# THE ROLE OF INDIVIDUALS FOR ABSORPTIVE CAPACITY IN INDUSTRIAL R&D

DAVID RÖNNBERG SJÖDIN
Luleå University of Technology, Entrepreneurship and Innovation, Sweden
david.ronnberg.sjodin@ltu.se (Corresponding)

JOHAN FRISHAMMAR
Luleå University of Technology, Entrepreneurship and Innovation, Sweden
johan.frishammar@ltu.se



## ABSTRACT

Absorptive capacity, conceptualized as identifying, selecting and integrating useful knowledge from the environment into commercial applications, is a key capability for any organization, team or individual. While prior literature has made substantial advancement into the performance consequences of absorptive capacity, few studies have addressed what actually constitutes ACAP on a micro level. Thus, there exists a significant gap within the literature concerning the micro-foundations of ACAP. This study attempts to fill this gap by means of multiple case studies within the R&D organizations of three multinational engineering firms. Our findings show how the micro foundations of absorptive capacity are rooted in individual skills, roles and relationships.

**Key words:** Absorptive capacity, micro-foundations, knowledge transfer

## INTRODUCTION

Identifying, selecting and integrating useful knowledge from the environment into concrete applications is a key capability for any organization, team or individual (Volberda et al, 2010). In this sense Cohen and Levinthal (1990) made as seminal contribution by introducing the concept of Absorptive Capacity (ACAP) to describe this organizational capability. Essentially, the absorptive capacity of a firm depends on the ability of its individual members to recognize valuable external knowledge in the environment, integrate it together with existing organizational capabilities and stimulate its utilization within the organization. Since the original conception of the concept ACAP has received widespread recognition and has spread across multiple fields of research (e.g. Todorova & Durisin, 2007; Zahra & George, 2002; Lane et al, 2006, Jansens et al, 2005; Cohen & Levinthal, 1990; Volberda et al, 2010).

However, the literature on ACAP is not without its critique. For example, Lane, Koka and Pathak (2006) warned that the concept of ACAP has become reified (i.e. the concept is taken for granted and researchers fail to specify the underlying assumptions) with devastating effects on the validity of studies that use the ACAP concept. Moreover, as of now most attention has been focused on the tangible outcomes of ACAP such as relationships towards new product success or sales growth (e.g. Wales et al, 2014). In contrast, organizational design and individual level antecedents have been relatively neglected in the ACAP literature. Thus, the antecedents of ACAP from the actions and interfaces of individual, organizational and even inter-organizational actors remain blurred (Volberda et al 2010; Lewin et al, 2011).

In addition, ACAP has generally been perceived as a ‘passive’ outcome based on crude measures such as R&D investments or patents (Cohen & Levinthal, 1990). Recently, however, a renewed

debate on its 'proactive' dimensions has emerged. In particular, Volberda, Foss and Lyles (2010) has highlighted the need of developing further understanding of the micro foundations of ACAP such as processes, roles and individual level antecedents. In this vein, we argue that we still lack a clear understanding of the impact of individual roles on organizations absorptive capacity. Our current view of individual roles in R&D is related to technological gatekeepers (Allen, 1977), or knowledge transformers (Harada, 2003) and do not offer a comprehensive depiction of how different individuals recognize, transform and champion external knowledge to ensure its absorption by the wider organization. Therefore, further studies of what roles individuals assume in the process of absorbing knowledge into the organization, and how these diverse roles and activities shape their ability to generate innovations for their organizations is required.

Therefore, this study focuses on the micro foundations of ACAP by investigating the antecedents of ACAP in the form of individual roles and responsibilities within organizations. We do so by using an inductive approach based on interviews with R&D professionals within three multinational engineering firms. By highlighting individual roles in identifying, assimilating and utilizing external knowledge, we are able to identify critical micro antecedents to ACAP and contribute to further unpacking of the black box of ACAP and guide further development of academic understanding as well as efficacious managerial practices.

In the following sections we will start by outlining the theoretical background followed by a chapter describing the methods employed for data collection and analysis. Next, we summarize our findings and show how absorptive capacity manifest at the organizational, team and individual levels. Finally, we discuss our findings and provide implications for theoretical development within the ACAP literature as well as practice and suggest directions for further research.

**THEORETICAL BACKGROUND**

In their seminal contribution Cohen and Levinthal (1990:128) define ACAP as the organisation's ability to '*recognize the value of new information, assimilate it, and apply it to commercial ends'*. Cohen and Levinthal (1990) further stated that ACAP is largely influenced by the organization's level of prior related knowledge. Accordingly, lacking prior related knowledge, an organization will not have the capability to learn from the new information gleaned from the external environment. In particular, having individuals in possession of diverse and varied knowledge within the organization enhance the chance that the incoming knowledge will relate to the existing knowledge base within the organization. In its lowest level, Cohen and Levinthal (1990) view prior related knowledge to include basic abilities or even sometimes just shared language. However, it can also relate to being in touch with current scientific or technological trends in a given field.

However various alternative definitions of ACAP have been provided by different researchers since the 1990s. For example, using Cohen and Levinthal's (1990) original definition, Zahra and George (2002, p. 193) defined absorptive capacity as *'a set of organizational routines and strategic processes by which firms acquire, assimilate, transform, and exploit knowledge for the purpose of value creation with an emphasis on dynamic capabilities geared toward strategic change and flexibility wherein firms create and exploit new knowledge by transforming acquired knowledge'*. Zahra and George (2002) furthermore made a distinction between potential and realized absorptive capacity. Potential absorptive capacity indicates a firm receptiveness to understanding and evaluating external knowledge. In contrast, realized absorptive capacity reflects a firm's ability to derive new

insights from the recombination and implementation of existing and newly acquired knowledge (Zahra and George, 2002).

ACAP has been considered as a multilevel construct that can be found at different levels like the national, industry, inter-organisational, organisational, unit and individual levels (Lane et al. 2006; Cohen & Levinthal 1990; Volberda et al, 2010). Indeed, in the original Cohen and Levinthal (1990) paper individuals were considered as a keystone to firm level absorptive capacities which corresponds with the general notion that organisational knowledge ultimately exist in the members of the organisation (Felin & Hesterly 2007). Yet recent, research has largely ignored the individual dimension of ACAP.

Since knowledge within organisations is possessed by individuals, it is critical that firms develop structures necessary for sharing this knowledge to enable the utilisation thereof within the firm. Prior research has suggested a number of factors influencing a firm's or business unit's ability to access and integrate external knowledge. For example, different aspects of coordination capabilities such as boundary-spanning roles, cross-functional interfaces, participation in decision making, and job rotation have been described as antecedents to ACAP (Eisenhardt and Martin, 2000, Henderson and Cockburn, 1994, Van Den Bosch et al., 1999 and Knoppen et al., 2011). Similarly, different aspects of socialization capabilities such as connectedness and socialization tactics (Adler and Kwon, 2002, Nahapiet and Ghoshal, 1998) have also been proposed as potential antecedents for ACAP. However, few studies have addressed such issues in depth and through qualitative methods (Volberda et al, 2010) which underlines the need for additional knowledge in this domain.

**METHODS**

To gain a deeper understanding of the routines, roles and practices underlying firm level knowledge transfer, the present study adopts an inductive exploratory case study strategy (Eisenhardt, 1989). Creating an understanding of this phenomenon is a multifaceted and context-bound pursuit, and qualitative case studies can offer detailed insights and uncover substantial complexity that reflect both organizational and individual processes (Grönlund et al, 2010; Eisenhardt & Graebner, 2007)). This approach is especially appropriate given our limited knowledge of such knowledge transfer routines. We conducted multiple case studies of R&D units within three multinational engineering companies in Sweden. The motivation for selecting these firms where their reputation as being technologically advanced and innovative and their similar characteristics in terms of supplying complex products towards industrial customers as well as their multinational operations.

*Table 1. Information about the studied firms*

| Firm | Main product | Number of employees | Turnover |
|---|---|---|---|
| **Titan** | *Construction and mining equipment* | 40,150 | USD 11,3 billion |
| **Lion** | *Commercial vehicles* | 38,600 | USD 10,6 billion |
| **Eagle** | *Vehicle systems* | 88,200 | USD 28,5 billion |

Data for the study were collected primarily through individual, in-depth, face-to-face interviews. Given the present purpose, interviews were deemed an appropriate strategy since they can provide insightful information and can be focused directly on research topics. In total we conducted 28 interviews on site at our three case study firms as well as six additional companies which took part in an exploratory pre-study. The respondents held different roles within R&D such as project managers,

department managers and technology transfer specialists. The interviews ranged from one to three hours, with an average of 2 hours. The data collection was undertaken during three main phases from September 2013 to December 2014 as displayed in figure 1.

Secondary data were also collected during the data collection period in the form of document studies. We reviewed both company reports and project documents, thus enabling empirical triangulation with the interviews. By using interview data and secondary data from numerous sources, we have attempted to establish evidence triangulation. To increase reliability, enhance transparency, and the possibility for replication, a case study protocol was constructed along with a case study database. This included case study notes, documents, and analysis.

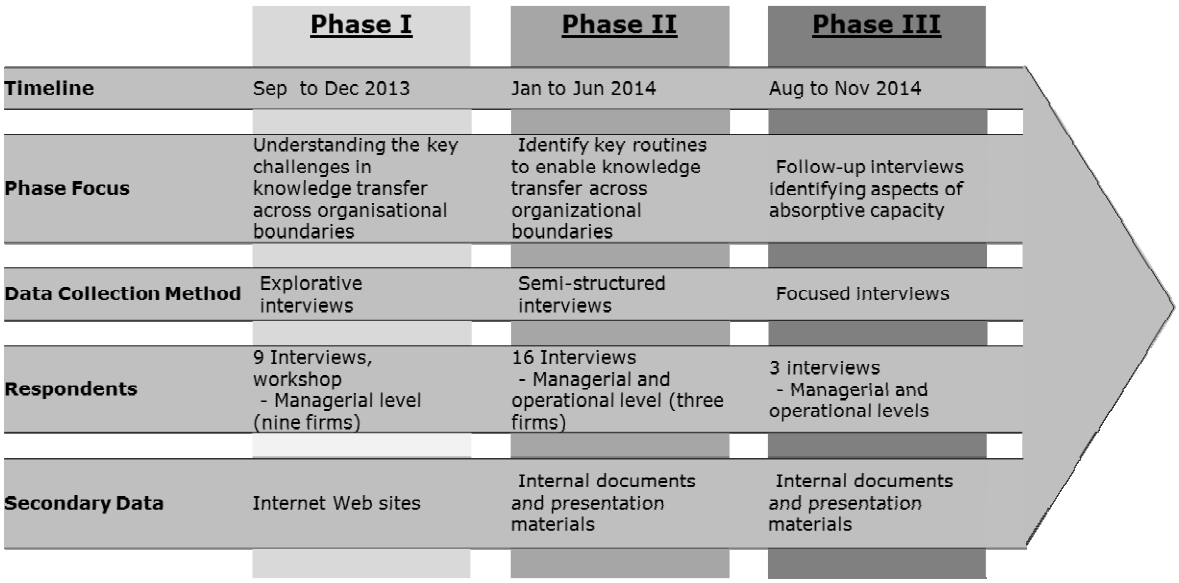


*Figure 1. The different phases of the data collection*

The data analysis was based on the constant comparison technique (Strauss & Corbin, 1990; Parida, Wincent, & Kohtamäki, 2013), which provides ways to identify patterns in a large and complex dataset. Moreover, it also provides the method to find links within analytical themes effectively and accurately. Through a series of iterations and comparisons, it is possible to identify themes and overarching dimensions to develop an empirically grounded framework. In the following section, we will describe the sequence of actions taken during our data analysis.

The first step in our data analysis focused on in-depth analysis of raw data (e.g., interview transcripts). Following Nag, Corley, and Gioia (2007) we re-read each interview several times, each time marking interesting phrases and passages that were similar to and different from each other, to discern similarities and differences among respondents. Thus, by coding common words, phrases, terms, or labels respondents mentioned, we were able to identify first-order categories. These categories express the views of the respondents in their own words. In the present study, the codes mainly refer to the interplay among antecedents of absorptive capacity at the organizational and individual levels.

The second step of the analysis built on the first-order categories being analysed further to discover links and patterns within the categories. This iterative process led to the formation of second-order dimensions that are theoretically distinct concepts composed by combining first-order categories.

Our analysis resulted in identifying 7 second-order dimensions, which were at a higher abstraction level compared to the first-order categories. These dimensions relate to different specific activities or routines that facilitate ACAP. Following validity claims in the literature, the dimensions were refined further based on the interplay between data from interviews and secondary sources such as internal documents, presentations, newspapers, and so on (Kumar, Stern, & Anderson, 1993). The final step involved generating overarching dimensions representing a higher level of abstraction in the coding. These third-order themes built on the first- and second-order themes and present theoretically and practically grounded categorizations. In the present study, we identified three third-order overarching dimensions related to the different dimensions of Cohen and Levinthals (1990) framework that are derived from investigating the studied R&D units. In total, these steps enabled us to develop an empirically driven theoretical framework that links various phenomena emerging in the data analysis. Figure 2 shows the data structure that constitute our main findings related to key activities for recognizing, integrating and exploiting external knowledge.

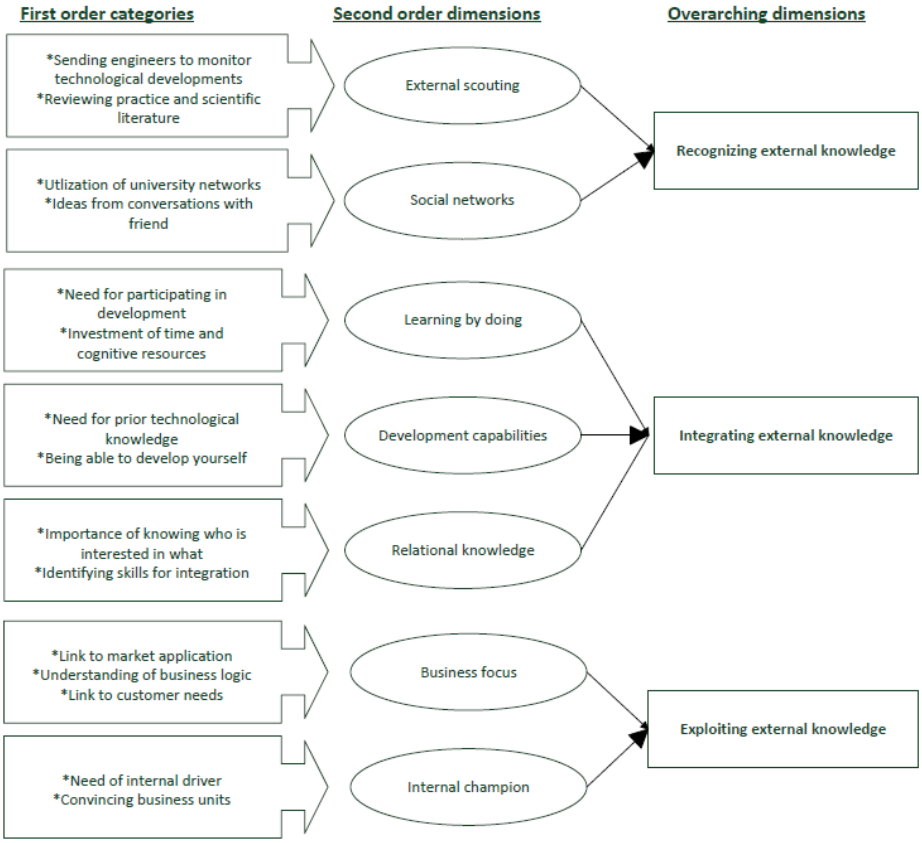


*Figure 2. Data structure*

**EMPIRICAL FINDINGS**

In our investigation of the routines, roles and practices underlying firm level knowledge transfer a key finding was the importance of organizational and individual roles in relation to the different dimensions of absorptive capacity. In particular several of our respondents discussed the importance of dedicated roles responsible for certain technology areas as key mechanisms for absorbing external knowledge.

*We have about seven or eight core areas here and each core area consists of one or more persons who have the primary task of analyzing trends within their field. This includes attending trade shows; reading articles and be sure to keep up with the area. It is these people who then' sifts through' what is of value for us and above all tie up contacts in areas where we have our core. (R&D Manager, Eagle)*

*For us it is very much up to individual responsibility to keep abreast of what is happening. We have a career ladder for engineers at R&D with four different levels based on knowledge. If you reach level four, then you have reached such a level that you are internationally known. You are in those environments, you have strong capabilities but also a network of contacts. This is a very important way to ensure that we are continuously developing our capabilities to keep up. We refer to these individuals as technical managers and they are responsible for following areas we need to have coverage on. It is a form of technical sensing, to have this global contact network so to speak and to understand what is going on. This is how you get the new technological capabilities in to the company. This is how we work, to give everyone a more individual responsibility for absorbing new knowledge is much stronger than someone to sit and point out that: 'Olle now you go to Germany, I heard there was something going on there'. It should self driven and self selected what to monitor and what to be involved in. (Senior R&D Manager, Lion)*

*It is a formal position when you reach Technical Manager you work in a certain area, you have a role. It is a form of employment just to absorb these developments. I think that is a strong way to bring it forward. It is actually relevant within all levels, both technical development and research areas. (Senior R&D Manager, Lion)*

*We have a number of specialists who are sitting on their areas of expertise in the technology group whose task is precisely to have and support with this knowledge so that uncertainty does not become too large. These people do not develop software per se, but they support the development of functionality in the rest of the organization. So that's a very important factor to have a level of internal knowledge which is sufficient. (R&D Manager, Eagle)*

*I think it is key that we give time and resources to these real future visionaries who see opportunities, that likes to explore new technologies. It does not need to be fixed but still allow them to follow, scout, and scan the technological environment. (R&D Manager, Lion).*

Our respondents could thus clearly identify the importance of having roles connected to absorbing new knowledge. In addition, we found several activities and practices that were helpful for recognizing, integrating and exploiting external knowledge which are described in the following sections.

### 4.1 Key activities for recognizing external knowledge

A key activity for identifying and recognizing external knowledge is engaging in *external scouting*. This could include participation at conferences or trade shows as well as monitoring the news within industry and academic journals. In addition, scanning of surrounding industries showed to be an important practice in our studied firms.

*We send relatively new designers into the field and to conferences and fairs to crawl under [vehicles] and take photos. It is about studying competitors and suppliers on the component*

*and vehicle try to understand their technologies from afar but also discussing with them. To read trade magazines is also important (R&D Manager, Eagle).*

*So, for better or worse it is often the individual engineer that 'sniffs-out' the right technologies and tries to contact other networks and partners. While doing so from a strictly technological and knowledge-hungry need… For example, when we go to trade shows, exhibitions, seminars, etc, I believe it is our technological engineers, those who work with these capabilities and these technology development needs, it is their mission to be out and try identifying what is available and what are the trends and what is possible and what is impossible and what is research. (R&D Manager, Eagle).*

*In my research team I have some engineers who work for me in identifying new technologies by reading articles and reviewing articles from conferences and stuff (R&D Manager, Lion).*

*We invest dedicated funds to send people to trade shows, seminars etc. So that they can develop their basic knowledge and we give them opportunities to be out. They create themselves a network by being out. I think this is actually our strengths when it comes to finding and acquiring new technologies which enables us to integrate them internally (Head of R&D, Eagle).*

In addition, several respondents mentioned the importance of *social networks* of-work that could be utilized for finding relevant knowledge. Participation in different organizations, committees, and trade groups was also mentioned by several respondents as a way of identifying relevant knowledge.

*There may be things that are difficult for the organization at that level. Often the solution is to call a friend, branch out, is there anyone who knows someone who knows someone who works in anything that is related to this. How was it at university does the faculty have someone which is good at this which we may call. (R&D Manager, Eagle).*

*We know that a lot of knowledge is shared of work, for example having a beer with friends. Our engineers are typically personally interested in new technologies and often pick up ideas for new developments by interacting with old classmates in other firms and getting a sense of what they are working on (R&D Manager, Eagle).*

**4.2 Key activities for integrating external knowledge**

To effectively integrate and assimilate external knowledge our respondents highlighted the importance of *active participation*, which captures the need to be actively involved in the development or reconfiguration of an external technology in order to be able to integrate it within the internal operations. This could be described as a form of learning by doing.

*It's like this, we cannot buy knowledge. If someone has done something and we buy the results and take them in that is one thing, but what we're looking for is really to build capabilities and you do that through individual involvement. It is then a very important aspect that we are involved and contribute sufficiently to absorb this. It's not that the knowledge we have is stored in some documents, but it is active in those who work here and the skills and capabilities which are developed by participation. (Senior R&D Manager, Lion)*

*Being involved in a research project such as with a university where you just jot down your signature and send in some money and maybe at some point join a meeting gives very little. I*

*do not think I have ever found this to be profitable for us in terms of gaining new knowledge. I think you have to spend your own time to really bring home knowledge. You really need to have a research that is truly interested in the project and will have time to really assimilate this knowledge. Preferably the project should be done jointly then it becomes absolutely the best. (R&D Manager, Titan)*

*Where we are in we want to be all in or not at all. In a project where we are one tenth, twentieth or hundredth of consortium, we will not have any opportunity to assimilate what others learn. But it must be a gear-up ratio that allows us to understand what the other party understands. We cannot be too small in the projects, then it is better to fold. (Senior Manager External Research, Lion)*

The importance of active participation was deemed particularly important since it was one way that companies could gain key skills in understanding the technology. In particular, many respondents highlighted the need of having *development capabilities* to assimilate external technologies.

*Yeah the skills for integration is quite similar to [the skills for] identification, it is closely related. It [integration] is also about technical knowledge and if you understand how this technology works you can understand how it can be integrated into the product because you know it inside-out. Then you know that we need to add or revise this part and we need to remove this part to make the product perfect, that's based on the technical interest generally. (R&D Manager, Eagle)*

*In some sense I think that we are good at assimilating knowledge that is quite similar to our current thinking and capabilities. But when it comes to newer technologies, a major technological leap, then there is a resistance within the organization. (R&D Manager, Titan)*

*To succeed, we need a certain level of knowledge. Even if you are integrating something from the outside you need a basic understanding of the functioning of what you are acquiring. You do not have to be at the level of being able to make the system [technology] yourself, but you should not be far from it. (Technology Manager, Eagle)*

*These [integration] skills are often tied to individual people since we cannot afford to have too many specialists (R&D Manager, Eagle).*

Furthermore, integration of external knowledge requires the identification of the right people within the organization who should be engaged and would be interested in the technology. This can be described as *relational knowledge or* know-who: i.e. knowing which internal actors are interested and capable of absorbing certain knowledge.

*When I intercept something related to engine development, at least I know who to send the information to. Then they can assess whether it is new, relevant or not. I think that is good enough for us. Those technologies that we don't have 'up and running yet' are much more difficult because then there is no receiver. (Senior Manager External Research, Lion)*

*The benefit with the technology road map which we have implemented is that now we have identified what are the different players in our important technology areas. If it is related to another area that connects to ours we can look at it. Is it important? If it does not belong anywhere we release it. Take graphene for example it will be a really long time before it comes up on our agenda. Because there is a lot of basic research remaining, then maybe it*

*should be developed and applied in another domain before it becomes feasible in ours. (Senior Manager External Research, Lion).*

### 4.3 Key activities for exploitation of external knowledge

Exploiting knowledge from external sources can be a key challenge in R&D work. Our respondents highlighted the importance of having individuals involved in project who had a *business focus* (e.g. thinking of market exploitation) in order to drive such efforts and make sure that the integrated technologies were implemented and put to use for commercial ends. Some respondents mentioned the importance of connecting internal/external technology development to product development and market knowledge within the business units.

*In my opinion many of these research programs that occur in clusters and such external constellations could be handled more effectively if we had involved someone with a business sense. That is, what do we do with this result and what is the next step, how can we use this? (R&D Manager, Eagle)*

*It is easy that these developments ends-up in technology portfolios that no one really picks up. Maybe I am exaggerating, but it is a feeling I have that to be able to productize [integrate into products] that you would get further to a bigger business benefit if you have had a person with a business sense involved. Let the engineers work but try narrowing it and packaging it and get it together. (R&D Manager, Eagle)*

A similar issue was raised by several respondents concerning the importance of having an *internal champion* that could push the integrated knowledge into concrete applications for the business.

*I think that you need to find a person, an internal person who is interested in the technology and believe in its potential. If you don't have that I do not think that it is very easy. I want someone like this an internal champion who believe in it. It is difficult as a head [senior manager] to push it in. You want to find someone who is committed to the project. (Senior Manager, Titan)*

## CONCLUSION

Identifying, selecting and integrating useful knowledge from the environment into concrete applications is a key capability for any organization, team or individual. Within the management literature this capability is commonly referred to as absorptive capacity (ACAP). While prior literature has made substantial advancement into the performance implications of absorptive capacity few studies have addressed the issue of what actually constitutes ACAP (Volberda et al, 2010; Patterson & Ambrosini, 2014). Therefore, there exists a significant gap within the literature concerning the micro-foundations of ACAP. This study has aimed to fill this gap by means of multiple case studies within R&D organizations of three multinational engineering firms. Our findings identified the importance of individuals for firm level absorptive capacity.

In terms of implications our results suggest that firms should dedicate organizational resources to support the development of ACAP by formalizing roles and activities. This study has uncovered roles that individuals play in absorbing external knowledge and provided some further insights into how interactions among different roles enable firms to successfully absorb knowledge. Furthermore, we highlight the importance of distinct roles in different stages of the knowledge absorption process. In

addition, we describe how individuals may combine efforts and take on different roles across multiple phases of the knowledge absorption process which helps to enrich and extend our understanding of the value of having individuals take on multiple roles and how efforts in one area may complement efforts in other areas. Thus, by exploring how individuals absorb external knowledge, we help ground the concept of ACAP in a set of activities that capture distinct elements of individual's efforts to recognize, integrate and exploit external knowledge within organizations. By bringing attention to these activities, we have sought to advance our understanding of the expansive concept of absorptive capacity by identifying more refined and empirically rooted mechanisms that capture individual's efforts to absorb external knowledge. In doing so, we contribute to addressing a serious gap in our understanding of the micro foundations of ACAP. Further studies, in this important domain is encouraged.

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