The impact of innovation orientation on the role of absorptive capacity

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[Abstract] The external sourcing of knowledge plays an important role for nurturing an organization's innovativeness. In order to harness this resource, organizations need absorptive capacity (ACAP), i.e. the know-how to identify, assimilate, transform, and exploit external knowledge. Higher levels of ACAP will increase the performance of converting external knowledge to economic ends. But is this equally true for different forms of innovation orientation? The exploration of new knowledge and the deepening of familiar knowledge require different approaches and management regimes. We explore whether the impact of ACAP is different for exploration and exploitation. Preliminary results by Partial least square show that potential absorptive capacity positively moderates the effect of innovation orientation on innovation performance. Further data will allow testing for the abovementioned difference.

1. Introduction

The sourcing of knowledge outside the organization plays an important role for nurturing its innovativeness. In order to profit from external knowledge sources, organizations need absorptive capacity (Cohen & Levintal 1990). It is defined as the "*ability to recognize the value of new information, assimilate it, and apply it to commercial ends"* (Cohen & Levinthal 1990, p. 128). Zahra & George (2002) refined the absorptive capacity construct into two dimensions: *Potential absorptive capacity* refers to the firm's ability to acquire and assimilate external knowledge, and *realized absorptive capacity* captures a firm's ability to transform and exploit the externally sourced knowledge.

Several studies have shown that organizations with higher levels of absorptive capacity will perform better in converting external knowledge to economic ends (Fosfuri & Tribó 2009; Rothaermel & Alexandre 2009). In this vein, many scholars argue that absorptive capacity is a critical antecedent of for innovation performance and ultimately for financial and overall company performance (Kostopoulos et al., 2011). Other researchers, however, emphasize the importance of additional organizational antecedents as well as environmental characteristics for the impact of absorptive capacity on the firm performance (e.g. Jansen et al., 2005). We argue that an organization's innovation orientation is one such organizational factor.

March (1991) has put forward the argument that the exploration of new knowledge and the deepening of familiar knowledge require different approaches and management regimes for organizational learning. He relates exploration to "*things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*" and exploitation to "*refinement, choice, production, efficiency, selection, implementation, execution.*" (ibid, p. 71).

In a similar manner, scholars like Jansen et al. (2006) argued about the positive effect of exploration and exploitation on the innovation performance. However, he also mentioned the major role of organizational and environmental factors in this context. We will investigate one such factor in more detail.

Considering the knowledge intake from external sources as mapped on the exploratory-exploitative dimension, a distinction in terms of distance to the internal knowledge base is useful (see e.g. Sidhu et al. 2010). More precisely, we draw on the concept of (optimal) cognitive distance (Wuyts et al. 2005), i.e., *the degree to which the knowledge or skills of actors involved in mutual learning are different*. It is evident that exploratory search aims for integrating knowledge with higher cognitive distance as compared to exploitative search. As Nooteboom et al. (2007) point out, high levels of absorptive capacity are needed in order to efficiently 'learn' from knowledge domains with higher cognitive distance. Hence, we propose that nurturing absorptive capacity is more important for companies which try to harness external knowledge and simultaneously pursue an exploratory innovation strategy by asking: Does the role of absorptive capacity differ for exploratory and exploitative innovation strategies?

All in all, this paper is organized as follows. First, the relevant literature relating to exploratory innovation, exploitative innovation and absorptive capacity. Second, hypotheses development and model based on the literature review. Subsequently, the research method, analysis and results are described. Finally, the results including conclusion, limitations, and areas to be addressed in future research are discussed.

2. Literature and Hypotheses

As described before external knowledge can foster the value creation and innovativeness of the firms (Cohen and Levinthal 1990, George and Zahra 2002). Such benefits can, for instance, stem from new recombinations of existing and new knowledge (Teece 1986, Harrisson, et al. 2001). Depending on the type of integrated knowledge, the value and impact of such recombination is very different.

2.1 External search for exploration and exploitation purposes

The purposes of exploring and exploiting are fundamentally different, e.g. in terms of search strategies, newness of the desired knowledge and technology, organizational context of knowledge assimilation and transformation, and the resulting enhancement of the existing knowledge base (March 1991, Nooteboom et al. 2007, Rothaermel & Alexandre 2009).

With respect to external search multiple strategies and knowledge sources exist. External knowledge, as Flatten et al. (2011), suggested can be acquired from sources like personal networks, consultants, seminars, internet, database, professional journals, academic publications, market research, regulations, and laws. Furthermore, search can be characterized considering breadth and depth of

search (Dahlander & Gann 2010).

Based on the differences between exploration and exploitation we propose that organizations which focus on exploration will install a relatively broad scope of search. They will engage in learning with many and diverse actors. Moreover, exploration aims for distant knowledge. Hence, it requires to continuously unlock new knowledge sources. As a result, the set of knowledge sources will frequently change. Exploitation orientation, on the other hand, requires a focused scope of search for relatively for close knowledge. Hence we propose that organizations focusing on exploitation will include fewer and less diverse actors, and aim for longer relationships with them (see Figure 1).

Hyp.1: Exploratory innovation orientation is positively related to the breadth of external search.

Hyp.2: Exploitative innovation orientation is negatively related to the breadth of external search.

2.2 Exploratory and exploitative innovation, external search, and absorptive capacity

Absorptive capacity (ACAP) has been described as consisting of four distinct organizational capabilities, i.e., the capability to *identify, assimilate, transform,* and *exploit* the external knowledge sources (George & Zahra 2002, Flatten et al. 2011). Furthermore, George & Zahra (2002) distinguish between potential and realized ACAP. Potential absorptive capacity (PACAP) is seen as the outward oriented facet, directed to *identify* and *assimilate* valuable external knowledge. On the other hand, realized absorptive capacity (RACAP), its inward oriented facet, is concerned with the capacity to internally *transform* and *exploit* previously assimilated knowledge.

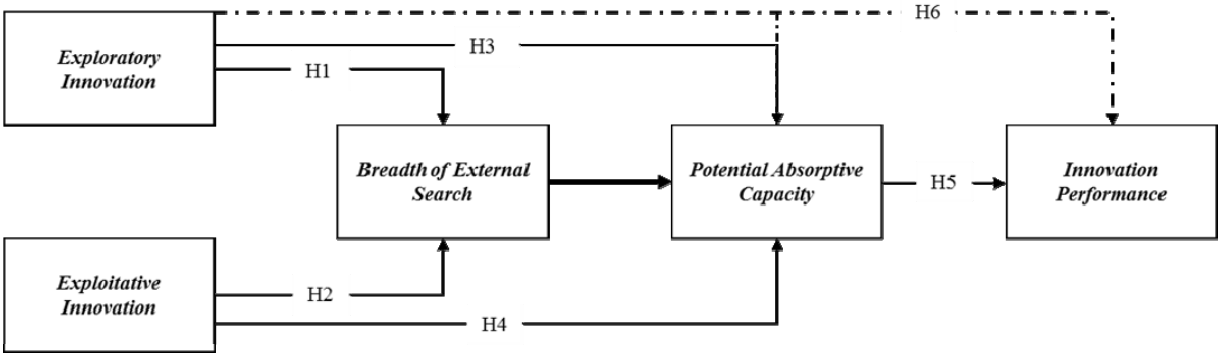

Figure 1- the Research Model

Altogether, in the present study we focus on PACAP as it is closer to questions of knowledge identification and access as well as to the impact of strategic intent, i.e., innovation orientation, on search behavior. Nooteboom et al. (2007) provide first evidence that higher degrees of ACAP are needed in order to profit from cognitively distant knowledge. In a similar way, we propose innovation orientation and the scope of external search to impact PACAP:

Hyp.3: Exploratory innovation orientation has a strong positive relation to PACAP.

Hyp.4: Exploitative innovation orientation has a weak positive relation to PACAP.

Hyp.5: Breadth of external search is positively related to PACAP.

2.3 Absorptive capacity and performance

Scholars unanimously agree that ACAP positively influences innovation performance, and ultimately firm performance (e.g. Todorova & Durisin 2007, George & Zahra 2002). More precisely, Kostopoulos et al. (2011) show that ACAP partially mediates the impact of external knowledge on innovation and financial performance. We take this further in proposing that the type of innovation orientation has an effect on the importance of PACAP.

When organizations aim to make use of cognitively distant external knowledge, high levels of ACAP are needed (Nooteboom et al. 2007). Likewise, frequent accesses to new knowledge will help a firm to stimulate its potential absorptive capacity (PACAP) (Lane et al. 2007, George and Zahra 2002; Abecassis, et al., 2008; Fosfuri and Tribó 2008). Hence, we propose innovation orientation as contingency for the impact of PACAP.

Hyp. 6: The more an organization is orientated towards exploratory innovation, the higher will be the impact of PACAP on innovation performance.

We will test this hypothesis by estimating the same SEM for companies with different innovation orientations. Subsequently we will analyze the impact of PACAP on performance for significant differences. Taken together, the proposed hypotheses form the research model depicted in Figure 1.

3. Method

3.1 Setting and Data Collection

This paper reports on a study that is conducted as part of a larger research project on innovation management. Survey-based data is used as empirical grounding of this study. We conducted an online survey with diversified German firms (n=43). The sample comprises multiple industries, i.e. 25% information and communication; 14% manufacturing; 8% health and social care; 7% logistics services; 6% financial services; 5% education; 3% property and housing; 3% construction; 3% energy supply; 3% car dealer and repair; 17% other professional, scientific and technical services; 6% provision of other services. 14% of the companies operate on B2C-markets, 66% on B2B-markets, and the rest in both.

The issued survey consists of multiple innovation related scales, including *innovation performance, company performance, absorptive capacity, breadth of external search, exploratory* and *exploitative innovation orientation*. All scales were taken from highly published academic studies to ensure a high quality of measurement.

3.2 Measurements and validation of constructs

Endogenous variables

Innovation performance was measured according to Jansen (2006) by asking the following questions: 1) which percentage of turnover can be contributed to products and/or services which over the last three years are clearly improved on a number of aspects and 2) which percentage of turnover can be contributed to products and/or services which over the last three years are entirely new for our organization. The questioned were answered based on a 7 points Likert scale.

Furthermore, following Zahra & George (2002) and Flatten et al. (2011), *potential absorptive capacity* was measured through acquisition and assimilation focus of organizations for the external knowledge sources. More concretely, we used the Likert-scaled items proposed by Flatten et al. (2011) to ascertain the strategies to acquire and assimilate the external knowledge.

Moreover, based on Flatten et al. (2011), *breadth of external search* was measured in a formative way through the firms' means to the external knowledge sources. Respondents indicated their firm's external knowledge sources in forms of personal networks, consultants, seminars, internet, database, professional journals, academic publications, market research, regulations, and laws concerning environment / technique / health / security. Therefore, by considering the same weight for each item, we furthered on the examinations.

Exogenous variables

Exploratory innovation and *exploitative innovation* were measured following Jansen et al. (2006), Benner & Tushman, (2003), and Lewin et al. (1999). *Exploratory innovation* was examined through firms' perspective on the acceptance of demands beyond the existing industries, frequency of operating in new markets and utilization of the new channels for the new products. *Exploitative innovation* was measured thorough companies' orientation for improving the internal efficiencies and firms' approach to increase economies of scales (Uzzi and Lancaster, 2003; March, 1991).

Validation of constructs

In order to monitor the reliability of extracted data, we measured the Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) values. In particular, regarding the internal consistency of each construct,

CR criterion was measured to compliment the deficiencies of Cronbach's alpha value (Chin 1998). Likewise, furthering on convergent validity and following Fornell & Larcker (1981), the AVE values were measured.

Altogether, table 1 presents the assessment reliabilities of all the reflective variables with consideration of different criteria.

Table 1-Multiple assessments of reliability on construct level

Reflective measurements	CR	AVE	Cronbach's α
Construct: EXPR	*0.72*	*0.48*	*0.50*
Construct: EXPL	*0.85*	*0.66*	*0.79*
Construct: PACAP	*0.93*	*0.74*	*0.91*
Construct: INNO-PER	*0.91*	*0.83*	*0.85*

CR: composite reliability; AVE: average variance extracted; Cronbach's alpha

According to Urbach & Ahlemann (2010) and Fornell & Larcker (1981), values that exceed the

minimum level of 0.5 and significance level of 0.7 are considered reliable. Values above the 0.95 level indicate a potential problem with common method bias. Hence, all the presented variables in the table 1 can be considered reliable.

4. Analyses and Results

Given the exploratory nature of the research model, Partial Least Squares approach (PLS) (Chin 1998) has been chosen as the method of analysis.

Following Urbach & Ahlemann (2010), and in order to confirm that the constructs are not theoretically related to each other, the square roots of the variables' AVE as a discriminant validity value were tested. Comparing the resulted values (table 2) on the diagonal with the values in the same column shows that Fornell and Larcker (1981) criterion is fulfilled. Thus, for all variables in the analysis it can be stated that discriminant validity is well given.

Continuing the model assessment, the values for R^2 and predictive relevance Q^2 were measured. According to Chin (1998), the R^2 values with approx. 0.67 are substantial, values around 0.333 are average, and values of 0.19 and lower are weak. Accordingly, based on the number of observations and the presented results in table 3, potential absorptive capacity has a substantial value, and breadth of external search together with innovation performance have medium R^2 values.

Table 2-Discriminant validity using Fornell-Larcker criterion

	BSE	*EXPR*	*EXPL*	*PACAP*	*INNO-PER*
BES (formative)	*1*				
EXPR	*0.34*	*0.62*			
EXPL	*0.05*	*0.25*	*0.61*		
PACAP	*-0.41*	*0.73*	*0.27*	*0.86*	
INNO-PER	*-0.03*	*0.31*	*0.03*	*0.06*	*0.932*

on the diagonal the square roots for each of the constructs AVE (average extracted variance) are calculated for comparison

In a similar manner and following blindfolding method (Hair, Ringle and Sarstedt 2013), the Q^2 values should be positive to confirm the predictive relevance. More precisely, the values of 0.02, 0.15, and 0.35 relatively indicate that an exogenous construct has a small, medium, and large predictive relevance for a selected endogenous construct. Thus, *potential absorptive capacity* (0.36) is assumed as high predictively relevant construct.

Table 3- Results for R^2 and Q^2 of structural model

Endogenous constructs	R^2 Value	Q^2 Value
Potential Absorptive Capacity	*0.35*	*0.36*
Breadth of External Search	*0.12*	*0.16*
Innovation Performance	*0.15*	*0.14*

For hypotheses testing, we followed Chin (1998) using blindfolding (Hair, Ringle and Sarstedt 2013). Consequently, table 4 indicates the results of path coefficients (ß) together with the significances (t-values). Considering the number of observations and according to Urbach and Ahlemann (2010), the path coefficients over 0.1 with t-values of over 2.042 can be considered as significant on the 95% confidence level.

Following Cohen (1988) and in order to observe the impact of each construct on the hypotheses and model, the f^2 and q^2 effect size values were calculated.

Regarding the first hypothesis, the findings from table 4 show a significant positive relation between the exploratory innovation and the breadth of external search (ß = 0,37, t = 1.96). Based on the positive values of f^2 and q^2, it can be argued that this hypothesis holds true.

The results for hypothesis 2 are not significant. Hence, no relation between exploitative innovation orientation and breadth of external search can be stated.

Based on the results from hypothesis 3, a significant positive relation between exploratory innovation and PACAP can be highlighted (ß = 0.75, t = 7.77). In particular, it underlines the interdependency of exploration and company's PACAP, that is, the ability to acquire and assimilate external knowledge.

In like manner with hypothesis 2, the results for hypothesis 4 are not significant based on our data.

Last, the results of hypothesis 5 show a significant positive relation between breadth of external search and PACAP (ß = 0.45, t = 2.63).

Table 4-Summary of final results for every hypothesized effect in the structural model

#	Hypothesized Effect	ß	t	f²	q²
H1	*Exploratory innovation orientation is positively related to the breadth of external search.*	0.37	1.96+	0.16	0.01
H2	*Exploitative innovation orientation is negatively related to the breadth of external search.*	-0.17	0.56	0.03	0.85
H3	*Exploratory innovation orientation has a strong positive relation to PACAP.*	0.75	7.77**	1 17	1.01
H4	*Exploitative innovation orientation has a weak positive relation to PACAP.*	0.03	0.18	0.002	-0.2
H5	*Breadth of external search is positively related to PACAP*	0.45	2.63*	0.25	0.08
H6	*The more an organization is orientated towards exploratory innovation, the higher will be the impact of PACAP on innovation performance.*	0.29	1.69+	0.03	0.92

*ß = path coefficient estimates; t = t-value (significance level + for t > 1.697 and p-value < 0.10, * for t >2.042 and p-value < 0.05 and ** for t > 2.750 and p-value < 0.01); f²= effect size; q²= predictive relevance (Stone-Geisser-Criterion)*

Considering the exploratory innovation together with PACAP, the results from hypothesis 6 reveal the positive impact of interaction between these two constructs on the innovation performance (ß = 0.29, t = 1.69). The extracted f² and q² values from hypothesis 6 also confirm the significance of the positive interaction of exploratory innovation and PACAP on the firm´s innovation performance. Thereupon, it can be argued that the more an organization is orientated towards exploratory innovation, the higher will be the impact of PACAP on innovation performance.

5. Discussion

Previous studies on managerial orientations and absorptive capacity show the necessity to consider two main types of factors, i.e., environmental related and organizational related (Jansen et al., 2005, 2006). We have examined one organizational factor, namely innovation orientation, on the role of potential absorptive capacity.

Above all, the presented study aims for refining the understanding of PACAP. It advances scientific knowledge about the effectivity of PACAP in the contexts of exploratory and exploitative innovation orientation. Drawing on the concept of optimal cognitive distance (e.g. Wuyts et al. 2005), we have developed and tested the impact of PACAP for both innovation strategies.

Previous studies such as Rothaermel & Alexander (2009) and Cohen & Levinthal (1990) proxy ACAP by R&D expenditures (p. 767), a global indicator for the willingness to invest in ACAP. With respect to such works, our study represents an advancement as it employs a direct measure of PACAP.

Our results deepen this knowledge by showing that the outward oriented facet of ACAP (PACAP, measured following Flatten et al., 2011) is an effective moderator for exploration, but not for exploitation. Organizations which follow an exploration strategy will, therefore, profit more from investing in identification and assimilation skills then organizations which focus on exploitation.

Our findings reveal the positive effect of the exploratory innovation and PACAP interaction on the innovation performance. It holds true that companies with open scope of learning which reaches beyond their existing industry, firstly engage in broader search activities and show higher levels of PACAP. Second, these knowledge absorption settings can enable them to reach high levels of innovation performance.

Accordingly, our data shows that an exploitative innovation orientation is not related to external search, nor to PACAP and subsequent gains in innovation performance.

For RnD managers, our study provides recommendations on how to manage the external search and assimilation of distant and close knowledge. The intent to integrate and harness distant new knowledge from external sources requires building up high levels of potential absorptive capacity. To reach this end, managers should rely on many and diverse knowledge sources and establish shorter relations to them in order to maintain a high(er) cognitive distance between the actors' knowledge bases. Others have proposed broadcast rearch (Jeppesen & Lakhani 2010) as incorporated in open innovation tools like contests and communities to be a fruitful management approach.

The intent to integrate and harness close new knowledge requires a different management approach. Based on our model, we propose long

term relations to fewer external knowledge sources to be more effective. That is, managers should focus on building and maintaining learning networks (e.g. Powell 1998, Wijk et al. 2008) with other organizations of the domain.

5. Conclusion

This research aims at obtaining a better understanding of management factors which influence the application and success of open innovation activities. More precisely, the study focused on the firms' innovation orientation and the relevant knowledge absorption theories. Innovation orientation was dimensioned in two: exploratory and exploitative innovation (March, 1991; Jansen et al., 2006). Likewise, to have a clear view on the adaption of external knowledge sources, absorptive capacity (AC) was referenced (Zahra & George, 2002; Flatten et al., 2011). Furthermore, by considering the firm performance, a research model was developed (figure 1).

In order to test the abovementioned model, an existing questionnaire from HHL Leipzig Graduate School of Management was utilized and spread among the diversified German companies. Subsequently, an appropriate quantitative method based on the number of observations and the model's predictive nature was deployed.

The exhibited results in the section 3.2 show that the interaction between potential absorptive capacity and exploratory innovation has a positive effect of the firm innovation performance. To put it another way, the more managers are oriented on the exploratory innovation, the more knowledge access they get. At a same time, higher focuses on the exploration together with the firm abilities on PACAP will cause higher levels of innovation performance.

6. Limitations and Future Research

The present paper reports on an ongoing research project. Therefore, the empirical basis for the study needs to be broadened in the future. Second, our analysis focuses on PACAP and its particular link to exploration. One open question is whether exploitation efforts can be strengthened by focused search and long lasting partnerships with knowledge sources. Third, in a similar way, realized absorptive capacity (RACAP) needs to be better understood. It is open inhowfar RACAP is related to particular innovation orientations.

Fourth, by considering the ambidextrous nature of exploratory and exploitative innovation, firms may pursue different strategies in different environments and market contexts such as analyzers, prospectors, reactors and defenders (Conant, Mokwa and Varadarajan 1990).

Acknowledgement

We would like to thank the companies who provided data and participated in our empirical study.

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