in seemingly unrelated events. Casadesus-Masanell et al. (2013, p. 465) observed that incumbents often learn about new business models from entrants and respond to these new business models by incorporating these innovations (in full or in part) into their businesses. This implies that the learning process comprise an internal review process with regard to the competitor's business model as the adaption of a new business model requires appropriate resources.

If these resources are not available the implementation does not work effectively or fails entirely (Wessel/Christensen 2012).

We assume that observing and assessing innovations and future trends is a promising way for established SMEs to seek for new business opportunities and hence we hypothesize:

Hypothesis 1: SMEs' assessment and review activities concerning innovations and future trends are positively associated with the perceived impact those innovations and future trends have on the current business model (opportunity seeking).

A key element for firms in sustaining competitiveness is managing resources strategically (Ireland et al. 2003). Firms hold heterogeneous and idiosyncratic resources on which their strategies are based. Competitive advantages are achieved when the strategies are successful in leveraging these resources (Hitt et al. 2001). As time goes by and environmental conditions change the existing resources may lose value. Thus the aquiring and developing of new ressources and the subsequent structering of the resource portfolio, bundeling of ressources and leveraging capabilities lead to sustainable competitive advantages (Ireland 2002, Hitt et al. 2001). Ireland et al. (2003) draw special attention to human and social capital as valuable resources. These intangible resources are less imitable than tangible ones.

External networks can serve as sources of implicit and explicit new knowledge. The establishment of an external network is thus a suitable strategy for SMEs for enhancing their human and social capital. Such networks involve relationships with customers, suppliers, and competitors among others and facilitate SMEs' access to complementary and thus beneficial resources (Brunswicker/Vanhaverbeke 2015, Gronum et al. 2012, Hitt et al. 2001). Both informal networks and formal cooperation are supportive in building up trust. They also enhance the organizational ability to work effectively together with other organizations (Hitt et al. 2001).

Lasagnis' (2012) empirical results based on 500 SMEs in six European countries indicate that innovation performance is higher in those SMEs which are proactive in strengthening their relationships with innovative suppliers, users, and customers. Furthermore, these findings support the view that SMEs will have better new product development results if they improve their relationships with laboratories and research institutes. However, crucial for realising the benefits of new knowledge is the absorptive capacity e.g. through research and development activities or the set-up of pilot projects to gain experience (Cohen/Levinthal 1990).

Assuming that applying strategic measures enhances firms' ability to sustain their competitive advantage through exploiting opportunities we hypothesize:

Hypothesis 2: Opportunity seeking is positively interrelated with implementing specific strategies to cope with potential disruptive innovations and new business models (advantage seeking).

Figure 1 illustrates the theoretical frame work of this study. We expect that monitoring, assessment and review activities are positively interrelated with opportunity seeking (hypothesis 1). Opportunity seeking is expected to have a positive relationship with advantage seeking (hypothesis 2). Combining both single direct effects from hypothesis 1 and 2 we can formulate a hypothesis regarding the relationship between monitoring, assessment and review activities and implementing specific strategies to cope with potential disruptive innovations and new business models (advantage seeking). Because both direct effects are assumed to be positive, we also expect a positive relationship between monitoring, assessment and review activities and advantage seeking. Hence, we hypothesize:

Hypothesis 3: The relationship between monitoring, assessment and review activities on the one hand and advantage seeking on the other hand is positive. This indirect effect is moderated by opportunity seeking.

Insert Figure 1 Here

3. Data and descriptive statistics

3.1 Sample

This study uses data from an online survey that was conducted by the end of 2016 in the area of Dusseldorf, western Germany. We contacted about 5,000 firms of all industries and sizes, of which 327 answered the questionnaire completely. Since we focus on SMEs all large firms were excluded. Furthermore, some firms had to be excluded because of missing values in some variables. Our final sample comprises 268 SMEs.

The applied questionnaire contains a set of questions on digitization, disruptive innovations and various entrepreneurial responses to these issues. In particular, it comprises questions on strategies firms have implemented to deal with disruptive innovations and new business models as well as on the importance of new technologies and business models with regard to a

firm's business model. We utilize this information to represent the constructs opportunity seeking and advantage seeking.

3.2 Variables

According to our hypotheses there are two dependent variables: opportunity seeking and advantage seeking. As we apply a path model to test our hypotheses, opportunity seeking constitutes an independent variable as well. For capturing the construct opportunity seeking we use information on a firm's assessment of the importance of new technologies and business models for the firm's prospects. The respondents could choose among the following possible answers. The emergence of new technologies and business models …

- are only of slight importance
- are not assessable yet
- are crucial for the firm's development
- can significantly weaken the market position
- can significantly improve the market position
- can enable continuous improvements
- can enable radical new business potentials.

In order to identify SMEs that respond proactively to upcoming technologies and business models and thus in an opportunity seeking way we run a cluster analysis using this specific information. The results of the cluster analysis are presented in table 1. We identified two groups of SMEs. The first one comprises opportunity seeking SMEs, the second one the remaining, more conservative SMEs.

Insert Table 1 Here

An opportunity seeking SME is one that recognizes the opportunities of potentially disruptive technologies for its business model and its significance for the firm's development. Accordingly, opportunity seeking SMEs are more likely to answer that potentially disruptive innovations and business models are crucial for the firm's development. They also state more frequently that potentially disruptive innovations can weaken or improve a firm's market position significantly. Furthermore, they are more likely to see the potential of technology based developments for continuous improvements or for radical new business potentials. In contrast, SMEs of the remaining group are characterized by either having problems with evaluating the

relevance of potentially disruptive innovations and new business models for their own business or by attaching only minor importance to potentially disruptive innovations. Most SMEs in our sample belong to the second, conservative group. Only less than one out of five SMEs belongs to the proactive opportunity seeking group showing entrepreneurial behaviour.

Based on the result of this cluster analysis the variable *opportunity seeking* is coded as a dummy variable taking the value of one if a SME belongs to the proactive, opportunity seeking group and zero otherwise.

For capturing the construct advantage seeking, we use information on strategies SMEs have implemented in order to deal with the emergence of potentially disruptive innovations. Possible answers were cooperation with customers and suppliers, setting up own pilot projects, seeking advice by external specialists, investing in own R&D, cooperation with universities and other research institutions, and cooperation with competitors. For each item we create a dummy variable taking the value of one if the respective strategy has been implemented, and zero otherwise. This set of dummy variables represents the advantage seeking behaviour of SMEs. Table 2 reports descriptive statistics for each strategy.

Insert Table 2 Here

The most frequently implemented strategy to respond to potentially disruptive innovations and business models is the cooperation with customers and suppliers, followed by seeking advice by external specialists. More than 18 percent of all SMEs have started own pilot projects. About 15 percent have both cooperated with competitors and invested in own R&D. Only a few SMEs in our sample have entered a cooperation with universities or other research institutions.

A second independent variable refers to assessing innovation and future trends. For capturing this behaviour we use information on specific monitoring and assessment activities of SMEs. We generate two dummy variables. The first one *monitoring* takes the value one if a firm reports to monitor new technologies and business models, and zero otherwise. The second one *assessing* takes the value one if a firm states it conducts assessments and reviews concerning innovations and future trends, and zero otherwise. Descriptive statistics of these two dummy variables as well as of all control variables are presented in appendix A1.

We also include a set of control variables in our path model. Firstly, we control for the importance of ICT for a firm's business model because we assume that SMEs having a business model which is based on ICT are in a better position to respond to opportunities and risks resulting from digitization successfully. To take this into account we include two dummy variables taking the value of one if ICT is important or if it is very important for the own business, and zero otherwise. Secondly, we also include the age of the firm, a dummy variable for export activities, dummy variables for size and industry, and dummy variables for the sales development in the past three years. Concretely, we distinguish between decreasing, increasing and consistent (+/- 2 percent) sales within the past three years.

4. Results

To test our hypotheses we estimate a path model. In doing so we can test all three hypotheses simultaneously within one model. For reasons of clarity, we report each stage of our model separately for both (groups of) dependent variables. We start with the results of the model regarding opportunity seeking (table 3).

Insert Table 3 Here

SMEs observing their environment and evaluating upcoming trends and technologies with regard to their relevance for the own business model have a significant higher probability to belong to the group of proactive, opportunity seeking SMEs. In particular, evaluating newly upcoming trends and innovations is positively related to opportunity seeking. Simply observing potentially disruptive technologies and business models has no statistically significant effect. Our empirical results also show that SMEs for whose business model ICT is important or very important are more likely to belong to the group of proactive, opportunity seeking SMEs. The remaining control variables have no significant effect.

In table 4 we report the main effects of opportunity seeking on the probability to implement various strategies dealing with disruptive innovations (advantage seeking). For complete results including all coefficients see appendix A2.

Insert Table 4 Here

Our estimations reveal that opportunity seeking SMEs are indeed more likely to implement specific strategies to deal with disruptive innovations, compared to non-entrepreneurial SMEs. In particular, they have a higher probability to cooperate with customers and suppliers as well

as to start own pilot projects. Furthermore, they are more likely to seek advise by external specialists, to cooperate with competitors and to conduct own R&D. Surprisingly, cooperation with universities and other research institutions is negatively correlated with opportunity seeking. However, the corresponding coefficient is highly insignificant.

Additionally, we estimated the indirect effects of monitoring and assessing on implementing specific strategies to deal with potentially disruptive innovations and business models via belonging to the group of opportunity seeking SMEs. These indirect effects are calculated by multiplying each direct effect of monitoring and assessing the business environment on being a proactive, opportunity seeking SME with each direct effect of being a proactive, opportunity seeking SME on each strategy, respectively. Table 5 reports the results.

Insert Table 5 Here

The indirect effects of monitoring new technologies and business models on the implementation of various strategies to deal with disruptive innovations and business models are not statistically significant. With regard to conducting assessments and reviews concerning innovations and future trends we find a positive statistically significant indirect effect on each strategy except the cooperation with universities and other research institutions. Cooperation with universities and other research institutes has a negative indirect effect which is, however, highly statistically insignificant. The positive statistically significant indirect effects we found are the result of statistically significant positive direct effects we found when testing hypotheses one and two.

Finally, a few control variables affect statistically significant the advantage seeking behaviour of SMEs (see appendix A2). SMEs reporting that ICT is very important for their business model have a higher probability to invest in own R&D, while SMEs rating the role of ICT for their business model as important are less likely to cooperate with customers and suppliers. Age is positively related with seeking advice by external specialists as well as with cooperation with universities and other research institutions. Furthermore, our results indicate that exporting SMEs are more likely to invest in own R&D as well as to cooperate with universities and other research institutions. However, they less often seek advice by external specialists. SMEs reporting increased sales in the past three years have a higher probability to cooperate with suppliers and customers and to cooperate with universities and other research institutions.

5. Discussion and implications

The aim of this study is to analyse how established SMEs respond to potentially disruptive innovations and business models. On the one hand, these trends could be regarded as a risk for established SMEs because new firms may enter the market, reducing possibly established firms' market shares drastically. On the other hand, these innovations and new business models provide established SMEs with new business opportunities as well. Drawing on the strategic entrepreneurship approach we argue that established SMEs that reveal entrepreneurial behaviour are more likely to respond proactively to potentially disruptive innovations and business models. To be able to respond to these new trends a firm needs to recognise them beforehand. Hence, we also argue that SMEs observing and evaluating relevant new trends and technological developments are more likely to belong to the group of strategic entrepreneurs.

We tested our hypotheses using a sample covering 268 SMEs located in the area of Dusseldorf in western Germany. Basically, we find empirical evidence supporting all of our hypotheses. Based on a cluster analysis we split our sample into two different groups. The first group (proactive SMEs) is able to identify potential opportunities resulting from new technologies and business models driven by the ongoing process of digitization. However, this group is at the same time aware of the potential risks resulting from potentially disruptive innovations and business models. In contrast, the second group of SMEs rate innovations and new business models driven by the digitization as less important for their business' prospective. Furthermore, they are not able to evaluate the impact of these developments on their own business. In our sample, the group of so called proactive, opportunity seeking SMEs (entrepreneurs) are a distinct minority. Results of our path model indicate that the entrepreneurial SMEs are more likely to implement specific strategies to deal with potentially disruptive innovations and business models. In this case, SMEs act as strategic entrepreneurs.

Our results also point to established SMEs' need to observe and analyse their business environment to identify new relevant technologies and business models. In particular, our empirical findings suggest that it is not sufficient just to observe the own business' environment. There seems to be a need of regularly assessing and reviewing innovations and upcoming trends which are relevant for the own business' prospects. Identifying those developments and weighing the related opportunities and risks enables established SMEs to deal with potentially disruptive innovations and business models. Hence, the results of our study prove that strate-

gic entrepreneurship is a suitable theoretical concept to explain SMEs' varying responses to potentially disruptive innovations.

Our study also indicates issues left for future research. The results of our study suggest that proactive SMEs are more likely to implement specific strategies responding to potentially disruptive innovations and business models. However, it is unclear whether all SMEs are affected by these developments in the same intensity. It is possible that in the group of the so called conservative SMEs some are only slightly affected. From their point of view, there might be no need for implementing specific strategies dealing with potentially disruptive innovations and business models. For a final assessment of the behaviour of SMEs, an analysis is needed whether SMEs implementing specific strategies are more successful in the long run, compared to SMEs which do not pursue any strategies. Future research may also investigate whether there are single strategies or bundles of strategies which are more promising in dealing with potentially disruptive developments due to the ongoing digitization.

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Figure 1: Theoretical Framework and Hypotheses

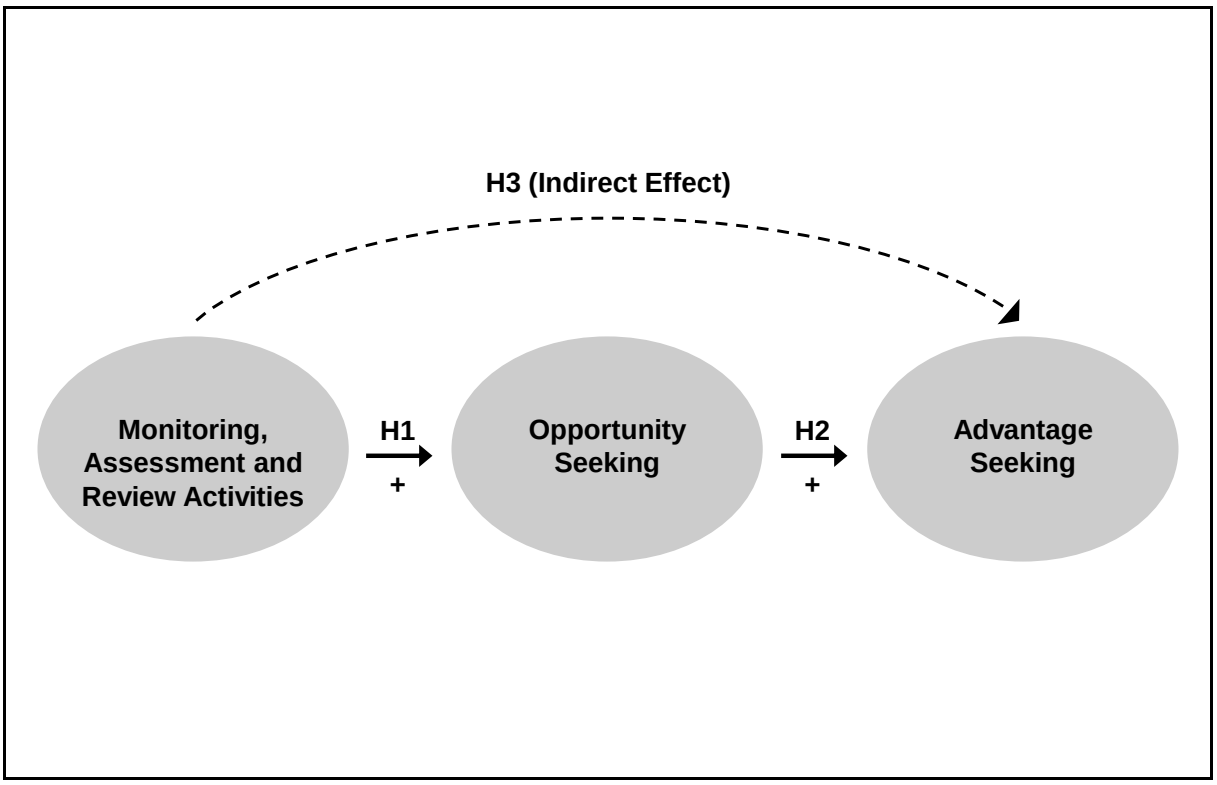

Table 1: Cluster analysis to detect opportunity seeking SMEs

	Opportunity seeking SMEs	Other SMEs
Slight importance	0.039	0.539
Importance not yet assessable	0.137	0.318
Crucial for the firm's development	0.275	0.097
Can significantly weaken our market position	0.196	0.101
Can significantly improve our market position	0.824	0.023
Enables continuous improvements	0.588	0.129
Enables radical new business potentials	0.412	0.018
Number of observations	51	217
Share of SMEs	0.190	0.810

Table 2: Strategies to deal with disruptive innovations (advantage seeking behaviour): Descriptive statistics

Variable	Mean	Std. Dev.
Cooperation with customers and suppliers	0.369	0.484
Own pilot projects	0.183	0.387
Seek advice by external specialists	0.291	0.455
Invest in own R&D	0.146	0.353
Cooperation with universities and other research institutions	0.063	0.244
Cooperation with competitors	0.149	0.357

Table 3: Being a proactive, opportunity seeking SME: Results of the path model

Variables	(1)
Monitoring new technologies and business models	0.030
	(0.050)
Conducting assessments and reviews concerning innovations and future trends	0.186***
	(0.057)
ICT very important for business model	0.119*
	(0.063)
ICT important for business model	0.161**
	(0.074)
Age	0.001
	(0.001)
Export: Yes	0.077
	(0.054)
Sales: Increased	0.036
	(0.050)
Sales: Decreased	0.021
	(0.075)
Size categories	Yes
Industry	Yes
Constant	-0.064
	(0.075)
R-Square	0.131
Observations	268

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Strategic actions: Results of the path model

Variable	Coefficient	Std. Error
Cooperation with customers and suppliers	0.171**	(0.075)
Own pilot projects	0.146**	(0.057)
Seek advice by external specialists	0.132*	(0.069)
Invest in own R&D	0.162***	(0.053)
Cooperation with universities and other research institutions	-0.027	(0.038)
Cooperation with competitors	0.111**	(0.056)

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Indirect effects of observing the business environment on implementing concrete strategies: Results of the path model

	Monitoring new technologies and business models		Conducting assessments and reviews concerning innovations and future trends	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Cooperation with customers and suppliers	0.005	0.009	0.032*	0.017
Own pilot projects	0.004	0.007	0.027**	0.014
Seeking advice by external specialists	0.004	0.007	0.025*	0.015
Invest in own R&D	0.005	0.008	0.030**	0.013
Cooperation with universities and other research institutions	-0.001	0.002	-0.005	0.007
Cooperation with competitors	0.003	0.006	0.021*	0.012

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix

Table A1: Descriptive statistics of independent and control variables

Variable	Mean	Std. Dev.
Monitoring new technologies and business models	0.672	0.470
Conducting assessments and reviews concerning innovations and future trends	0.205	0.405
ICT very important for business model	0.187	0.390
ICT important for business model	0.119	0.325
Age	30.586	31.708
Export: yes	0.313	0.465
Sales: Same	0.384	0.487
Sales: Increased	0.489	0.501
Sales: Decreased	0.127	0.333
Sales: less then 1 Mio. €	0.366	0.483
Sales: 1 Mio. € to less than 2 Mio. €	0.213	0.410
Sales: 2 Mio. € to less than 10 Mio. €	0.287	0.453
Sales: 10 Mio. € to less than 50 Mio. €	0.134	0.342
Manufacturing	0.231	0.422
Distribution	0.142	0.349
Business services	0.250	0.434
Personal services	0.243	0.429
Other	0.134	0.342

Table A2: Strategic actions: Complete results of the path model

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Proactive one	0.171**	0.146**	0.132*	0.162***	-0.027	0.111**
	(0.075)	(0.057)	(0.069)	(0.053)	(0.038)	(0.056)
ICT very important for business model	-0.044	-0.051	0.078	0.109*	-0.032	-0.053
	(0.080)	(0.061)	(0.073)	(0.056)	(0.040)	(0.060)
ICT important for business model	-0.156*	-0.022	0.016	-0.006	-0.059	-0.109
	(0.094)	(0.071)	(0.085)	(0.066)	(0.047)	(0.070)
Age	-0.000	0.000	0.002**	0.000	0.001*	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Export: Yes	-0.035	0.079	-0.145**	0.195***	0.060*	-0.021
	(0.068)	(0.051)	(0.062)	(0.047)	(0.034)	(0.051)
Sales: Increased	0.123*	-0.012	0.078	0.024	0.071**	0.022
	(0.063)	(0.048)	(0.058)	(0.045)	(0.032)	(0.047)
Sales: Decreased	-0.007	0.033	0.059	-0.047	0.069	0.030
	(0.094)	(0.071)	(0.086)	(0.066)	(0.047)	(0.070)
Size categories	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.352***	0.070	-0.019	0.030	-0.036	0.075
	(0.090)	(0.068)	(0.082)	(0.063)	(0.045)	(0.067)
R-Square	0.085	0.178	0.140	0.157	0.106	0.127
Observations	268	268	268	268	268	268

Notes: Standard errors in parentheses; Column 1: Cooperation with customers and suppliers, Column 2: Own pilot projects, Column 3: Seeking advice by external specialists, Column 4: Invest in own R&D, Column 5: Cooperation with universities and other research institutions, Column 6: Cooperation with competitors, *** p<0.01, ** p<0.05, * p<0.1.