



# Breaking through innovation barriers: Linking effectuation orientation to innovation performance



Sebastian Szambelan <sup>a, \*</sup>, Yi Jiang <sup>b</sup>, René Mauer <sup>a</sup>

<sup>a</sup> ESCP Europe, Heubnerweg 8-10, 14059, Berlin, Germany

<sup>b</sup> ESCP Europe, 79 Avenue de la République, 75011, Paris, France

## ARTICLE INFO

### Article history:

Received 20 October 2017

Received in revised form

24 November 2019

Accepted 29 November 2019

Available online 29 November 2019

### JEL classification:

D70L25L26030031

### Keywords:

Effectuation orientation

Innovation barriers

Corporate entrepreneurship

Effectual control orientation

Innovation performance

## ABSTRACT

This study aims to understand how firms overcome market-based innovation barriers and achieve innovation performance using the effectuation orientation construct. In so doing, we provide more nuanced insights into how the combination of mindsets and actions helps firms to overcome barriers. Based on a quantitative research design, data from 157 established organizations show variations in how effectual actions are related to perceived innovation barriers. Among the conclusions we draw from the results is the fact that effectual contingency and effectual means orientation are negatively associated with market-based innovation barriers, which are in turn negatively associated with a firm's innovation performance. Overall, the empirical results provide new insights into the literature of both innovation and entrepreneurship.

© 2019 Elsevier Ltd. All rights reserved.

## 1. Introduction

Innovation is closely associated with firms' competitive advantages and financial performance (Ireland & Webb, 2007; Sharma & Chrisman, 1999). It is argued that achieving innovation is particularly difficult for established firms (Covin et al., 2007). This is because they may face market-based innovation barriers, defined as forces that hinder firms from pursuing innovating activities (D'Este et al., 2012). To date, scholars have identified numerous innovation barriers that prevent organizations from innovating successfully (Sandberg & Aarikka-Stenroos, 2014). For example, intrafirm innovation barriers include a lack of innovation competence (O'Connor & DeMartino, 2006), a lack of resources (Kelley, 2009) or an unsuitable organizational structure (Wood & Brown, 1998), whereas market-based innovation barriers may reflect competitor rivalry (Lynn, Morone, & Paulson, 1996) or a missing market demand for innovation (Riffai, Grant, & Edgar, 2012). While the types of innovation barrier have already been identified, we know relatively little about how firms can overcome these barriers

(Story, Daniels, Zolkiewski, & Dainty, 2014).

Recent research on how firms overcome innovation barriers can be organized from two perspectives: the mindset-based view and the action-based view. The mindset-based view, represented by an organization's culture and underlying values, has been introduced as a new construct that helps firms overcome innovation barriers (Loewe & Dominiquini, 2006). According to the action-based view, certain actions such as behaviors related to leadership, management processes, or building human capital can affect the overcoming of innovation barriers (D'Este, Rentocchini, & Vega-Jurado, 2014; Souto & Rodriguez, 2015). However, little research has systematically investigated how both mindsets and actions can help firms overcome these innovation barriers. A deeper understanding of this subject could provide new insights into our knowledge of how firms can achieve this, and therefore catalyze our thinking, and help us approach the innovation phenomenon in a novel way (Cornelissen & Durand, 2014; Pinder & Bourgeois, 1982).

To this end, our study addresses the following research question: What effects do firms' mindsets and actions have on innovation barriers and innovation performance? To tackle this research question conceptually we borrow the effectuation orientation construct from the entrepreneurship literature. Effectuation orientation is defined as a strategic orientation that reflects a firm's

\* Corresponding author.

E-mail address: [sszambelan@escpeurope.eu](mailto:sszambelan@escpeurope.eu) (S. Szambelan).

direction toward proactively shaping and designing the external environment, and creating new markets (Werhahn, Mauer, Flatten, & Brettel, 2015). The dimensions of this construct fall into two categories: (1) firms' mindsets, represented by effectual control orientation; (2) firms' actions, represented by four effectual action orientation dimensions (affordable loss orientation, contingency orientation, means orientation, and partnership orientation). Empirically, we test several hypotheses with a structural equation model. Our focus is on the relationship among firms' effectual mindsets, effectual actions, perceived market-based innovation barriers, and innovation performance. The analyses are based on survey data from 157 established firms in Germany.

Results show a positive relationship between effectual control orientation (ECO) and most of the effectual action orientation (EAO) dimensions, with the exception of affordable loss orientation. Our data also suggest that the relationship between four action-based effectuation orientation dimensions and perceived innovation barriers varies across dimensions: affordable loss and partnership orientations are positively associated with perceived innovation barriers, whereas contingency and means orientations are negatively associated. Finally, our results indicate a negative association between perceived market-based innovation barriers and a firm's innovation performance.

This study provides new insights into entrepreneurship and innovation literatures. First, we discuss our findings on the associations between ECO and the action-based effectuation orientation dimensions. Specifically, we focus on how extant research empirically supports our unexpected findings regarding the role of affordable loss within the effectuation theory. We thereby suggest how to potentially refine the mindset and the action aspects of the effectuation orientation construct. Second, we dive deeper into the relationship between entrepreneurial actions and innovation. To put it more concretely, we introduce the perceived market-based innovation barriers and innovation performance as consequences of effectuation orientation, discussing in particular whether the creativist view of effectuation helps to address the research question of how to reduce innovation barriers. We also explain why the effects of effectual actions over perceived innovation barriers vary across effectual dimensions and categorize them into diminishing and revealing dimensions. Third, through borrowing effectuation orientation as a new lens through which to examine how firms overcome innovation barriers, we discuss how both mindset and action might direct future research towards more tangible mechanisms for increasing the chances of successful innovations.

The following section highlights the theoretical background and outlines the hypotheses. The third section then introduces the methodology, and the fourth section presents the findings. Finally, section five discusses the contribution of this work, while section six outlines underlying limitations and potential avenues for future research.

## 2. Theory and hypotheses

Innovation is considered an important element for a firm's financial performance (Audretsch, 1995; Schumpeter, 1934). However, to achieve superior innovation performance, firms face numerous barriers that hinder them from innovating or innovating successfully (Covin et al., 2007; D'Este et al., 2012). The nature of these barriers can vary in several ways. From a firm's perspective, they can be categorized into intrafirm and market-based innovation barriers (Piatier, 1984; Sandberg & Aarikka-Stenroos, 2014). Intrafirm innovation barriers focus on factors that fall within the scope of an organization, such as resources, qualifications and motivation. Market-based innovation barriers, on the other hand, are more market-driven and define the external market

environment that organizations are confronted with. Examples of such barriers are competitive rivalry on price or technology, and missing market demand (Lynn et al., 1996; Piatier, 1984). Such market-based barriers can be perceived as the given characteristics of a market environment to which organizations must adapt (Sandberg & Aarikka-Stenroos, 2014). Therefore, the question of what organizations can do to overcome these market-based innovation barriers is of interest to the research community.

Extant research has already identified some mechanisms for reducing innovation barriers, which can be broadly divided into mindsets and actions. Mindsets, for instance, can be represented by an organization's culture and its underlying values (Loewe & Dominiquini, 2006). Actions include obtaining additional resources as a means of reducing barriers. This entails both financial resources, such as public funding (Souto & Rodriguez, 2015), and non-financial resources, such as human capital (D'Este et al., 2014). Close cooperation with market stakeholders is discussed as another action that has the effect of reducing innovation barriers (Souto & Rodriguez, 2015).

Although both mindsets and actions are identified and discussed as mechanisms that reduce innovation barriers, few researchers have investigated their combined dynamics on innovation barriers. This is surprising because the combination of mindset and action could be the key for understanding more clearly how firms can overcome innovation barriers based on elements over which managers have control. Indeed, numerous scholars have argued how individual (Ajzen, 1991), group (Bridoux & Stoelhorst, 2016), and firm level (Prahalad & Bettis, 1986) mindsets interplay with firms' actions. For example, Tripsas and Gavetti (2000) argue that it is only by considering managerial beliefs that scholars can understand firms' behavior in relation to the external changing environments. Consequently, we aim to shed light on the linkage between firms' mindsets and actions and their combined effects on market-based innovation barriers.

To address this research aim, we borrow from the entrepreneurship literature. Entrepreneurship highlights the importance of innovation, while it is in itself considered as a recombination of resources that disrupts economies' equilibria (Schumpeter, 1934). Scholars often present entrepreneurial opportunities as a form of innovation (Autio, Kenney, Mustar, Siegel, & Wright, 2014; Shane & Venkataraman, 2000). For example, proactive entrepreneurial firms introduce innovative products and services ahead of the competition, thus creating a competitive advantage which enables the firm to charge a premium for those products and services (Rauch, Wiklund, Lumpkin, & Frese, 2009; Schumpeter, 1934; Shane & Venkataraman, 2000). Entrepreneurial concepts enabling the formation of such opportunities are therefore helpful in explaining how barriers to innovation can be overcome.

Within the entrepreneurship field, our attention lies with effectuation orientation. Originating from effectuation theory (Sarvasathy, 2001), effectuation orientation is defined as a strategic direction that exerts a controlling and shaping influence on an external environment in a co-creative manner (Werhahn et al., 2015). Such a perspective shifts the focus from predicting the unknown future towards obtaining control of the environment to co-create the future (Sarvasathy, 2001, 2008). This means that, instead of trying to predict the future, effectually oriented firms proactively shape and design their external environment (Dew, Read, Sarvasathy, & Wiltbank, 2015; Wiltbank, Dew, Read, & Sarvasathy, 2006).

Effectuation orientation comprises a firm's effectual mindsets and actions (Werhahn et al., 2015). First, the control aspect of effectuation orientation (i.e. ECO) captures the strategic mindset that enables stakeholders to shape external environments. Second, affordable loss orientation, contingency orientation, means

orientation and partnership orientation capture the action-based orientations that firms could take under an effectual control mindset. These five dimensions define effectuation orientation and measure firms' mindsets and actions.

We chose to borrow the effectuation orientation construct because of the closeness of the phenomenon and its underlying assumptions to literatures related to innovation barriers and performance (Okhuysen & Bonardi, 2011). First, since effectuation orientation originated from entrepreneurship literature and entrepreneurship has long been seen as a key source of innovation (Arrow, 2012; Autio et al., 2014; Barringer & Bluedorn, 1999; Schumpeter, 1934; Story et al., 2014), the conceptual distance between effectuation orientation and the extant ways to investigate mindsets and actions on innovation barriers is very small.

Second, we argue that the underlying assumptions of effectuation orientation are compatible with the literature on overcoming innovation barriers. This means that the degree to which the theories are brought together relies on similar explanatory properties. For instance, in line with the recent development of how firms overcome innovation barriers, effectuation orientation is composed of both mindset- and action-based elements (Szambelan & Jiang, 2019). It has also been argued that innovation barriers are represented by market perceptions resulting from organizations' actions (D'Este et al., 2012). Similarly, effectuation orientation is built around the premise of influencing the external environment through effectual actions (Dew, Read, Sarasvathy, & Wiltbank, 2008; Venkataraman et al., 2012). We next elaborate on each of these reasons as we develop our hypotheses.

The effectuation orientation construct captures both the entrepreneurial mindset and action dimensions (Szambelan & Jiang, 2019). The mindset dimension (i.e. ECO) is associated with the focus on controlling uncertain environments rather than predicting them. Organizations with such a mindset show action-based effectuation dimensions (Werhahn et al., 2015). Specifically, they acknowledge the uncontrollable contingencies and leverage them as valuable and subsequently controllable resources (Harmeling & Sarasvathy, 2013), instead of working against them. They focus on existing and available means to co-create the future with different stakeholders (Werhahn et al., 2015). Finally, they take decisions on the basis of how much they are willing to lose (Dew, Sarasvathy, Read, & Wiltbank, 2009).

Action-based dimensions are represented through an organization's affordable loss orientation, contingency orientation, means orientation and partnership orientation. These action-based effectuation dimensions ultimately reflect ways to implement the mindset-based effectuation orientation. This means that firms' employees take concrete actions, such as focusing on what they have, building strategic alliances, taking actions based on affordable loss, and embracing contingencies subsequent to effectual control mindset. Such a link between mindsets and actions is analog to previous findings at individual, group and firm levels (Ajzen, 1991; Bridoux & Stoelhorst, 2016; Prahalad & Bettis, 1986).

It has been argued that an effectual mindset is closely associated with effectuation actions (Szambelan & Jiang, 2019). This means that firms with a control mindset will conduct effectuation actions. In line with the initial findings of positive associations between control orientation and the action orientation dimensions (Werhahn et al., 2015), we hypothesize that:

**H1.** Effectual control orientation is positively associated with effectual affordable loss orientation (a), contingency orientation (b), means orientation (c), and partnership orientation (d)

In order to link effectuation orientation to market-based innovation barriers, it is important to understand that the effectuation literature considers entrepreneurship as a science of the artificial

(Sarasvathy, 2003; Venkataraman, Sarasvathy, Dew, & Forster, 2012). Effectuation theory argues that entrepreneurs do not solely understand certain phenomena as they are typically applied in the natural or social sciences but, rather, they understand how these phenomena can be designed and how new artifacts can be created. Based on ideas initially developed by Simon (1996), effectuation focuses on actions and interactions at the interface or boundary of internal (e.g. intrafirm) and external (e.g. external market) environments (Venkataraman et al., 2012). Focusing on these design-based actions and interactions allows entrepreneurs "to design worlds and not just to study them" (Venkataraman et al., 2012, p. 24).

This perspective is analog to the social construction theory (Berger & Luckmann, 1991), which posits that realities for individuals and societies are not given, but are constantly formed through social interactions. Based on a set of experiences and knowledge, reality can be perceived differently by different individuals. In effectuation theory, elements of social construction are apparent. Entrepreneurs carry out actions based on their existing means, knowledge, and personal networks, and co-create the future with selected stakeholders (Sarasvathy, 2001). According to effectuation theory, the future, represented by what to do (new goals) and how to do it (new means), is the outcome of an effectuation process (Dew et al., 2008; Sarasvathy and Dew, 2005; Wiltbank et al., 2006). This implies that the future is created by entrepreneurs themselves. Subsequently, effectuating entrepreneurs may perceive less uncertainty, as reality is constructed by the entrepreneurs and the related stakeholders.

Consequently, we also consider innovation barriers, not as given market characteristics, but as subjective perceptions resulting from a firm's actions and interactions. From the aforementioned constructivist perspective, innovation barriers can be interpreted as artifacts on the boundary between the internal firm and external market environment. Specifically, this article interprets them as subjective perceptions of the external environment (Barker, 2017). Defining innovation barriers as subjective perceptions also means that they can be altered with design-based approaches, such as effectuation (Venkataraman et al., 2012). Such a perspective would allow for a better identification of much-needed means that enable market-based innovation barriers to be reduced and enable firms to successfully innovate (Story et al., 2014). Specifically, effectuation orientation as a non-predictive firm orientation can be used as a means for overcoming perceived innovation barriers from a firm-level perspective. This is in line with previous suggestions, as made by Chesbrough (2010), for example, who argues in favor of effectuation as a means to overcome business model innovation barriers.

First, it is argued that the principle of affordable loss gives the applying firm a perception of control and reduces the level of disappointment if investments in new innovation fail. In such cases, the firm would arguably not blame the market for that failure, but move forward to the next idea as the loss was already accounted for from the outset (Dew et al., 2009). Second, a mindset that enables openness and the inclusion of contingencies creates a more positive perspective of unexpected market events (Harmeling & Sarasvathy, 2013). Therefore, their occurrence would not add to the negative perception of perceived market-based barriers. Third, focusing on available means reduces market-based innovation barriers, as dependency on other market players for unavailable but much-needed resources is reduced (Sarasvathy, 2001). Finally, a focus on co-creation through partnerships with other market stakeholders might reduce the perceived resistance of other market participants and hence the perception of market-based innovation barriers. Overall, this study hypothesizes that the four action-based effectuation orientation dimensions have a negative impact on the

perceived level of market-based innovation barriers.

**H2.** Effectual affordable loss orientation (a), contingency orientation (b), means orientation (c) and partnership orientation (d), are each negatively associated with the perceived level of market-based innovation barriers.

Innovation barriers are frequently discussed as forces hindering organizations from innovating or innovating successfully (Sandberg & Aarikka-Stenroos, 2014). Consequently, researchers have suggested that it is important to overcome such innovation barriers in order to pave the way towards successful innovation (Story et al., 2014). This study builds on these findings and links perceived innovation barriers to a firm's innovation performance. In sum, we argue that effectual actions reduce perceived innovation barriers, which ultimately, enable a firm to create new innovative products or services and introduce them successfully onto the market ahead of the competition (Aarikka-Stenroos & Lehtimäki, 2014). As introductions of new innovations are key to succeeding on the market (Covin & Miles, 1999; Covin & Slevin, 1989), hypothesis three argues that the level of perceived market-based innovation barriers is negatively associated with a firm's innovation performance:

**H3.** The perceived level of market-based innovation barriers is negatively associated with the firm's innovation performance.

### 3. Methodology

#### 3.1. Sample and data collection

To assess the aforementioned hypotheses, primary data from established German organizations was collected. Established organizations are believed to have a greater level of clearly defined processes and routines, which creates a certain level of organizational inertia, making them more resistant to external changes (Dew, Goldfarb, & Sarasvathy, 2006). This, on the other hand, would make the perception of market-based innovation barriers more prominent. In addition, established organizations are more likely to have already gone through a re-invention of their business model, or at least a significant update of their product or service portfolio. Such activities are necessary for acknowledging certain barriers (D'Este, Iammarino, Savona & Tunzelmann, 2012). We therefore consider established organizations as the right context for assessing the underlying research model of this study.

Based on a random Orbis database excerpt, we contacted management members from firms operating in industries which have been suggested for innovation research<sup>1</sup> by the OECD (2005). Respondents were asked to answer each item from a firm-level perspective. The survey was active between August and November 2016. After two reminders, 164 complete responses from 164 different firms were obtained. Seven of those had to be removed as the respondents' reported positions (e.g. advisors, assistants, unknown positions) were not within the relevant scope: i.e. owner, supervisory board member, management team member or shareholder. The remaining firms in the final sample were all founded in 2010 or earlier, as this study focuses on established companies (Cai, Guo, Fei, & Liu, 2016; Chandler, DeTienne, McKelvie, & Mumford, 2011).

Thus the final sample includes 157 firms aged between 6 and 339 years, with an average age of 52 years. The number of employees is between 1 and 150,000 full-time equivalents, with an average of 1251. Revenues range from €0.1 million to €27 billion with an average of €251 million. Respondents were 52 years old, on average, and mainly male (82%), which is in line with the German average (52 years, 71% male) (Statista, 2016a; 2016b). Finally, they represent the following positions: CEOs (56%), management members (33%), owners (8%), shareholders (2%) and supervisory board members (1%).

#### 3.2. Measurements

**Effectuation orientation.** The items for the five effectuation orientation dimensions were taken from the original study published by Werhahn et al. (2015). ECO, partnership orientation and contingency orientation were each measured through four items on a seven-point Likert scale, while effectual means orientation and affordable loss orientation each included three underlying items (see Appendix A). All items asked for the importance and willingness to enable a certain effectual behavior, based on the last three years. Exploratory factor analysis (EFA) resulted in a five-factor solution (based on Kaiser, 1974) accounting for 55% of the total variance. As the first item of the effectual partnership orientation cross-loaded onto the effectual affordable loss orientation, means orientation and contingency orientation factors, the item was removed for subsequent analyses. The final item selection also resulted in a five-factor solution accounting for 57% of the total variance, with each item loading onto its respective factor. Each factor accounts for 44%–64% of its items' total variance, with acceptable<sup>2</sup> Cronbach's alpha values between 0.69 and 0.87 and KMO values between 0.64 and 0.81. Finally, a confirmatory factor analysis (CFA) was conducted, which showed a good model fit<sup>3</sup> ( $\chi^2/df = 1.46$ ; goodness-of-fit index (GFI) = 0.91; adjusted GFI (AGFI) = 0.87; comparative fit index (CFI) = 0.96; standardized root mean square residual (SRMR) = 0.07; root mean square error of approximation (RMSEA) = 0.05).

**Perceived Innovation Barriers:** The market-based innovation barriers were taken from the Community Innovation Survey (CIS) (Eurostat, 2012). The survey provided 9 market-based innovation barrier items on a five-point Likert scale. The final set of market-based innovation barriers included price competition, product and brand competition, market dominance, innovation competition and market demand. As in previous research (D'Este, Iammarino, Savona, & Tunzelmann, 2012) these items were considered as a market-based factor. The EFA showed that the factor accounts for 34% of the total variance with a Cronbach's alpha of .71 and a KMO value of 0.68. Finally, the CFA also showed a good model fit ( $\chi^2/df = 1.53$ ; GFI = 0.99; AGFI = 0.94; CFI = 0.99; SRMR = 0.03; RMSEA = 0.06). These results included two co-varied error terms, in line with suggestions by Reddy (1992).

**Innovation Performance:** Innovation performance was measured using the scale from Im and Workman (2004) (see Appendix A). It was based on assessing the success of newly-developed products across three dimensions: market share, profitability and sales. To match the requirements of the underlying study, the items were moved from a single product level to a general performance assessment of newly-developed products and services within the past three years. Survey participants were therefore asked to assess

<sup>1</sup> In accordance with suggestions from the Oslo manual for innovation research (OECD, 2005) the following industry groups have been excluded: agriculture, hunting, forestry, fishing, education, health, social work, other community, social and personal service activities, activities of private households as employers, and extra-territorial organizations and bodies.

<sup>2</sup> Thresholds based on Loewenthal (2001) and Kaiser (1974) (Cronbach's alpha >.7; KMO > 0.6–0.7 – based on sample size and scale novelty).

<sup>3</sup> Thresholds based on Wheaton, Duane, and Summers (1977) and Byrne (2016) ( $\chi^2/df < 5$ ; GFI >0.9; AGFI >0.9; CFI >0.9–0.95; RMSEA <0.006).

their performance linked to newly-developed products and compare it to their biggest competitor. The responses were captured across three items with a seven-point Likert scale. All three measures had a high share of commonly explained variance (73%) with a high Cronbach's alpha of .89 and a KMO value of 0.75. Consequently, the following analyses refer to the average of the three items as innovation performance.

**Total Model.** In order to assess the discriminatory validity of the measures we used, an additional EFA was conducted, which included all factors. The seven-factor solution accounts for 56% of the total variance, with each item loading onto its respective factor loadings between 0.35 and 0.90 (see Table 1). In addition, the inter-factor correlations range from 0.00 to 0.39 (see Table 2), which is a further indicator of good discriminatory validity. Finally, the KMO value of 0.74 and the CFA results ( $\chi^2/df = 1.35$ ; GFI = 0.87; AGFI = 0.83; CFI = 0.94; SRMR = 0.06; RMSEA = 0.05 with  $p = .61$ ) show a good model fit.

### 3.3. Common method bias

As all obtained data was based on self-reported information from single respondents, several procedural remedies were followed, based on suggestions by Podsakoff, MacKenzie, Lee, and Podsakoff (2003). These measures included respondents' anonymity, no immediate proximity of the independent and dependent variable, different scale types, and no possibility to return to previous questionnaire sections for comparison or changes.

Furthermore, post-hoc statistical assessments were conducted to assess the potential impact of a common method variance (based on suggestions by Podsakoff et al., 2003). Each test was conducted twice, as the market-based innovation barrier factor might have different dynamics (e.g. through social desirability). First, a Harman's single factor test was conducted. Results show that a single factor accounts for only 21% of the total variance including market-based innovation barriers, and 26% excluding the barriers. Second, a common latent factor was created and its common variance

assessed. This assessment showed a common variance of 3% including the innovation barrier, and 22% excluding the barriers. All results are below the critical thresholds (Fuller, Simmering, Atinc, Atinc, & Babin, 2016), which is why a common method bias does not seem to be an issue in the collected data sample.

## 4. Analysis and results

### 4.1. Data analysis

First, the correlation matrix (see Table 2) indicates that ECO correlates positively with effectual contingency orientation ( $r = 0.35$ ,  $p < .001$ ), means orientation ( $r = 0.27$ ,  $p < .001$ ) and partnership orientation ( $r = 0.39$ ,  $p < .001$ ). However, there is no correlation between ECO and affordable loss orientation ( $r = 0.00$ , not significant). Second, there are no significant effects between market-based innovation barriers and the separate effectuation orientation dimensions. Third, market-based innovation barriers show a significant negative association with a firm's innovation performance ( $r = -0.32$ ,  $p < .001$ ). Finally, it is noteworthy that ECO indicates a significant positive correlation with innovation performance ( $r = 0.25$ ,  $p < .01$ ). This is a direct association, which is not part of the underlying research model. We elaborate on this association in the discussion section.

The overall research model (Fig. 1) was tested in a structural equation model with the help of SPSS AMOS 23 and the Maximum Likelihood technique.<sup>4</sup> The overall model shows a good fit with high fitness indices (GFI, AGFI, CFI) and low residual values (RMSEA): ( $\chi^2/df = 1.36$ ; GFI = 0.86; AGFI = 0.83; CFI = 0.94; SRMR = 0.08; RMSEA = 0.05 with  $p = .58$ ). All path coefficients are statistically significant, with the exception of the path between ECO and affordable loss orientation. These results include co-varied error-terms of the four effectuation orientation dimensions that are modeled on the same level as dependent variables and measured with items from the same scale (Preacher & Hayes, 2008; Reddy, 1992).

### 4.2. Results

**Hypothesis 1.** Hypotheses H1a–d predicted positive effects of ECO on the effectual action dimensions of effectuation orientation. The results from analyzing the structural equation model (Fig. 1) can be found in Table 3. There is a highly significant positive relationship between ECO and three of the effectual action orientation dimensions. These are: effectual contingency orientation ( $\beta = .31$ ,  $p < .001$ ), means orientation ( $\beta = .42$ ,  $p < .001$ ) and partnership orientation ( $\beta = .32$ ,  $p < .001$ ). The data therefore support hypotheses H1b, H1c and H1d. The path coefficient between ECO and affordable loss orientation, on the other hand, is slightly negative, but not significant ( $\beta = -.01$ , not significant). Therefore, the underlying data do not support hypothesis H1a.

**Hypothesis 2.** Hypotheses H2 a–d predicted a negative effect of the four effectuation orientation dimensions on the perceived level of market-based innovation barriers. In contrast to the non-significant correlations, Table 3 shows that all path coefficients are statistically significant. However, only the paths from effectual contingency orientation ( $\beta = -.26$ ,  $p < .05$ ) and means orientation ( $\beta = -.29$ ,  $p < .05$ ) are negative. The other two paths from effectual affordable loss orientation ( $\beta = .28$ ,  $p < .05$ ) and partnership

**Table 1**  
Discriminant validity test (EFA).

	Factor Loadings						
	1	2	3	4	5	6	7
Eff. Control Orientation	<b>.88</b>	-.02	-.07	.18	-.06	-.01	-.01
Eff. Control Orientation	<b>.73</b>	.08	.03	.16	-.18	-.05	-.09
Eff. Control Orientation	<b>.62</b>	-.10	.08	-.24	.28	.09	.02
Eff. Control Orientation	<b>.53</b>	-.01	.00	-.10	.06	.09	.19
Eff. Affordable Loss Orientation	-.05	<b>.77</b>	.00	-.01	.01	.01	.01
Eff. Affordable Loss Orientation	-.01	<b>.72</b>	.01	.11	-.03	.15	.00
Eff. Affordable Loss Orientation	.06	<b>.70</b>	.02	-.08	.05	-.03	.01
Eff. Contingency Orientation	.05	-.02	<b>.89</b>	-.02	-.04	.00	-.07
Eff. Contingency Orientation	.01	.10	<b>.86</b>	-.09	.01	-.04	-.03
Eff. Contingency Orientation	-.04	-.06	<b>.77</b>	.06	-.06	.07	.03
Eff. Contingency Orientation	-.01	.03	<b>.66</b>	.07	.07	-.09	.04
Eff. Means Orientation	.09	-.02	-.08	<b>.71</b>	.05	.00	-.04
Eff. Means Orientation	.04	-.02	.06	<b>.64</b>	.07	-.01	.04
Eff. Means Orientation	-.03	.08	.07	<b>.50</b>	.10	-.04	.05
Eff. Partnership Orientation	-.09	.08	-.10	.04	<b>.89</b>	.00	-.03
Eff. Partnership Orientation	-.05	-.16	.10	.16	<b>.70</b>	.12	.03
Eff. Partnership Orientation	.18	.12	.00	.02	<b>.57</b>	-.11	-.02
Market Innovation Barrier	-.07	-.01	.04	.11	-.07	<b>.77</b>	.08
Market Innovation Barrier	.00	.05	.04	-.09	-.02	<b>.70</b>	.10
Market Innovation Barrier	-.02	-.05	-.01	.05	.04	<b>.59</b>	-.19
Market Innovation Barrier	.13	.06	-.09	-.10	.02	<b>.39</b>	-.11
Market Innovation Barrier	.10	.10	-.05	-.05	.09	<b>.35</b>	-.05
Innovation Performance	.04	-.01	-.05	-.04	-.04	.02	<b>.90</b>
Innovation Performance	-.09	.05	-.02	.02	.11	-.09	<b>.82</b>
Innovation Performance	.11	-.03	.04	.05	-.10	.02	<b>.82</b>

Note: Principal Axis Factoring with Promax Rotation was used.

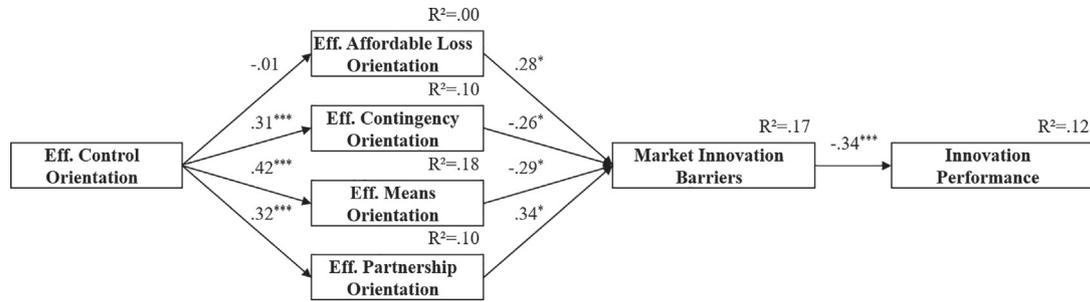
<sup>4</sup> Data analyses show no multicollinearity (VIF values between 1 and 1.3) and no non-linear relationships.

**Table 2**  
Descriptive statistics and correlation matrix.

		Expl. Var.	$\alpha$	KMO	Mean	S.D.	1	2	3	4	5	6	7
1	Eff. Control Orientation	49%	.78	.64	5.21	1.16	1						
2	Eff. Affordable Loss Orientation	54%	.77	.70	5.46	1.37	.00	1					
3	Eff. Contingency Orientation	64%	.87	.81	5.88	.94	.35***	.29***	1				
4	Eff. Means Orientation	44%	.69	.66	5.98	.93	.27***	.24**	.29***	1			
5	Eff. Partnership Orientation	56%	.77	.67	5.27	1.28	.39***	.16*	.37**	.34***	1		
6	Market Innovation Barriers	34%	.71	.68	2.43	.91	-.09	.10	-.09	-.09	.11	1	
7	Innovation Performance	73%	.89	.75	4.37	1.20	.25**	.03	.20*	.15 <sup>a</sup>	.13 <sup>a</sup>	-.32***	1

Note: Pearson Correlations are reported (two-tailed test).

<sup>a</sup>  $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .



**Fig. 1.** Proposed Research Model.

Note: Standardized estimates,  $\dagger p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

**Table 3**  
Standard estimates for each hypothesis.

Hypothesis		Std.Estimate	Std. Error	C.R.	p	Result
H1a: Eff. Control O.	→ Eff. Aff. Loss O.	-.01	.17	-.16	.869	Not Supported
H1b: Eff. Control O.	→ Eff. Contingency O.	.31	.13	3.45	.000***	Supported
H1c: Eff. Control O.	→ Eff. Means O.	.42	.08	3.60	.000***	Supported
H1d: Eff. Control O.	→ Eff. Partnership O.	.32	.15	3.32	.000***	Supported
H2a: Eff. Aff. Loss O.	→ Market Innovation Barriers	.28	.09	2.37	.018*	Not Supported
H2b: Eff. Contingency O.	→ Market Innovation Barriers	-.26	.12	-2.21	.027*	Supported
H2c: Eff. Means O.	→ Market Innovation Barriers	-.29	.30	-2.07	.039*	Supported
H2d: Eff. Partnership O.	→ Market Innovation Barriers	.34	.12	2.59	.010*	Not Supported
H3: Market Innovation Barriers	→ Innovation Performance	-.34	.10	-3.40	.000***	Supported

Note:  $\dagger p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , C.R.: Critical Ratio.

orientation ( $\beta = .34$ ,  $p < .05$ ), on the other hand, are positive. Consequently, the data support hypotheses H2a and H2c, whereas they do not support hypotheses H2b and H2d. Such division of effectuation dimensions in connection with innovation-related consequences is surprisingly in line with previous empirical findings, which show positive effects on innovation performance by focusing on means and leveraged contingencies, and non-significant effects through partnerships and affordable loss (Roach, Ryman, & Makani, 2016).

**Hypothesis 3.** The third and last hypothesis refers to the negative association of market-based innovation barriers and a firm's innovation performance. The path coefficient shows a negative relationship between the two constructs ( $\beta = -.34$ ,  $p < .001$ ). Consequently, the data supports Hypothesis 3, which means that reduced market-based innovation barriers are associated with a higher innovation performance by the firm.

Finally, a bootstrapping analysis was conducted to assess the total effect of effectual control orientation on a firm's innovation performance (including a direct effect of ECO on innovation performance). Based on 5000 samples and a 95% bias corrected confidence interval, the total effect is positive and significant ( $\beta = 0.22$ ,  $p < .05$ ).

**5. Discussion**

This study assesses the relationship between effectuation orientation and perceived levels of market-based innovation barriers and innovation performance. Based on a sample of 157 established firms, results show that effectuation orientation, composed of both mindsets and actions, is highly relevant for studying market-based innovation barriers. The study further emphasizes variations in how effectual actions are related to perceived market-based innovation barriers, which in turn influence innovation performance. The findings offer insights into the effectuation and innovation literature, and they hold promising implications for practitioners.

First, our findings align with and further inform effectuation theory. Building on recent suggestions to conceptualize the effectual control mindset as the driver for effectual action orientation dimensions (Werhahn et al., 2015), our study introduces a more nuanced perspective on the interrelation of the five effectuation dimensions. While our results show a positive relationship between ECO and three of the four effectual action dimensions (i.e. effectual contingency orientation, means orientation and partnership orientation), we find that affordable loss orientation shows no significant relationship to ECO, and has an opposite effect on

market-based innovation barriers compared with the other three dimensions.

This result is different from what we hypothesized. However, although unexpected, it somehow supports and aligns with numerous extant research studies in effectuation. For example, Werhahn et al. (2015) find that affordable loss has the weakest link to ECO compared with other dimensions. Similarly, Read, Song, and Smit (2009) find no significant effect of affordable loss on venture performance. Moreover, Jiang and Rüling (2019) claim that affordable loss is not present in some of the effectuation episodes identified during new venture creation processes. These repeated examples of empirical evidence, questioning the role of affordable loss, capture our imagination so that we think differently about the role of affordable loss within the effectuation theory. Such a perspective may help to further refine effectuation constructs.

A plausible way to explain this unexpected finding might be that the mindset aspect of effectuation orientation is captured not only by effectual control, but also by items embracing affordable loss. This conjecture is suggested by scholars in the recent development of effectuation literature (Szambelan & Jiang, 2019). More concretely, this means that the affordable loss dimension could be incorporated into the effectual control mindset dimension. For example, future scholars could complement the effectual control mindset by adding items like “we attempt to control our downside or to control uncertainty by investing no more than we are willing and able to lose”. Embracing affordable loss as an additional aspect of an effectual mindset may further refine the effectuation orientation construct.

Second, the two-fold relationship between four action-based effectuation orientation dimensions and perceived innovation allows us to dive deeper into the relationship between entrepreneurship and innovation in a more established corporate context. Specifically, this study leverages effectuation as a concept focusing on the design of external environments (Venkataraman et al., 2012; Welter, Mauer, & Wuebker, 2016). Analog to the social construction theory (Berger & Luckmann, 1991), we argue that reality, such as a firm’s external environment, for example, can be constructed. Therefore, we hypothesized that firms that follow the action-based effectuation orientation dimensions perceive fewer market-based innovation barriers. Our results show that this hypothesis is supported for effectual contingency orientation and means orientation, but not for affordable loss and partnership orientations.

One explanation for the skewed results might lie in the dynamics underlying established organizations. Here, managers often need to report to shareholders, who do not want to jeopardize existing profitability and/or established decision-making routines based on business plans and expected returns. The need for a certain level of predictions and business plans to satisfy relevant stakeholder requirements could create less favorable conditions under which managers implement affordable loss. Following this line of logic, established firms might have a lower likelihood of accepting an affordable loss orientation. Consequently, negative reactions from the market and a firm’s shareholders might lead to increases in the perceived level of market-based innovation barriers. Similarly, effectual partnership orientation and the associated attempt to include other stakeholders to pursue a certain vision might also lead to the realization that these stakeholders do not want to be involved in such endeavors. Specifically, it means that only by attempting to establish partnerships do firms realize that not all stakeholders are always willing to pursue such partnerships. Therefore, the effectual partnership orientation might lead to a higher perception of market-based innovation barriers. In a way, these two effectual dimensions reveal market-based innovation barriers, which otherwise would not previously have been perceived as being so high.

These differentiated dynamics of effectuation orientation dimensions on innovation barriers seem to be in line with previous findings in the innovation barrier literature. Specifically, D’Este et al. (2012) identify deterring innovation barriers (barriers that are overcome through innovation activities) and revealing innovation barriers (barriers that appear through innovation activities). Consequently, we argue that effectuation dimensions can also be split into diminishing (i.e. effectual contingency orientation and means orientation) and revealing dimensions (i.e. effectual affordable loss orientation and partnership orientation). In other words, by following some effectual dimensions, the level of perceived market-based innovation barriers can be overcome (i.e. diminishing dimensions), whereas the application of other effectual dimensions reveals new innovation barriers (i.e. revealing dimensions). This is important to understand as the perceived level of innovation barriers is negatively associated with a firm’s innovation performance. An active attempt to reduce perceived innovation barriers could therefore have a direct effect on a firm’s innovation performance compared to that of its competitors.

This study also contributes to the innovation literature. By borrowing the effectuation orientation construct (Werhahn et al., 2015), we gain deeper knowledge of how mindsets and actions are both important to overcome market-based innovation barriers (Story et al., 2014). By interpreting the level of perceived market-based innovation barriers as socially constructed perceptions, effectuation orientation is introduced as a concept allowing for the alteration of those perceptions (Sarasvathy, 2003; Venkataraman et al., 2012). This does not mean that the barriers do not exist or can be removed completely. However, it is argued that certain deterring barriers might fall below a certain level and enable firms to innovate successfully (based on D’Este et al., 2012). Also, we identify different effects of effectuation dimensions on innovation barriers. This adds to the innovation literature as it suggests that the source of innovation barriers might create an interesting new research stream. This stream could incorporate constructivist elements (e.g. Berger & Luckmann, 1991; Venkataraman et al., 2012; Welter et al., 2016) and enable a more thorough assessment of how perceived barriers could be overcome. Future research could further elaborate on the distinct roles of firms’ mindsets and actions. The data indicate a direct, significant correlation between ECO and a firm’s innovation performance. The question therefore arises, if the same actions produce different effects on innovation barriers and performance, are they built on a different underlying mindset?

Finally, the study’s findings have several implications for practitioners. First, the study interprets market-based innovation barriers as socially constructed perceptions. Having such a conceptualization of innovation barriers in mind, it shows practitioners that they might be able to reduce and overcome certain innovation barriers. This is in contrast to seeing innovation barriers as given and uncontrollable obstacles, which might prevent potential innovation activities from being pursued. Second, effectuation orientation is introduced as a novel firm-level orientation driven by a mindset towards controlling the environment and co-creating its future. Building on this ECO, the implementation of the effectual action orientation dimensions shows promising effects on the perceived market-based innovation barriers. In particular, focusing on given means rather than inaccessible means or unavailable forecasts could yield more realistic solution spaces. When looking at the characteristics underlying effectual means orientation, firms could focus more on initiatives for which they have the relevant capabilities or the greatest motivation. This would at the same time help them to leverage existing knowledge and expertise in the best possible way. In addition, an openness to contingencies and their association with opportunities (Harmeling

& Sarasvathy, 2013) helps in perceiving the market more positively and thus in reducing perceived market-based innovation barriers. Specifically, this effectual dimension suggests that firms establish a firm mindset that allows them to perceive new information or setbacks as opportunities. They could then exploit contingencies effectively. Additionally, the unsupported hypotheses also provide insights for practitioners. Both dimensions, affordable loss orientation and partnership orientation, are still mindsets worth pursuing, as other publications have already shown (e.g. Brettel, Mauer, Engelen, & Küpper, 2012; Read et al., 2009). However, practitioners should be more aware of their possible consequences on perceived market-based innovation barriers. If these barriers are perceived as higher than before, managers might understand where such an increase originates from and could act accordingly. Ultimately, this study shows that lowering perceived innovation barriers might be worth pursuing, as lowered perceived market-based innovation barriers are positively associated with a firm's innovation performance. This highlights the importance of understanding the perceived levels of innovation barriers, what they originate from, and how they can be overcome.

## 6. Limitations and future research

Several limitations need to be considered when interpreting this study's results. First, this study is based on a cross-sectional research design. The causal linkages are therefore based on theoretical considerations. We need further validation to claim such linkages. The potential causal chain, discussed in this study, is based on the belief that a firm's mindset is the guiding principle for subsequent actions. These actions, ultimately, are claimed to have an effect on perceived innovation barriers. However, it could also be the case that the perceived innovation barriers are influenced by the mindset and that these levels of innovation barriers define the subsequent course of action. Future research could build on this study, and use longitudinal and mixed method studies to shed more light on the causal relationships between mindsets and actions at firm level.

Second, certain cultural and contextual characteristics of the German sample might affect the results and findings. Our study only collects data on German firms' subjective perceptions of market-based innovation barriers. Such perceptions could vary across different countries and potentially across industries. It will

therefore be interesting if future studies could look at how relationships between effectuation, perceived market-based innovation barriers, and firm performance play out in new contexts. Such new contexts could be represented by firms from a different cultural background, or firms created by refugee entrepreneurs. For example, we could better understand the relationships between affordable loss dimensions with entrepreneurial actions and perceived innovation barriers. In doing so, future study will then help us expand the boundary conditions of effectuation theory and further refine the antecedents of innovation performance.

Third, all underlying analyses were based on data obtained from single respondents in each company. In the future, we therefore suggest a multilevel research design across different organizational hierarchies. Specifically, the question arises as to how perceived firm-wide mindsets differ across the organization. If they do differ, it would be worth investigating what effect this has on a firm's actions. These actions could still be defined by top management or they could actually differ across the organization with potentially different effects on a firm's performance.

## 7. Conclusion

This study introduces effectuation orientation into the innovation barrier literature as a novel firm orientation. Specifically, it argues in favor of effectuation's shaping effects on perceived market-based innovation barriers, which are negatively associated with a firm's innovation performance. Specifically, it discusses ECO as a firm's underlying effectual mindset, a mindset that triggers the remaining action-based effectuation orientation dimensions. These can be further divided into two categories. First, effectual contingency orientation and means orientation can be described as diminishing effectual dimensions, which reduce perceived market-based innovation barriers. Effectual affordable loss and partnership orientation, on the other hand, can be labeled as revealing effectual dimensions, which increase the level of perceived market-based innovation barriers. The findings are based on 157 responses from established organizations in Germany and contribute to the effectuation and innovation literature.

## Appendix A

Variables	Items	Questions
		Please indicate the extent to which you agree or disagree with the following statements with regards to the last three years: As the managers of this company, we consider it important that both we ourselves and our employees ...
<b>Effectual Control Orientation</b>	Item 1	... attempt to shape the environment we operate in.
	Item 2	... attempt to proactively design our environment with others.
	Item 3	... attempt to co-create future markets.
	Item 4	... attempt to influence trends.
<b>Effectual Affordable Loss Orientation</b>	Item 1	... only invest what we can afford to lose.
	Item 2	... try to limit the potential loss of initiatives to an acceptable degree.
	Item 3	... only invest if the loss of the investment would not ruin the company.
<b>Effectual Contingency Orientation</b>	Item 1	... regard surprises to be new opportunities.
	Item 2	... exploit contingencies as effectively as possible.
	Item 3	... use new information as resources.
	Item 4	... use setbacks as new opportunities.
<b>Effectual Means Orientation</b>	Item 1	... use our personal knowledge and experience in the best possible way.
	Item 2	... pursue those initiatives for which we have great motivation and interest.
	Item 3	... pursue those initiatives for which we personally have the relevant competencies.
Effectual Partnership Orientation	Item 1*	... aim to ensure that gains and risks in existing partnerships are shared fairly.
	Item 2	... approach potential partners very early on in order to jointly co-create the future.
	Item 3	... enter into business relationships where the partners are willing to commit (e.g. invest time) from the onset.
	Item 4	... perceive new actors on the market as potential partners.

(continued)

Variables	Items	Questions
<b>Market-based Innovation Barriers</b>		Innovation barriers: How important were the following factors as obstacles to meeting your enterprise's goals over the last three years?
	Item 1	Strong price competition
	Item 2	Strong competition on product quality, reputation or brand
	Item 3	Dominant market share held by competitors
	Item 4	Innovations by competitors
<b>Innovation Performance</b>	Item 5	Lack of demand
		Please evaluate your firm's success in developing new products or services in comparison to your biggest competitors over the last 3 years:
	Item 1	Sales development of newly developed products/services.
	Item 2	Profitability of newly developed products/services.
	Item 3	Market share of newly developed products/services.

\* Item was removed from analyses as it cross-loaded onto effectual contingency and affordable loss orientation.

## References

- Aarikka-Stenroos, L., & Lehtimäki, T. (2014). Commercializing a radical innovation: Probing the way to the market. *Industrial Marketing Management*, 43, 1372–1384.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Arrow, K. J. (2012). Economic welfare and the allocation of resources for invention. In H. Landstrom, & F. T. Lohrke (Eds.), *Elgar research collection. International library of entrepreneurship: Vol 23. Intellectual roots of entrepreneurship research* (pp. 667–683). Cheltenham, U.K. and Northampton, Mass.: Elgar.
- Audretsch, D. B. (1995). *Innovation and industry evolution*. Cambridge, Mass., London: MIT Press.
- Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy*, 43, 1097–1108.
- Barker, T. (2017). Socially constructed barriers to innovation. <http://www.business2community.com/business-innovation/socially-constructed-barriers-innovation-01776718#kPY5lcZp9RHXBfGv.97> Accessed 04.09.2017.
- Barringer, B. R., & Bluedorn, C. (1999). The relationship between corporate entrepreneurship and strategic management. *Strategic Management Journal*, 20(5), 421–444.
- Berger, P. L., & Luckmann, T. (1991). *The social construction of reality: A treatise in the sociology of knowledge* (Vol 10). Penguin UK.
- Brettel, M., Mauer, R., Engelen, A., & Küpper, D. (2012). Corporate effectuation: Entrepreneurial action and its impact on R&D project performance. *Journal of Business Venturing*, 27, 167–184.
- Bridoux, F., & Stoelhorst, J. W. (2016). Stakeholder relationships and social welfare: A behavioral theory of contributions to joint value creation. *Academy of Management Review*, 41, 229–251.
- Byrne, B. M. (2016). Structural equation modeling with AMOS: Basic concepts, applications, and programming. In *Multivariate applications series* (2<sup>nd</sup> ed.). New York: Routledge.
- Cai, L., Guo, R., Fei, Y., & Liu, Z. (2016). Effectuation, exploratory learning and new venture performance: Evidence from China. *Journal of Small Business Management*, 55, 388–403.
- Chandler, G. N., DeTienne, D. R., McKelvie, A., & Mumford, T. V. (2011). Causation and effectuation processes: A validation study. *Journal of Business Venturing*, 26, 375–390.
- Chesbrough, H. (2010). Business model innovation: Opportunities and barriers. *Long Range Planning*, 43, 354–363.
- Cornelissen, J., & Durand, R. (2014). Moving forward: Developing theoretical contributions in management studies. *Journal of Management Studies*, 51, 995–1022.
- Covin, J. O., & Miles, M. P. (1999). Corporate entrepreneurship and the pursuit of competitive advantage. *Entrepreneurship: Theory and Practice*, 23(3), 47–63.
- Covin, J. G., & Miles, M. P. (2007). Strategic use of corporate venturing. *Entrepreneurship: Theory and Practice*, 31, 183–207.
- Covin, J. G., & Slevin, D. P. (1989). Strategic management of small firms in hostile and benign environments. *Strategic Management Journal*, 10, 75–87.
- D'Este, P., Rentocchini, F., & Vega-Jurado, J. (2014). The role of human capital in lowering the barriers to engaging in innovation: Evidence from the Spanish innovation survey. *Industry & Innovation*, 21, 1–19.
- Dew, N., Goldfarb, B., & Sarasvathy, S. (2006). Optimal inertia: When organizations should fail. In *Ecology and strategy* (pp. 73–99). Bingley: Emerald (MCB UP).
- Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2008). Outlines of a behavioral theory of the entrepreneurial firm. *Journal of Economic Behavior & Organization*, 66, 37–59.
- Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2015). Entrepreneurial expertise and the use of control. *Journal of Business Venturing Insights*, 4, 30–37.
- Dew, N., Sarasvathy, S. D., Read, S., & Wiltbank, R. (2009). Affordable loss: Behavioral economic aspects of the plunge decision. *Strategic Entrepreneurship Journal*, 3, 105–126.
- D'Este, P., Iammarino, S., Savona, M., & Tunzelmann, N. von (2012). What hampers innovation?: Revealed barriers versus deterring barriers. *Research Policy*, 41, 482–488.
- Eurostat. (2012). The community innovation survey 2012. <http://ec.europa.eu/eurostat/documents/203647/203701/Harmonised+survey+questionnaire+2012/164dfdfd-7f97-4b98-b7b5-80d4e32e73ee> Accessed 09.04.2016.
- Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). Common methods variance detection in business research. *Journal of Business Research*, 69, 3192–3198.
- Harmeling, S. S., & Sarasvathy, S. D. (2013). When contingency is a resource: Educating entrepreneurs in the balkans, the bronx, and beyond. *Entrepreneurship: Theory and Practice*, 37, 713–744.
- Im, S., & Workman, J. P., Jr. (2004). Market orientation, creativity, and new product performance in high-technology firms. *Journal of Marketing*, 68, 114–132.
- Ireland, D. R., & Webb, J. W. (2007). Strategic entrepreneurship: Creating competitive advantage through streams of innovation. *Business Horizons*, 50, 49–59.
- Jiang, Y., & Rüling, C.-C. (2019). Opening the black box of effectuation processes: Characteristics and dominant types. *Entrepreneurship: Theory and Practice*, 43, 1042258717744204.
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39, 31–36.
- Kelley, D. (2009). Adaptation and organizational connectedness in corporate radical innovation programs\*. *Journal of Product Innovation Management*, 26, 487–501.
- Loewe, P., & Dominiquini, J. (2006). Overcoming the barriers to effective innovation. *Strategy & Leadership*, 34, 24–31.
- Loewenthal, K. (2001). *An introduction to psychological tests and scales*. Hove, UK: Psychology press.
- Lynn, G. S., Morone, J. G., & Paulson, A. S. (1996). Marketing and discontinuous innovation: The probe and learn process. *California Management Review*, 38, 8–37.
- O'Connor, G. C., & DeMartino, R. (2006). Organizing for radical innovation: An exploratory study of the structural aspects of RI management systems in large established firms. *Journal of Product Innovation Management*, 23, 475–497.
- OECD. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data*. Paris: OECD Publishing, 3<sup>rd</sup>.
- Okhuysen, G., & Bonardi, J.-P. (2011). The challenges of building theory by combining lenses. *Academy of Management Review*, 36, 6–11.
- Piatier, A. (1984). *Barriers to innovation: A study carried out for the commission of the European communities, directorate-general information market and innovation* (1st ed.). London: Pinter.
- Pinder, C. C., & Bourgeois, V. W. (1982). Controlling tropes in administrative science. *Administrative Science Quarterly*, 27, 641.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879.
- Prahalad, C. K., & Bettis, R. A. (1986). The dominant logic: A new linkage between diversity and performance. *Strategic Management Journal*, 7, 485–501.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891.
- Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. *Entrepreneurship: Theory and Practice*, 33, 761–787.
- Read, S., Song, M., & Smit, W. (2009). A meta-analytic review of effectuation and venture performance. *Journal of Business Venturing*, 24, 573–587.
- Reddy, S. K. (1992). Effects of ignoring correlated measurement error in structural equation models. *Educational and Psychological Measurement*, 52, 549–570.
- Riffai, M. M. A., Grant, K., & Edgar, D. (2012). Big TAM in Oman: Exploring the promise of on-line banking, its adoption by customers and the challenges of banking in Oman. *International Journal of Information Management*, 32, 239–250.
- Roach, D. C., Ryman, J. A., & Makani, J. C. (2016). Effectuation, innovation and performance in SMEs: An empirical study. *European Journal of Innovation Management*, 19, 214–238.
- Sandberg, B., & Aarikka-Stenroos, L. (2014). What makes it so difficult?: A systematic review on barriers to radical innovation. *Industrial Marketing*

- Management*, 43, 1293–1305.
- Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26, 243–263.
- Sarasvathy, S. D. (2003). Entrepreneurship as a science of the artificial. *Journal of Economic Psychology*, 24, 203–220.
- Sarasvathy, S. D. (2008). *Effectuation: Elements of entrepreneurial expertise*. Cheltenham: Edward Elgar Publishing.
- Sarasvathy, S. D., & Dew, N. (2005). New market creation through transformation. *Journal of evolutionary economics*, 15(5), 533–565.
- Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, Mass: Harvard U.P.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25, 217–226.
- Sharma, P., & Chrisman, J. J. (1999). Toward a reconciliation of the definitional issues in the field of corporate entrepreneurship. *Entrepreneurship: Theory and Practice*, 23, 11–27.
- Simon, H. A. (1996). *The sciences of the artificial* (3<sup>rd</sup> ed.). Cambridge Mass: MIT Press.
- Souto, J. E., & Rodriguez, A. (2015). The problems of environmentally involved firms: Innovation obstacles and essential issues in the achievement of environmental innovation. *Journal of Cleaner Production*, 101, 49–58.
- Statista. (2016a). Durchschnittsalter von Führungskräften in Deutschland nach Bundesländern 2016. <https://de.statista.com/statistik/daten/studie/182536/umfrage/durchschnittsalter-von-geschaeftsfuehrern-nach-bundeslaendern-und-geschlecht/> Accessed 26.06.2017.
- Statista. (2016b). Pressemitteilungen - männer doppelt so häufig in führungspositionen wie frauen - statistisches bundesamt (destatis). [https://www.destatis.de/DE/PresseService/Presse/Pressemitteilungen/2014/05/PD14\\_189\\_133.html](https://www.destatis.de/DE/PresseService/Presse/Pressemitteilungen/2014/05/PD14_189_133.html) Accessed 26.06.2017.
- Story, V. M., Daniels, K., Zolkiewski, J., & Dainty, A. R. J. (2014). The barriers and consequences of radical innovations: Introduction to the issue. *Industrial Marketing Management*, 43, 1271–1277.
- Szambelan, S. M., & Jiang, Y. D. (2019). Effectual control orientation and innovation performance: Clarifying implications in the corporate context. *Small Business Economics*, 33, 455.
- Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal*, 21, 1147–1161.
- Venkataraman, S., Sarasvathy, S. D., Dew, N., & Forster, W. R. (2012). Reflections on the 2010 AMR decade award: Whither the promise? Moving forward with entrepreneurship as a science of the artificial. *Academy of Management Review*, 37, 21–33.
- Welter, C., Mauer, R., & Wuebker, R. J. (2016). Bridging behavioral models and theoretical concepts: Effectuation and bricolage in the opportunity creation framework. *Strategic Entrepreneurship Journal*, 10, 5–20.
- Werhahn, D., Mauer, R., Flatten, T. C., & Brettel, M. (2015). Validating effectual orientation as strategic direction in the corporate context. *European Management Journal*, 33, 305–313.
- Wheaton, B., Duane, A., & Summers, G. (1977). Assessing reliability and stability in panel models. *Sociological Methodology*, 8, 84–136.
- Wiltbank, R., Dew, N., Read, S., & Sarasvathy, S. D. (2006). What to do next? The case for non-predictive strategy. *Strategic Management Journal*, 27, 981–998.
- Wood, S. C., & Brown, G. S. (1998). Commercializing nascent technology: The case of laser diodes at Sony. *Journal of Product Innovation Management*, 15, 167–183.