The role of KIBS in the clients' knowledge absorption process: the case of exploration innovation

Guillaume Imbert
Laboratoire IREGE, Université de Savoie
guillaume.imbert@univ-savoie.fr

Résumé :

It is well known that absorptive capacity facilitates innovation performance. And yet, despite firms may have difficulty developing effective absorptive capacity on their own and the growing importance of service firm in innovation activities, extant literature has neglected the influence of service suppliers in this process. We contribute to the literature by identifying how knowledge-intensive business services (KIBS) may affect the knowledge absorption process of their clients. Using an empirical study based on three exploration innovation contracts, our results confirm that KIBS affects the absorption process. This research highlights three decisive roles played by KIBS, which are seen to function as trigger, developer and teacher of their client's absorptive capacity and underlines the interdependencies between KIBS and clients in this process. We discuss the idea of an "insemination capacity" developed by KIBS - leading to enhanced clients' absorption process – and the relative nature of absorptive capacity. Important managerial implications for both KIBS and innovative firms are given.

Mots-clés : absorptive capacity, innovation, innovation intermediaries, knowledge-intensive business services, service-supplier relationship.

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Introduction

Absorptive capacity appears critical in the context of open innovation strategies (Chesbrough, 2003) as firms must acquire, assimilate, transform and exploit external knowledge (Zahra and George, 2002) to get better results out of their suppliers. Specifically, issues concern collaboration with Knowledge Intensive Business Services (Miles *et al*., 1995) which rely on knowledge creation, accumulation, and dissemination (Bettencourt *et al*., 2002) and play a key role in the innovation performance of their clients (Den Hertog, 2000; Bettencourt *et al.,* 2002). Based on an interactional perspective, the effectiveness of the clients' absorption process partly determines the performance of innovation (Cohen and Levinthal, 1990; Tsai, 2001). This is especially the case for exploration contracts (March, 1991) which performance relies on the value, variety and originality is largely based on the value and variety of knowledge creation activities (Le Masson *et al*., 2006).

Despite widespread recognition that absorptive capacity is a dynamic capacity (Zahra and George, 2002) and the burgeoning literature on innovation intermediaries, most research continues to neglect the building of ACAP at a dyad level. Only a few research have recently been acknowledged that external organizations may impact absorptive capacity (Spithoven *et al.,* 2011; Lichtenthaler and Lichtenthaler, 2010). However, the impact of external sources on ACAP remains unidentified. In addition, the supplier-client relationship has not yet been investigated empirically. Taking into account this gap, this research explores the role of KIBS in the context of exploration innovation. Specifically, our research question is: What is the role of KIBS in the knowledge absorption process of their clients?

This empirical and exploratory research relies on three innovation case studies involving KIBS, *i.e.* a product design firm, and its clients. This research provides an unconventional extended view of absorptive capacity and provides meaningful insights on the absorption processes and performance of innovative firms. Specifically, we highlight three specific roles of KIBS in their client's knowledge absorption process, underline the

interdependencies involved in this relationship and notably discuss the idea of an "insemination capacity" of KIBS.

The paper is structured as follows. Section 1 introduces the theoretical background on absorptive capacity in the context of innovation contracts. Section 2 provides an insight into the methodology and the data collection. Section 3 describes the results and investigates the roles of KIBS on the absorption process of their clients. We discuss the results in Section 4 and finally conclude with research implications, limitations, and future avenues.

1. Absorptive capacity : a key driver of collective exploration innovation

1.1. Co-innovation in the context of client-supplier relationship

More and more innovation-related activities are conducted outside organizational boundaries. Yet, if "*A solution to one's problem can usually be found in someone else's toolbox (...) the challenge is finding it*" (Gassman *et al*., 2011: 457). To meet this challenge of innovative companies, some firms have focused their areas of expertise on finding innovation solutions in different fields for their clients. These innovation intermediaries (Gassman *et al*., 2011) have grown quickly since the 1980s. As management, engineering and strategy consulting firms, they are part of the large KIBS' category. We adopt Muller and Zenker's (2001: 2) definition of KIBS as "*firms performing, mainly for other firms, services encompassing a high intellectual added value*" and highlight three main characteristics of KIBS.

Firstly, this underscores the commercial nature of the relationship. Thus, supplier–client relationships can avoid some relationship issues, such as conflicting motivations (Cohen and Levinthal, 1990; Szulanski, 1996), in that the consulting firm and the client are entirely focused on the performance of the latter, through their engagement in a classic form of contract. The success of their collaborative relationship depends largely on the quality and strength of their interaction (Meeus *et al.*, 2001). Secondly, this definition highlights the KIBS' dissemination role of valuable knowledge. This role of knowledge intermediary received most attention in the vast literature devoted to knowledge brockers (Davenport and Prussak, 1998; Hargadon, 1998). Exploring knowledge brocker firms in the context of KIBS (consultancy companies and product design firms), Hargadon (1998: 214) defined them as "*organizations that profit by transferring from where they are known to where they represent*

innovative new possibilities. They transfer these ideas in the forms of new products or processes to industries that had little or no previous knowledge of them". Finally, it leads us to the innovation role of KIBS. Far beyond performing basic tasks in response to direct orders of clients, business services often take charge of strategic assignments including key innovation activities. In this sense, KIBS are not pure suppliers but rather innovation partners (Bettencourt *et al*., 2002). Den Hertog (2000: 508) investigates the roles of KIBS' providers as facilitators, carriers, and sources of innovation, so that they play "*a major role in initiating and developing innovations in client firms*".

In essence, the client-supplier relationship to shift from co-development to co-innovation (Segrestin, 2003; Maniak and Midler, 2008). It is characterized by increasing value added by suppliers, persistence in collaborative relationships, and greater mutual dependency as "*the client has become more dependent on the knowledge, continuity, and care of the selected suppliers*" (Wognum et al., 2002: 342). The initiative of innovation process now lies with the supplier, as well as the setting of objectives (Maniak and Midler, 2008). However, as innovation intermediaries, KIBS have to adapt to the evolutions of their client's innovation needs and must now deal with exploration activities.

1.2. Collective exploration innovation: towards a new business relationship

To meet the challenge of exploration (March, 1991), new innovation processes have emerged (Lenfle and Loch, 2010) such as "innovative design processes" (Hatchuel and Weil, 2003). Innovative design seeks to explore value areas characterized by the absence of client specification and the necessity to create new knowledge and competencies (Le Masson et al., 2007). It generates informal and incomplete results such as « concepts and knowledge gaps, products roadmaps and competencies » (Le Masson et al., 2007: 29). Therefore, the acquisition of external knowledge becomes a critical objective and justifies why innovative firms conduct exploration activities outside their organizational boundaries with the help of innovation intermediaries.

However, collective exploration innovation contracts address some specific issues (Segrestin, 2006). First, the object and rules of collaboration are progressively determined. Indeed, KIBS and clients cannot specify, at the early stages of the project, the usual functional, market and technical specifications, the precise step-by-step process or the expected outcomes. Contract is established before the object and the terms of the collaboration has been

defined. Then, KIBS and clients have to deal with considerable uncertainty. As exploration is characterized by knowledge creation through experimentation, the results of the collaboration is unpredictable.

This context of collective exploration introduced a new relationship in innovation services. First, the relationship largely relies on relationnal issues. These uncertain contracts do not efficiently protect partners which will have to deal with unexpected contingencies, as change of guidelines or ways of cooperation. It echoes the evolution from transactionnal to relationnal approach where contracts are yet another episode (Nogatchewsky, 2003). Indeed, coordination and cohesion mechanisms appear critical *(Segrestin, 2006)*. Then, knowledge creation and dissemination are prominant in this context. Because the effectiveness of KIBS depends on their knowledge accumulation, creation and dissemination abilities (Bettencourt et al., 2002), their performance relies on the client's ability to deal with external knowledge. Absorptive capacity becomes a critical capacity as it drives both clients and KIBS innovation performance.

1.3. Absorptive capacity as a key level of performance

Absorptive capacity affects innovation performance (Cohen and Levinthal, 1990; Tsai, 2001), the transfers of best practices (Szulanski, 1996) and interorganizational learning (Lane and Lubatkin, 1998). We present ACAP as a key capacity in the context of exploration innovation contracts, then, the promising literature dealing with the role of external knowledge sources for its development and highlight the research gap.

1.3.1 Absorptive capacity

Cohen and Levinthal (1990: 128) define absorptive capacity as "*the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends*". A broad consensus has developed around this definition, despite some major ACAP developments in the past two decades. Several reconceptualizations (Zahra and George, 2002; Todorova and Durisin, 2007), reifications (Lane *et al.,* 2006), and operationalizations, including ACAP scale measures (Chauvet, 2003; Flatten *et al.,* 2011), have enriched the concept.

Zahra and George's (2002) model provides three main contributions to Cohen and Levinthal's model. First, they consider ACAP as a dynamic capacity, which is particularly suited to our interorganizational learning context in which KIBS represent sources of innova-

tion with substantial impacts on clients. This dynamic conceptualization is particularly relevant, because "*it facilitates analysis of ACAP by enabling researchers to explore its different antecedents and consequences*" (Zahra and George, 2002: 185). Second, they add a new dimension and view ACAP with four dimensions, as we summarize in Table 1.

- Acquisition entails the identification and acquisition of external knowledge
- Assimilation refers to the analysis and understanding of external knowledge.
- Knowledge transformation combines newly acquired knowledge with the organization knowledge base.
- Exploitation transforms knowledge into operations, such as new products and service development.

Third, Zahra and George (2002) suggest that ACAP comprises two subsets, namely, potential (PACAP) and realized (RACAP) absorptive capacities, respectively focused on acquisition-assimilation and transformation-exploitation. We view PACAP as critical in exploration contracts as clients have to renew their knowledge stock while RACAP stresses the firm's ability to leverage external knowledge, which is critical for open innovation projects, particularly those emerging from contractual relations.

Table 1. ACAP dimensions: components and themes
(adapted from Zahra and George, 2002).

Dimensions	Components	Themes	Citations
Acquisition	Prior knowledge	Knowledge bases, experience of R&D department, education	Szulanski (1996); Autio et al., 2000; Zahra and George (2002)
	Prior investments	Risk tolerance, CEO support, R&D investments	Cohen and Levinthal (1990); Zahra and George (2002)
	Willingness to share knowledge	Value recognition, motivation, intensity and speed	Cohen and Levinthal (1990); Zahra and George (2002); Lane *et al.* (2006); Todorova and Durisin (2007); Lichtenthaler (2009); Flatten et al. (2011)
Assimilation	Understanding	Interpretation and confrontation	Cohen and Levinthal (1990); Szulanski (1996); Lane and Lubatkin (1998); Jansen *et al.* (2005); Todorova & Durisin (2007); Lichtenthaler (2009)
Transformation	Internalization	Recodification, ques-	Szulanski (1996); Van den Bosch

	and conversion	tioning, integration	*et al.* (2003); Jansen *et al.* (2005); Lichtenthaler (2009); Flatten et al. (2011)
Exploitation	Use and implementation	Core competencies, harvesting resources.	Cohen and Levinthal (1990); Lane and Lubatkin (1998); Autio *et al.* (2000); Lane *et al*. (2006)

1.3.2. Towards an extended view of ACAP

In the view to analyse absorptive capacity in the context of innovation contracts and supplier–client relationships, we need more literature focused on the building of ACAP. Thus, ACAP antecedents, and specifically interorganizational antecedents (Volberda *et al*., 2010) are relevant.

Two main streams of prior research investigate ACAP antecedents (Van den Bosch *et al.,* 2003): one focused on prior related knowledge (e.g., contiguous knowledge levels, knowledge base similarities) and another pertaining to organizational mechanisms, routines (Lane and Lubatkin, 1998), or coordination capacities (Jansen *et al.*, 2005). Across these streams though, most of ACAP research remains static and assumes the capacity is internally generated (Cohen and Levinthal, 1990; Zahra and George, 2002; Todorova and Durisin, 2007).

Yet, little research on ACAP considers interorganizational contexts (Lane and Lubatkin, 1998; Easterby-Smith *et al*., 2008) whereas firms may have difficulty developing effective ACAP on their own (Lane and Lubatkin, 1998). We stress the need to explore the role of external knowledge sources such as KIBS in building of ACAP processes. Efficient knowledge sharing depends on recipient's absorptive capacity (Cohen and Levinthal, 1990) but also "*very much on the knowledge sender's attitudes and behaviour*" (Minbaeva and Michailova, 2004: 666). Although "*authors who have studied absorptive capacity (...) argue that the absorptive capacity in the firm can only be generated internally*" (Spithoven et al., 2011:139), few recent works interestingly assume that ACAP do not result entirely from internal efforts. Four essential contributions are particularly noteworthy.

Lane & Lubatkin investigated ACAP at an inter-organizationnal level and introduced the concept of relative ACAP. They argue that firms have different levels of ACAP according to the context, and notably to knowledge acquired from other firms. Thus, partner characteristics play a role in the success of interoganizational learning but the outcomes of external sources in the building of ACAP remain vague.

Newey (2010) argues that a single firm engaged in open innovation activities may act as customer to an upstream supplier to become the supplier to a downstream customer for another day. The author notes that "*the focus of and way that absorptive capacity is leveraged is different in both cases* » (Newey, 2010: 704). Following on from Lane and Lubatkin's work, this concept of customer/supplier absorptive capacity shows ACAP is a relative construct but it does not explain the building of ACAP at interorganizational level.

From an empirical investigation of collective research centers, Spithoven (2011) determines that their members organize their absorptive capacity collectively. Developing knowledge activities such as pro-active knowledge intelligency and acting as knowledge agencies when they realize research projects for their member, research centers exert critical influence by helping SMEs overcome their lack of absorptive capacity. However, the role of collective research centers in the building of their members'ACAP remains vague. We suggest it is less a matter of ACAP building than ACAP substitution, as collaboration with SMEs may not develop learning outcomes.

Lichtenthtaler and Lichtenthaler (2010: 158) propose the concept of desorptive capacity, or the "*ability to identify technology transfer opportunities based on a firm's outward technology transfer strategy and to facilitate the technology's application at the recipient*." Suggested as a complement to absorptive capacity related to technology transfer, desorptive capacity consists of two stages process: identification and transfer. First, firms must identify profitable applications of potentially interesting technologies as well as potential "clients". Then, the technology transfer process "*calls for an active participation and support from the technology source to facilitate successful application*" (ibid). However, we consider that the role of knowledge sources remains vague for two mains reasons. First, the process by which the knowledge source facilitates application remains unclear. Then, outcomes of this process on the absorption process are still vague as Lichtenthtaler and Lichtenthaler (2009) had only addressed the exploitation dimension of ACAP.

In the light of these contributions, ACAP does not result entirely from internal efforts, but the role of knowledge sources in the absorption process remains unidentified. Specifically, three main gaps need to be highlighting.

- Prior work neglected the role of external sources in the building of ACAP

However, Lane and Lubatkin (1998: 461) note that « *definition of the (ACAP) construct suggests that a firm has an equal capacity to learn from all other organizations* ». Described above, recent works assume ACAP does not exclusively result from internal efforts but the role of external sources remains unclear: How do they impact ACAP? Which mechanisms are involved? What kind of interdependencies between both firms? These gaps echoe the importance of teaching activities, which has been largely neglected in the field of strategic management (Zhao and Anand, 2009). Then, prior works mainly refer to ACAP as unidirectional construct, and do not take into account the complexity and the richness of its four dimensions and process. Thus, they do not explicit adequately the role of external sources in ACAP building as the outcomes on the respective dimensions of ACAP have not been investigated empirically.

- ACAP process remains vague

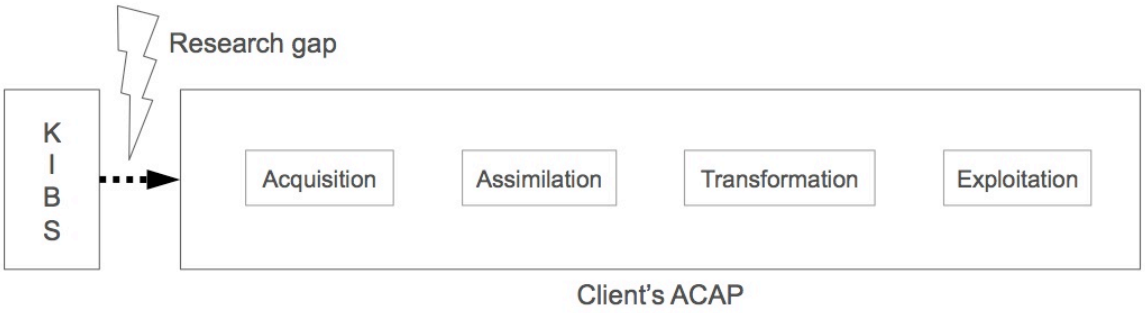
In the light of previous point, and despite the substantial literature on ACAP, absorption process remains unclear. Jansen (2005: 51) argues that "*even when organizational antecedents have been considered (e.g. Lane et al., 2001; Van den Bosch, Volberda, & De Boer, 1999), their relationships with different dimensions of absorptive capacity have not been tested empirically*". In addition, Volberda *et al.* (2010) point out ignorance of process dimensions: « *Examining ACAP process dimensions would (…) clarify how ACAP can be developped »* (2010 :16) and note that the learning process of ACAP are not fully used. This process-based approach of ACAP would appear particularly relevant in the case of innovation contracts as clients and service providers are engaged in a co-production relationship.

- ACAP literature has neglected the client-provider relationship

Most of prior research focuses on strategic alliances (Easterby-Smith *et al*., 2008), partnerships, and multinational corporations, at the expense of "traditional," contractual client–supplier relationship. However, we have already underlined the critical importance of absorptive capacity in this context of innovation intermediaries, and more specifically, in exploration activities. However, despite their innovation role (Den Hertog, 2000), their "knowledge bridge" functions (Miles *et al*., 1995) and their intensive interactions with clients (Bettencourt *et al.,* 2002), the role of KIBS in the knowledge absorption process of

their clients has not been explored empirically. Figure 1 illustrates a simplified model of the research gap.

Figure 1: Research gap



To address these limits and bridge the knowledge gap, an extended view of ACAP based on a dyadic relationship between KIBS and their clients is required. The empirical exploration of the relationships between KIBS and the absorptive capacity of their client in the context of exploration innovation. More specifically, our research question is: What is the role of KIBS in the knowledge absorption process of their clients?

2. Methodology : exploration case studies

To stress the need for an extended view of ACAP, we seek an unconventional point of view of ACAP. This research investigates the role of KIBS in the clients' knowledge absorption process in the context of exploration innovation contracts. Since this relationship has not been described in literature, we conducted an exploratory research which presents exploration innovation activities in the form of business contracts conducted between three innovative firms in the household and agri-food sectors (the clients) and a design firm (the supplier) - whose brockering role has been recognized (Hargadon, 2002).

Focusing on understanding the « how » and « why » of phenomena (Yin, 2003) and the issue of temporality (Rispal, 2002), case study method is particularly suited to studies on process and was the most appropriate method given the shortage of knowledge on ACAP in the context of exploration innovation contracts. We briefly describe the cases in table 2. Results provide deeper insights into knowledge absorption issues encountered in each case.

Table 2: A brief presentation of study cases

Name	Client's firm	Context of the contract
C1	Research center of an agri-food multinational firm	The client wanted to open up large avenues of innovation on the theme of the diets of the future. The KIBS provides prospective concepts.
C2	Leader in the field of appliances	The group detected an opportunity on food processors and engaged the services of the design firm to manage usability studies, suggest new areas of innovation and new concepts of products.
C3	French subsidiary of an agri-food multinational firm	Innovation and marketing wanted to explore new areas of innovation in the business of chocolate. The design agency provided new areas of innovation and related concepts in the short, medium.

We focused data collection on tracking KIBS capacity to impact the absorptive capacity of clients. We used two primary sources: interviews and participant observation. We worked for four years as an innovation consultant in the KIBS company and participated to KIBS workshops and client meetings. These data were completed with in-depth interviews that were carried out with managers, each lasting from 100 to 150 min. We collected data from both sides of the service relationship as we had access to two of the KIBS consultants and a manager for each client company, i.e. five semi-structured interviews. In this view, we designed the guide interview so as to obtain a correspondence between data and a better validity. The interview guide has three main sections: the first one address the theme of service-provider relationship in exploration innovation contracts and the second one focuses on organizational learning in this context. The last one was composed of open-ended questions on the knowledge absorption process of clients and the role of KIBS. As absorptive capacity remains a theoretical theme for managers, we help them by using graphic methods. Interviewees were able to play with ACAP dimensions cards (based on Zahra & George, 2002) and a project timeline to help them describe the process involved. We also triangulated with archival sources, such as technical and market studies, presentations, e-mails or meeting minutes.

We used a classic methodoloy following Miles and Huberman (1991). First, we condensed datas through coding and data reduction in a dynamic and iterative way. We combine datas from participatory observation and interviews. This allows us to identify regularities in

the identification of the roles of KIBS and the respective outcomes on the client's ACAP which constitute the main parts of the results. Finally, the inter-case analysis provides key elements of the discussion.

3. Results

Our findings provide evidence of the active role of KIBS in the absorption process of their clients in the context of exploration innovation contracts. In a first part, we provide insights into the main knowledge absorption issues encountered in each innovation exploration case. Then, we analyze the role of KIBS in the clients' absorption process and conclude with the interdependencies of KIBS and clients' role in the latter absorption.

3.1 Exploration innovation: three knowledge absorption stories

This report of results starts with a presentation of the study cases *via* the main knowledge absorption issues involved.

- Case n°1: A disguised knowledge absorption goal

The client is the research center of an agri-food multinational firm. The stated aim of this contract was the exploration of new concepts on the theme of diets of the future. However, acquisition and use of new knowledge have proved to be the core objectives of this exploration contract. This is exemplified by the following verbatim report of the client side project manager:

« *I realize my chief didn't want a design. Actually, he just needed us to create a knowledge base [...], much broader knowledge, in food areas we didn't know* » (Client 1). Yet, the acquisition of new external knowledge is not only about food knowledge, but also methods and know-how. Already familiar with exploration innovation, the client manager attached significance to the expertise of KIBS so as to disseminate methodological knowledge to his own team. Thus, one of the issue for the client side manager was to shift his individual absorptive capacity to a team and organizational level. But the main issue of the research center may be the gap between knowledge transformation and exploitation phases. Once the decision has been made to exploit the concepts, knowledge is transferred from the research team to "exploitation teams" (development, marketing, top management). Exploitation team must then acquire, assimilate and transform knowledge in their own ways very quickly:

« The time available for knowledge exchange in the firm is a real issue; we do not have time to share knowledge as it should be » (Client 1).

Yet, the firm encounters knowledge losses issues, all the more so when the top management give the go-ahead many moths or even years after completion of explorations.

- Case n°2: A focused knowledge absorption process

This contract was a first collaboration between C2 and the KIBS, which had to absorb contextual and « project » knowledge :

« *At the start, we tried to teach you what we knew about food processors: market knowledge, technologies…* [...] *it was for you, so as you could be pertinent and because we had to innove and were not supposed to reinvent the wheel.* » (C2 manager).

The clients' multidisciplinary team, composed of R&D, innovation and managers, facilitated knowledge dissemination accross units. Indeed, all business fonctions were in direct KIBS contact.

The client underlined two main issues of the firm's absorption process (R&D manager). First, knowledge explorations must be « business oriented ».

« *It is necessary to assimilate it (knowledge), to transform it in some way to have a first exploitation idea, knowing exploitation vision is the added value* » (R&D manager). This process implied feedback loops. Intensive iterations occur between assimilation and transformation dimensions, being guided by these exploitations ideas, such as customer benefits. Not only they were a means of getting round issues, but iterations were a way to enhance the value of knowledge. Then, the client highlights the role of the top management in the absorption process. Knowledge and concepts need the support of a high-ranking manager to reach the « exploitation stage ».

"It is like 'sponsors'. You may have the world's best concepts, it's nothing unless you can get hold of someone. The concept will walk around: this is experienced daily" (R&D manager). In this case, the absorption process cannot be filled out without the support of top management, especially knowledge transformation and exploitation activities that may need a go-away. Hence, the need to disseminate knowledge and promote project within the firm.

- Case n°3: A two-tier absorption process

This contract aims at exploring new areas of innovation in the business of chocolate. Throughout this collaboration, both firms faced huge differences between their knowledge bases, culture and methodologies.

« *The shocking revelation appears during the project's presentation [...] At that time, I told myself 'things don't look good' [...] because we do not speak the same language. We do not define a concept in the same way and thus, the outcomes could not be the same* » (KIBS manager). Therefore, both firms had to develop mutual understanding throughout socialization mechanisms.

The client encountered difficulties in absorbing external knowledge as the client side managers did not share the same objectives. Indeed, knowledge exploration was torn between the clients' innovation and marketing teams. Whereas the innovation manager focused on the development of methodological aspects and strategic vision (long term), the marketing team focused on concrete results throughout short-term concepts. Thus, a two-tier absorption process appears. On the one side, the innovation manager was involved in the co-production activities and fully mobilized his knowledge absorption capacity, developing value recognition, interpretation, questioning mechanisms for example. On the other side, the marketing team was not much involved in the knowledge absorption and co-production: as it allows the KIBS to operate with a greater level of autonomy, the team looked for "ready to exploit concepts". KIBS had to face a hard situation to manage. Finally, results provided new areas of innovation and related concepts in the short, medium and long term.

3.2. Tbe role and outcomes of KIBS in the clients' absorption process

As described above, exploration innovation contracts largely rely on knowledge absorption process. Yet, clients have to face various difficulties to absorb external knowledge. In spite of strengthening a clients' absorptive capacity is not an explicit objective of KIBS, this research confirms their significant role in clients' absorption process.

To introduce results, we acknowledge the role of the own absorptive capacity of KIBS. As they need usable and contextual knowledge from their clients, KIBS have to absorb knowledge from the client. They seek relevant knowledge actively, pulling, and adapting external knowledge from clients.

« We were here to retrieve a lot of knowledge and reframe the context of the project [...] most projects involve we have to re-create knowledge bases » (KIBS manager).

Our findings show KIBS provides help in their client's absorption process in various ways. Three main outcomes on ACAP emerged from the results. KIBS affects the respective dimensions of the clients' ACAP and the linkages/feedback loops between them. Finally, interorganizational learning outcomes may occurs through the client's ACAP development.

3.2.1 Role of KIBS in the respective dimensions of absorptive capacity

This analysis uses the four-dimentional ACAP model of Zahra and George (2002). Although conceptual, it is concrete enough to map the role of KIBS and the interactions. These results demonstrate how the four dimensions of the client's ACAP are affected, followed by linkages between them.

- Impacts on knowledge acquisition

Our findings confirm knowledge selection role of KIBS. Exploration innovation contracts rely on the acquisition of new external knowledge:

« Managing prospective and research activities involve you cannot do without a source of ideas, of innovation, another vision or angle of approach » (Client 1.)

However, KIBS aims at disseminating valuable knowledge for the clients and selects knowledge in accordance with the needs of the clients.

The role of client is critical in this sense:

« Because we 'muscle' suppliers (share knowledge), they are able to create a scale which allows you to say 'this thing must have value' and we ask them to design value propositions […] We try to give you this scale to ensure that you can manage the project without being dependent on us, otherwise, you cannot sort (knowledge and concepts)" (C2 manager).

Thus, knowledge selection of the KIBS eases the acquisition of external knowledge, reduces the gap between the partner's knowledge bases and makes absorption process more efficient:

« It avoids to scatter, to diverge » (Client 2).

To avoid the rejection of certain kind of knowledge (mainly distant from the client's knowledge base) KIBS managed dissemination of knowledge over time. It is about waiting for the right moment or transferring knowledge progressively. Specifically, KIBS managers were hesitant before proposing a concept which was far from the client's area of expertize. They transferred knowledge progressively:

"*We must adapt to the client's rhythm so as to allow time to integrate data".* (KIBS manager)

Finally, results show signifant differencies between KIBS and clients in terms of knowledge bases, methods and process. Yet, socialisation mechanisms are critical at the early stage of absorption process :

« You cannot be effective at the beginning (of the project), because you have to build a client/supplier relationship. You need to undersand interactions, roles *[...]* of your interlocutors to do the right things ». (KIBS manager).

Indeed, KIBS and clients learned in a reciprocal, two-sided process, to adapt to other's organizational cultures, knowledge base and process.

- Impacts on knowledge assimilation

Results underline understanding issues through assimilation process.

"If the way to communicate is not adequate [...] your brain cannot assimilate » (C1 manager).

Yet, communication appears critical in exploration innovation as clients face distant knowledge that may not be easy to understand. To enhance assimilation process, KIBS carefully selects knowledge supports and uses visual tools of representation:

« Formalizing in a visual and understandable way, mapping out knowledge to make it intelligible to the audience so as it will appropriate knowledge easily. If you do not use symbols [...] they (managers) are not able to assimilate *». (Client 1). Client 2 adds:*

"The idea of these concepts was not only to present concepts (to top management), but also to

Confrontation activities are part of the assimilation process. Hence the importance of interactive knowledge process in this context : « *Dialogue is important…and you must give them (managers) the opportunity to ask questions* » (C1 manager).

However, dialogue may still not be enough as exploration knowledge are often set in a certain context and hard to transfer: "*Knowledge explicitation is a big issue*" (C1 manager).

Yet, knowledge contextualization are used by KIBS : they adapt knowledge to the context of the client organization. KIBS seek to make knowledge as explicit as possible, to avoid assimilation issues. For example, knowledge is formalized in « accessible » formats such as roughs, concept boards or mock-ups. This contextualization tools directly respond to a client's needs:

« We needed concepts illustrated, easy to perform and justified so as to convince direction » (Client 2)

They also may adapt and internalize knowledge from the client organization, which strengthens their bond. Our findings finally show a time gap between assimilation and transformation dimensions:

« The time to digest information, to be able to appropriate it…between assimilation and transformation, it never reacts quickly! » (Client 1)

Through contextualization, KIBS may seek to accelerate this process. Sometimes, the stakes are higher as the assimilation and transformation process may not be conducted:

« If they make a demo, it will bluff everyone, otherwise nothing will happen » (Client 1).

- Impacts on knowledge transformation

Through knowledge transformation activities, clients combine newly acquired knowledge with the organization knowledge base. Our findings show organizational knowledge base partially rely on data base which are not efficient, as exemplified in case n°1:

« Data accumulate […] but there is no way to extract information, it is very hard, there is so much information in there that it is very difficult to have relevant information » (C1 manager).

KIBS appear as a additional resource to database: involving interpretation, confrontation and questioning process by the client, it actively disseminates knowledge.

As "It is difficult to find a universal language to clarify knowledge" (C1 manager), KIBS adapts knowledge transfer to client's team and recodifies knowledge across individuals. These recodification activities are repeated until client's teams are able to transform knowledge on their own. But the client also manage knowledge transformation, leveraging the expertize of KIBS:

« We do not transform knowledge once, but ten times, in ten different ways from various suppliers » (C1 manager).

- Impacts on knowledge exploitation

Our findings show managers recognize knowledge exploitation as a hard spot in the absorption process. Yet, clients may experience various problems during the exploitation stage.

Specifically, we underline knowledge losses affecting the process in several ways. There is a temporal gap between transformation and exploitation, occurring when knowledge is transferred from research teams to « exploitation teams » (development, marketing, top manage-

ment). Paradoxically, decisions in our context of multinational firms take months or years, but once the decision is made to exploit knowledge, exploitation teams must acquire, assimilate and transform knowledge in their own ways very quickly:

« The time available for the exchange of knowledge in the firm is a real issue; we do not have time to share knowledge as it should be ».

As the team recently involved in the project does not have enough time to acquire, assimilate or transform knowledge, they may endanger the value of knowledge. Then, personal turnover also affects knowledge as managers retire with valuable knowledge. In this respect, KIBS may act as an extern knowledge base of the innovative firm:

« M. (confidential supplier) is a 25 years Partner. It is no accident they deserve our commitment for 25 years […], it's a good way to garantee knowledge preservation outside. There is an internal back-up and an external back-up ». (C1 manager)

Finally, the design firm was not much involved in the downstream phases of the exploration projects, which involve technical and commercial development. As most of clients consider they are qualified to perform the exploitation phase, the role of KIBS is restricted. Yet, "*Projects may fall through at exploitation stage. Because there are a lot of knowledge misinterpretations*" (C2 manager).

Yet, KIBS tried to manage this issue throughout knowledge preservation activities. KIBS managers often reminded the value of concepts because client teams are embedded with technical and marketing during exploitation and they may forget the core "sense" of the concepts they are working on.

3.2.2. Linking the four dimensions

Results analyzed above show clients may face difficulties to shift from on dimension of knowledge absorption process to another one. First, there are temporal gaps between the client's ACAP dimensions.

" Time is an issue. There is a need to digest information, to appropriate it and it does not responds tit for tat between assimilation and transformation. Sometimes, people who received knowledge need several months or even one or two years to develop their own experience" (C1 Manager).

KIBS may accelerate the process by shortening these periods through contextualization mechanisms. Then, clients may have difficulties to shift from individual to team and organizational

levels of ACAP. For example, when a client manager disseminates knowledge to his team, he already has absorbed external knowledge. Yet, team members may have difficulties to recognize and assimilate external knowledge as they must develop their own experience. Thus, KIBS suggested to involve pluri-disciplinary teams in the projects to face this issue. Design firm also tried to ease knowledge transfer across client teams through the use of visual supports. Despite the fact that we present results in a chronological way, we acknowledge the role of feedback loops. For example, intensive iterations occur between assimilation and transformation dimensions. Not only they are a means of getting round issues, but iterations are a way to enhance the value of knowledge. Indeed, the management of iterations may be used purposefully:

« I provide various stimuli [...] in the view to obtain various orientations; knowledge may be transformed in different ways ». (C1 manager).

3.2.3 Teaching learning

Not surprisingly, our data suggest all clients learned from the KIBS throughout co-exploration activities in terms of management…

« *We learned it's possible to manage a project of this scale in 5 months : it provides references* » (C2 Manager).

…or new knowledge, which also lead the client's teams to develop new areas of innovation in various fields:

"They pushed the level of thinking and became an asset. These concepts end up multiplying, not necessarily in the food processors industry, but we reused these notions of (confidential). These projects educated us…via food processors, these things entered the group's assets" (C2 Manager).

But KIBS may also develop the interorganizational learning of the client in the form a "learning to learn" process (Stieglitz, 1987). This « teacher » role of KIBS only occurred in one of the case study. Case n°1 provides some insights. As a reminder, the absorption of external knowledge was the main objective of the contract: *" he just needed us to create a knowledge base [...], much broader knowledge; in food areas we didn't know » (client 1).*

KIBS teach the client design methodologies to enhance his ACAP:

« He (C1 manager) grew up with us. We brought him solutions within his vision, methods and projects [...] R&D team also grew up with (C1 manager)". (KIBS manager)

Thanks to the client's engagement in this learning process, C1 should enhance his ACAP over time, and so, in other contexts.

"Once you learned how to learn, you can learn everything! Everything!" (C1 manager).

3.3. Interdependencies in the client's absorption process

Our findings provide insights into mutual interdependencies involved in the client's absorption process.

First, results show this role of KIBS is exercised through subtle and intensive knowledge management activities that require mutual understanding of the partners. On the one side, we raise the issue of symmetrical roles, where both partners need their knowledge to be absorbed by the other. Indeed, KIBS seeks usable and contextual knowledge from their clients throughout their own absorptive capacity, but clients also have to acquire knowledge from the KIBS:

« So I 'feed' them, perform (knowledge) injections [..] and for this, you must have a good understanding of your partners, of the their sensibility » (Client 1).

KIBS confirms:

« *The fact they better know us allows them to see the added value we can provide. Our added value gives them enough value to help them make choices and valid decisions* » (KIBS).

On the other side, this research provides new elements on the role of clients. Not only clients open their knowledge bases to the KIBS, but they also disseminate knowledge in a quite similar manner to the KIBS:

« I disseminate data into the project and I try to do it at the right time to provoke designers, or hide certain data as possible until final stage » (Client 1).

This is a dynamic process where the client transfers the right knowledge at the right time to gain the maximum potential of his suppliers. Thus, this knowledge dissemination is based on a management perspective involving control activities:

« I make sure that he (the supplier) has well adopted the knowledge, and control. It's nearly a written test! » (Client 1).

To sum up, both KIBS and clients need resort to their own ACAP and knowledge dissemination activities, realized on slightly different ways as they do not have the same goals. This kind of reciprocal processes is supported by co-innovation activities and provides the basis for the mutual adjustments.

Following from the previous points, our findings highlight the critical role of the client in supporting the KIBS. This role is carried out in the favorable context of exploration contracts because the absorption of external knowledge is an important goal and determines the innovation performance of the firm. Our exploratory findings underline several key success factors by which clients support the ICAP of KIBS. First, their dynamism and flexibility in knowledge transfer process. As shown above, the role of KIBS in the knowledge absorption process of the client relies on strong interactions and mutual adjustments. This role is helped by the nature of innovation contracts that rely on co-creation mechanisms. Then, our findings show a role pivot in the client's managers who provide interface with the KIBS team. Outside meetings with the supplier, these individuals have to enhance the knowledge absorbed to the team and organizational levels. Their motivation appears critical as much as their communication and relationship skills are crucial:

« *This must take place through dialogue and the fact of making them want to ask questions [...] for me, all stimuli were needed to motivate them to acquire it* » (Client 1).

Finally, these results highlight the role of interactive processes and mutual adjustments on the absorption process of the client. Specifically, the role of KIBS in the client's absorption process is not a priority. Thus, they must not engage to much effort, i.e. more than had been appropriated. KIBS must seek some kind of balance based on the first knowledge exchanges of the two firms. If the effort developed by the KIBS is too low, the client cannot absorb the knowledge. At the opposite, too much effort could also limit organizational learning and "weaken" the client's ACAP and increase the client's dependence on KIBS.

Our findings show significant role of KIBS in their client's absorption process. Not only the various mechanisms used by KIBS impact the respective dimensions of ACAP, but they also seem to facilitate and accelerate the absorption process, and in one case, engage the client in organizational learning.

4. Discussion

Dealing with the study of absorptive capacity in situation of innovation service contracts, our core theoretical contribution is a dyadic framework of ACAP by which KIBS enhance the knowledge absorption process of their clients. This empirical exploration provides new insights relative to the innovation performance in the service contracts. Beyond this, three main

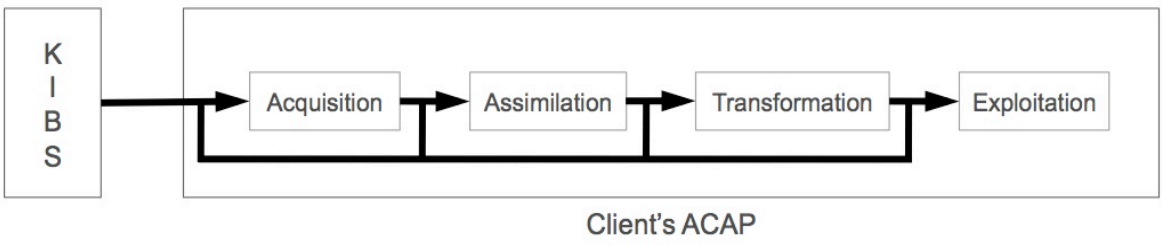
contributions are worthy of further discussion here. We discuss the roles of KIBS in the absorption process of the clients and suggest the idea of an insemination capacity. We then discuss the relative nature of absorptive capacity and argue the positive role of KIBS should be tempered.

Firstly, this research based on a dyadic view of ACAP stresses the critical roles of KIBS. Prior research already recognized that KIBS act as facilitator, carrier and co-producers of innovation (Den Hertog, 2000). In a quite similar way, we underline the complex and multidimensional role of KIBS in the ACAP performance of their clients. Our findings show how knowledge absorption process of innovative firms may be impacted by KIBS. From these results, three main roles in the client's absorption process merit to be discussed. We suggest KIBS act as:

- ACAP trigger.

This role deals with the ability of the KIBS to initiate and perpetuate a knowledge absorption sequence through the contract. Two main components are worthy of discussion. First, the KIBS eases the start of a knowledge absorption sequence that the client could not support on its own. This role is particularly involved when the knowledge base or firms are so distant it makes the recognition of value difficult (Cohen and Levinthal, 1990). Then, the ACAP process of the client may not run smoothly as we identified several hard points at the crossroads of ACAP dimensions. The KIBS helps the client to drive beyond these barriers. The mechanisms of the KIBS may help transitions and feedback loops between ACAP dimensions. In this view, KIBS act as ACAP dimensions triggers that accelerates and facilitates the process. However, we suggest a streamlined absorption process enhances the global knowledge absorption performance, in somewhat similar to Zahra and George (2002). The authors pointed out social integration mechanisms reduce the gap between potential absorptive capacity and realized absorptive capacity. However, we suggest ACAP facilitation mechanisms have broader impact as they trigger all dimensions of absorptive capacity. Figure 2 illustrates this role of ACAP trigger.

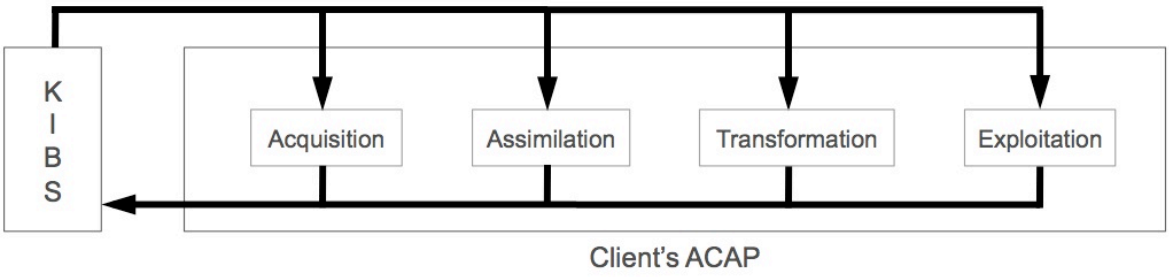
Figure 2. ACAP trigger's role of KIBS



- ACAP developer.

Our findings highlight the role of KIBS in the ACAP of the client and the multiple interactions and adjustments between ICAP and ACAP dimensions. Indeed, the lack of absorptive capacity is a major issue of knowledge transfers (Szulanski, 2000). Through this role, KIBS may help the client overcome its potential lack of ACAP. As most research considers ACAP as a dynamic capacity (Zahra and George, 2002) composed of four components capabilities, we suggest KIBS may develop one or several ACAP components of their clients. This development may occur during the contract, and more specifically, through intensive interactions, when the client cannot acquire/assimilate/transform or exploit external knowledge by himself. In certain ways, KIBS may be seen as an ACAP substitute. The reason being that it does not necessarily develop the client ACAP over the long term as the help of the KIBS is provided within the contract period and cannot be distinguished from the KIBS/client interaction. Indeed, the absorption process depends on the context (Lane and Lubatkin, 1998). Thus, the development of the client's absorptive capacity may be relative in this case. We return to this issue in the second point of the discussion. Figure 3 illustrates this role of ACAP developer.

Figure 3. ACAP developper's role of KIBS



- ACAP teacher.

Although KIBS does not aim at strengthening the clients absorptive capacity, they have an interest in developing the absorption process of their clients as it eases the use of their knowledge and the global performance of the relation/contract. Later, we discuss the idea of a relative development of ACAP throughout the duration of the contract but does ICAP develop ACAP outside of the service contract? This is not part of the contract but we suggest that KIBS may undertake this role despite themselves and under certain conditions. In economics, Stieglitz's (1987) notion of "learning to learn" is clearly a precursor of AC. We have the same

consideration here: KIBS learn to their clients how to learn & use knowledge. Indeed, this « teacher » role of KIBS only occurred in one of the case study. The client had a learning objective, all the more so given he wanted to develop his methodology:

« I was aware of (the KIBS) practices […], so I had like to reiterate it, but throughout a large scale implementation » (Client 1).

KIBS may undertake the role of teacher when organizational learning constitutes a strategic goal of the client. As teaching activities have been neglected in the management field (Zhao and Anand, 2009), our empirical research provides interesting insights where the KIBS teach the client design methodologies to help him better absorb knowledge. Because the client's reference contact person was fully engaged in this learning process and disseminated these methodologies in various departments, the teaching role of KIBS could possibly increase the ACAP of the client over time, and so, in other contexts. Figure 4 illustrates this role of ACAP teacher.

Figure 4. ACAP teacher's role of KIBS

Two perspectives on the role of KIBS in the client's ACAP should be considered. First, the typology demonstrates the wide variety of roles of KIBS. Throughout various mechanisms, KIBS play three key roles. We suggest these roles are not part of a sequential process but rather independent. Then, we stress the need to define this role of KIBS in the client's absorption process. Following from the "desorptive capacity" of Lichtenthaler and Lichtenthaler (2009), we suggest referring to the term of insemination capacity: a dynamic capacity developed by KIBS that affects the knowledge absorption sequence of their clients.

We then discuss the relative nature of absorptive capacity. ACAP depends on the context of the client relationship and more specifically, on the interactions between KIBS and innovative firms. Our findings highlight the critical role of interactive adjustments on ACAP dimensions and add to the argument that « interactive learning is a very complex process influenced by multiple contingencies » (Meeus *et al.*, 2001: 167). Thus, the level of absorptive capacity of the client varies not only according to the contract, but also according to project

stages. Lane and Lubatkin (1998) introduced the idea of relative absorptive capacity to describe the phenomenon that firms have various levels of ACAP. It depends on the similarity between firms (Lane and Lubatkin, 1998) and the degree of knowledge overlap between two parties (Cohen and Levinthal, 1990). This provides deep insights into our results. In this context, interactive adjustments are a dynamic way to create similarities between firms (in terms of knowledge bases and processes) that enhance and determine the level of absorptive capacity. Thus, ACAP should not be seen as the result of static contingencies factors, such as the similarity between firms, but rather the output of dynamic capacities ("insemination capacity"), process and know-how (innovation, communication, interpersonal skills…).

Finally, and even tough the results suggest a positive role of KIBS in the absorption process of their clients, we suggest they should be tempered for two reasons. On the one hand, because the client remains the front-line player in the development of his own absorptive capacity. Thus, the role of KIBS cannot be exercised without the active participation of the client in the co-production of the service. On the other hand, this active role of KIBS on client's ACAP might also cause negative externalities when the client is not able to acquire/assimilate/transform or exploit external knowledge by himself. In this case, the KIBS may endorse a substitution role. Although the effects are positive in the short term, i.e. throughout the duration of the contract, the client might not be able to enhance his ACAP on its own. The risk here being that the client develops an excessive dependence on the supplier.

Conclusion

This research contributes to the burgeoning literatures on absorptive capacity and innovation intermediaries by identifying the roles of knowledge-intensive business services on the knowledge absorption process of their clients. Using an empirical study based on three exploration innovation contracts, our results mainly underscore three decisive roles played by KIBS, which are seen to function as trigger, developer and teacher of their client's absorptive capacity. This allows us to suggest the idea of an insemination capacity developed by KIBS to enhance the clients' absorption process.

This multiple case study provides greater validity in the development of insights and fuller consideration of the context dependency than single case study (Yin, 2003). However, several limitations of this research merit discussion. This work is still in progress. Thus, there

is a need to further pursue data collection and analysis from KIBS managers to deepen our understanding of the role of KIBS on the ACAP of innovative firms. Then, we needed firms engaged in exploration innovation. It was no surprise that firms involved in our panel are multinational companies that are used to open innovation strategies and collaborations with KIBS. Yet, SMEs are more likely to suffer from a lack of absorptive capacity. Explorations in this way should offer interesting and differentiated results as the role of KIBS may be of particular importance in this context.

The present study provides several issues for future research. First, the interactive process of ACAP underlines temporal issues. Shifting from one dimension of ACAP to another one takes time, as the « temporal gap » between transformation and exploitation dimensions discussed above. Whereas this processing time affects the client-supplier relationship and the innovation performance, prior research neglected the temporal dimension of ACAP. Volberda *et al*. (2010) pointed out the need to explore ACAP temporal issues. Specifically, they suggest to explore the nature of the knowledge storage and retrieval of it. We also suggest an investigation of ACAP under time constraint would provide meaningful insights. Then, future research should investigate the cost issues of ACAP. Volberda *et al*. (2010:947) pointed out « there is little consideration in the literature of the cost of developing AC, changing it, or in some way taking advantage of an organization's AC ». We suggest innovative firms may develop more ACAP through the role of KIBS for less they would do on their own. Therefore, literature should investigate the cost benefit of this « learning sourcing ».

Finally, further research will be needed to develop the concept of insemination capacity. As a first step, further qualitative survey should deepens our understanding of the mechanisms involved. Second, future quantitative research are planned. As recent research provides great scale measure of ACAP (Flatten *et al*., 2011; Jiménez-Barrionuevo *et al.,* 2011) that could be used in the context of innovation contracts, we suggest future work should develop and use a multidimensional scale measure of insemination capacity in order to measure the role of the insemination capacity of KIBS on their clients' absorptive capacity. A deeper understanding of the impact of KIBS on the absorptive capacity of their clients would provide interesting insights on the management of innovation services contracts.

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