

Cooperating for innovation: devices for collective exploration

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

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Abstract

It is well known that absorptive capacity facilitates innovation performance. Yet, despite the growing importance of service firms and open innovation, extant literature has neglected the influence of service suppliers in this process. This research explores the role of the "insemination capacity", viewed as a knowledge-intensive business service (KIBS) firm's ability to initiate and perpetuate a knowledge absorption sequence relative to the absorptive capacity of their clients. The empirical study, based on three exploration innovation contracts, suggests that KIBS may trigger and develop the clients' absorptive capacity and proposes to link the different dimensions of the KIBS' insemination capacity with those of the client's absorptive capacity.

Keywords: absorptive capacity, innovation, insemination capacity, knowledge-intensive business services.

INTRODUCTION

Organizations rely on exploration activities (March, 1991) to face major environment transitions such as market, technological or institutional changes. Open innovation strategies can help them preserve their competitive advantage (Chesbrough, 2003), leading to more innovation-related activities conducted outside organizational boundaries. Thus, the role of service activities is outstanding in our modern economies, and suppliers of services often take charge of strategic assignments. In particular, KIBS (Miles *et al.*, 1995) may be key for their clients' innovation performance (Den Hertog, 2000) through their influence on knowledge creation, accumulation, and dissemination (Bettencourt *et al.*, 2002). Their absorptive capacity (ACAP, Cohen and Levinthal, 1990), i.e. the ability to acquire, assimilate, transform and exploit external knowledge (Zahra and George, 2002), appears critical in this context.

Based on an interactional perspective, the effectiveness of the client's absorption process partly determines the performance of innovation (Cohen and Levinthal, 1990; Tsai, 2001). This is especially the case for exploration contracts, which are largely based on knowledge creation activities (March, 1991). Despite widespread recognition that absorptive capacity is a dynamic capacity (Zahra and George, 2002), most research continues to offer a static view of its development, neglecting the role of knowledge sources and the growing trend of open innovation strategies. However, recent research suggests that external organisations may impact absorptive capacity (Spithoven *et al.*, 2011; Lichtenthaler and Lichtenthaler, 2010). More specifically, the "insemination capacity" (ICAP, Imbert and Chauvet, 2012) developed by KIBS to initiate and advance a knowledge absorption sequence by a client organization could offer an unconventional point of view of the ACAP, namely, that of the dyadic relationship. However, the outputs and mechanisms of ICAP on ACAP remain unidentified, and this relationship has not been investigated empirically.

Taking into account this gap, this research explores the role of KIBS on the absorption process of their clients in the context of exploration innovation. More specifically, we focus on the links between the insemination capacity of KIBS and the absorptive capacity of their clients to stress the need for an extended and dynamic view of ACAP. What are the links between ACAP and ICAP dimensions? What interdependencies exist between KIBS and clients in this relationship? What are the outputs of ICAP?

This exploratory research relies on three innovation case studies involving a KIBS, i.e. a design agency, and his clients. This research provides meaningful insights on the absorption processes and performance of innovative firms. It highlights three specific roles of KIBS,

which trigger, develop and teach ACAP to their clients. It also highlights the co-existence of different levels of ACAP, following Lane and Lubatkin's (1998) notion of relative absorptive capacity.

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, investigates the roles of KIBS on the absorption process of their client and analyses the links between the ICAP and ACAP dimensions. Finally, we discuss the results in Section 4 and conclude with research limitations and future avenues.

1. ABSORPTIVE CAPACITY : A KEY DRIVER OF EXPLORATION INNOVATION CONTRACTS PERFORMANCE

1.1 Innovation exploration contracts : a new service relationship

Innovation is widely recognized as a key driver of firm survival and growth. Yet, research on innovative activity in the service sector is relatively recent (Gallouj and Weinstein, 1997; Den Hertog, 2000).

1.1.1 The emergence of exploration innovation contracts

To face major environment transitions such as market, technological or institutional changes and to preserve their competitive advantage, firms rely more and more on exploration activities (March, 1991) and open innovation strategies (Chesbrough, 2003). To meet these challenges, 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 suppliers. Some consulting firms have focused their areas of expertise in innovation. Co-innovation contracts based on innovative design are

characterized by considerable uncertainty as they 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. Moreover, this type of contracts does not efficiently protect partners which will have to deal with unexpected contingencies, such as changes of guidelines or cooperative modes. This context of innovative design introduces a new relationship between suppliers and clients that echoes the evolution from a transactional to a relational approach (Nogatchewsky, 2003).

1.1.2 A new relationship in innovation service contracts

More and more innovation-related activities are conducted outside organizational boundaries. Most prior research focuses on strategic alliances (Easterby-Smith *et al.*, 2008) and R&D partnerships at the expense of “traditional” contractual business service relationships. Yet, the consulting industry has grown quickly since the 1980s. To meet the needs of innovative firms, some consultants have focused their areas of expertise on innovation. As management, engineering and strategy consulting firms, these innovation suppliers 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 two 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 latter’s performance, 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’s dissemination role of valuable knowledge. Indeed, far beyond performing basic tasks in response to clients’ direct orders, 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, such that they play “*a major role in initiating and developing innovations in client firms*”.

The final outputs of such services include innovative products and service offerings. But innovative companies have also to deal with exploration activities. Opening up exploration innovation activities leads the client-supplier relationship to shift from co-

development to co-innovation (Segrestin, 2003; Maniak and Midler, 2008). It is characterised 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). The business model of co-innovation cannot rely on a return on investment logic, as the project might not be commercially exploited, especially since this is not a specific requirement of exploration contracts. The aim of co-innovation in this context is knowledge creation and learning externalities that may help the client preserve competitive advantages, for example by developing knowledge cross-pollinisation (Kelley and Littman, 2005) or innovation capacity (Den Hertog, 2000).

Because the effectiveness of KIBS depends on their knowledge accumulation, creation and dissemination abilities (Bettencourt et al., 2002), their contract performance relies on the client’s ability to deal with external knowledge. This is especially the case for exploration contracts as they are largely based on knowledge creation activities. When the knowledge bases between both firms are distant, the difficulties encountered through the knowledge transfer are more abundant (Szulanski, 1996). Absorptive capacity becomes a critical capacity is as it drives both client’ and KIBS’ innovation performance.

1.2 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 and highlight the role of external knowledge sources for its development. We also suggest an integrative model of absorptive capacity in a contractual relationship context.

1.2.1 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 innovation 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's 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.

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 <i>et al.</i> (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 <i>et al.</i> (2005); Todorova & Durisin

			(2007); Lichtenthaler (2009)
Transformation	Internalization and conversion	Recodification, questioning, integration	Szulanski (1996); Van den Bosch <i>et al.</i> (2003); Jansen <i>et al.</i> (2005); Lichtenthaler (2009); Flatten <i>et al.</i> (2011)
Exploitation	Use and implementation	Core competencies, harvesting resources.	Cohen and Levinthal (1990); Lane and Lubatkin (1998); Autio <i>et al.</i> (2000); Lane <i>et al.</i> (2006)

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

1.2.2 The role of ACAP antecedents

In addition to the need to adopt a dynamic view of ACAP in the context of innovation contracts and supplier–client relationships, we need more literature focused on ACAP antecedents, and specifically interorganizational antecedents (Volberda *et al.*, 2010),

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 ACAP research remains static and assumes the capacity is internally generated (Cohen and Levinthal, 1990; Zahra and George, 2002; Todorova and Durisin, 2007). Knowledge “sources” appear as simple ACAP antecedents, due to their knowledge base, motivation, or level of prior related knowledge. Volberda *et al.* (2010: 27) thus call for research “to build on prior work addressing the nature of AC [...] and inter-organizational antecedents so that there is an accumulation of knowledge about AC.” Even if little research considers interorganizational contexts (Dyer and Singh, 1998; Lane and Lubatkin, 1998; Easterby-Smith *et al.*, 2008), the inter-organizational nature of ACAP is a key dimension of the ACAP concept, that is why we seek to overcome the mainstream static view of ACAP antecedents and clarify the role of external sources in the development of absorptive capacity.

We stressed the need to consider the role of external knowledge sources in the ACAP processes as efficient knowledge sharing depends on the absorptive capacity of the recipient (Cohen and Levinthal, 1990) but also “very much on the knowledge sender’s attitudes and

behaviour” (Minbaeva and Michailova, 2004: 666). From an empirical investigation of collective research centers, Spithoven (2011) determines that the actors organize their absorptive capacity collectively. 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.” According to this perspective, firms affect one another’s ACAP, though Lichtenthaler and Lichtenthaler (2009) focus on the exploitation dimension, neglecting the other ACAP dimensions. Finally, recent works assume that ACAP do not results entirely from internal efforts. Despite they are recognized for their innovation role (Den Hertog, 2000), their “knowledge bridge” functions (Miles *et al.*, 1995), their intensive interactions with clients (Bettencourt *et al.*, 2002), the role of KIBS on the knowledge absorption process of their clients hasn’t surprisingly been much explored.

1.2.3 Insemination capacity: the role of KIBS on client’s ACAP

Previous work addresses ACAP according to a “teaching” perspective and explore the active role of KIBS in the context of innovation contracts. Imbert and Chauvet (2012) explored absorptive capacity focusing on the service suppliers role and propose an extended view of ACAP with the concept of insemination capacity (ICAP). The ICAP of KIBS may exert critical influence by helping the client overcome its potential lack of absorptive capacity.

ICAP is a dynamic organizational capability developed by service suppliers to initiate and perpetuate knowledge absorption sequences by the client through four dimensions: knowledge adoption, selection, contextualization, and preservation. Derived from empirical research into KIBS, these dimensions are described below and summarize in Table 2.

- Knowledge adoption refers to the service firm’s ability to recognize, pull, and adapt knowledge from clients. This mechanism aims to reduce the gap between the respective knowledge bases of both firms, by identifying valuable knowledge and drawing in external knowledge.
- Knowledge selection refers to the consulting firm’s ability to select valuable knowledge for the client. Through interactive exchanges, providers build an estimation of the ACAP client to determine which knowledge to transfer, because it can be assimilated by the client.
- Knowledge contextualization refers to the provider’s ability to adapt the knowledge to the context of the client organization.

- In ACAP settings, knowledge preservation seeks to preserve the created value from threats created by the client as the transfer unfolds. Innovative firms may go astray (e.g., from the initial goals of the contract) as they transform and exploit external knowledge.

Dimensions	Components	Themes	Citations
Adoption	Value recognition	Prior knowledge, cognitives structures	Cohen and Levinthal (1990), Todorova and Durisin (2007)
	Knowledge extraction	Communication openness, knowledge interorganizational transfer	Bettencourt et al. (2002), Berthon (2001)
	Client involvement in the co-production of the service	Knowledge co-creation, intensive interractions	Vargo et al. (2008), Bettencourt <i>et al.</i> (2002), Meeus <i>et al.</i> (2001)
	Client learning (knowledge bases, process...)	Organizational socialization	Gourdarzi and Eiglier, 2006)
	Absorptive capacity	Supplier absorptive capacity	Newey (2010), Zahra and George (2002)
Selection	Detection of valuable knowledge for the client	Identification of transfer opportunities	Szulanski (2000), Lichtenthaler and Lichtenthaler (2009)
	Knowledge retention	Sticky, tacit and complex knowledge.	Szukanski (1996), Nonaka and Takeushi (1995)
Contextualization	Knowledge clarifying	Recodification, transformation, adaptability	Zahra and George (2002), Kim (1998)
	Internalization	Transformation, transfer, dissemination	Zahra and George (2002), Easterby-Smith et Lyles (2008)
Preservation	Repetition and adjustment of components	Insemination capacity	Imbert and Chauvet (2012)
	Reminder of the project value, external review	Coordination mechanisms, control operations	Maniak and Midler (2008), Simonet et al. (2003)

Table 2. ICAP's dimensions: components and themes
(adapted from Imbert and Chauvet, 2012).

1.3 Research questions: towards an extended view of ACAP

Three main limits of the ACAP literature stress the need to explore the ICAP – ACAP relationship. First, most research on ACAP remains static. Volberda et al. (2010) point out the ignorance of process dimensions and note that the learning processes of ACAP are not fully utilized: « *research on AC should examine the relationship between intra-organizational and inter-organizational antecedents* » (ibid, 947). This dynamic view of ACAP appears particularly relevant in the case of innovation contracts as clients and service providers are engaged in a co-production relationship.

The role of external « knowledge sources » on ACAP has been neglected. Most ACAP research assumes the capacity is internally generated (Cohen and Levinthal, 1990; Zahra and George, 2002; Todorova and Durisin, 2007) and seems to forget ACAP is an organizational learning capacity. However, Lane and Lubatkin (1998: 461) note that « this definition of the (ACAP) construct suggests that a firm has an equal capacity to learn from all other organizations ». We stressed the need to consider the active role of external knowledge sources in the ACAP processes as efficient knowledge sharing depends on the absorptive capacity of the recipient (Cohen and Levinthal, 1990) but also “very much on the knowledge sender’s attitudes and behaviour” (Minbaeva and Michailova, 2004: 666). Furthermore, the importance of teaching activities has been largely neglected in the field of strategic management (Zhao and Anand, 2009). Thus, there is a need to explore ACAP at a dyadic level that takes account of knowledge external sources. Finally, ACAP literature has neglected the client-provider relationship. Most 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 services, and more specifically, in exploration contracts.

An extended view of ACAP based on a dyadic relationship between KIBS and their clients is required to address these limits. However, this relationship has not been explored empirically. Yet, an exploration of the ICAP-ACAP relation could propose an original explanation of the performance of exploration innovation contracts, as limited investigations relates absorptive capacity to radical innovation (Lane *et al.*, 2006) which is closed to the concept of exploration innovation: « Exploratory innovations are radical innovations, designed to meet the needs of emerging customers and new markets (Abernathy and Clark, 1985) » (Le Masson *et al.*, 2012, p3.)

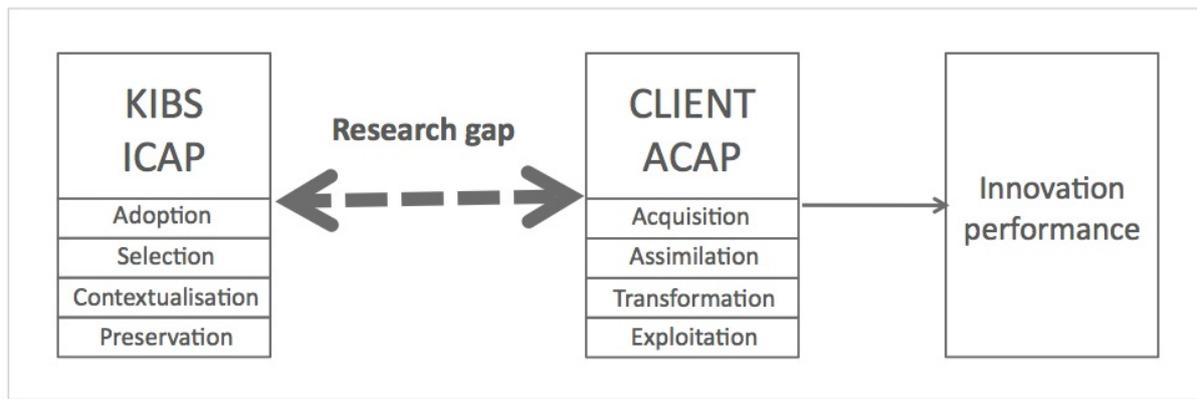


Figure 1. Towards an integrative model of the ICAP-ACAP relationship

The integrative model (Figure 1) remains static and points out the need to clarify the following links between ICAP and ACAP:

Links between the respective dimensions of both capacities

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”*. Precise correspondences between the ACAP and ICAP dimensions have not been yet explored.

Outputs of ICAP

As the links between ICAP and ACAP have not been explored yet, the outputs of ICAP are still vague. ICAP eases the start and development of a knowledge absorption sequence but the general outputs remain unclear. Further explorations should answer to the following questions: does ICAP develop ACAP ? Under which conditions?

Mutual adjustments to ACAP and ICAP levels

The level of absorptive capacity varies from compagny to compagny, whether they are service suppliers or innovative firms. Furthermore, absorptive capacity is relative and depends on context (Lane and Lubatkin, 1998). Thus, firms engaged in open innovation contracts have to adapt to each other and ajust their levels of ICAP and/or ACAP to fit their partner. We note that the integrative model might be misleading if taken at face value: the four dimensions of ICAP do not automatically coincide with the four dimensions of the ACAP model. In particular, there is a need to clarify how KIDS evaluate the ACAP of their clients and adapt themselves.

Then, we argue this process results in the adaptation of ICAP and ACAP respective dimensions. Prior research recognized a chronological order of ACAP dimensions although

they note the existence of feedback loops (Todorova and Durisin, 2007). But the ACAP process has not been much explored in empirical studies, even more in the context of exploration innovation contracts. We suggest ICAP follow the same chronological and dynamical process. Hence, the correspondences and adjustments of ACAP and ICAP dimensions follow a logical progression of organizational learning where both client and supplier should process step by step. This allows us to deduce some logical links between ACAP and ICAP respective dimensions while avoiding irrelevant combinations. For example, the KIBS cannot contextualises knowledge if the client has not acquired it. Therefore, we identify the main relevant relationships between ACAP and ICAP dimensions in figure 2.

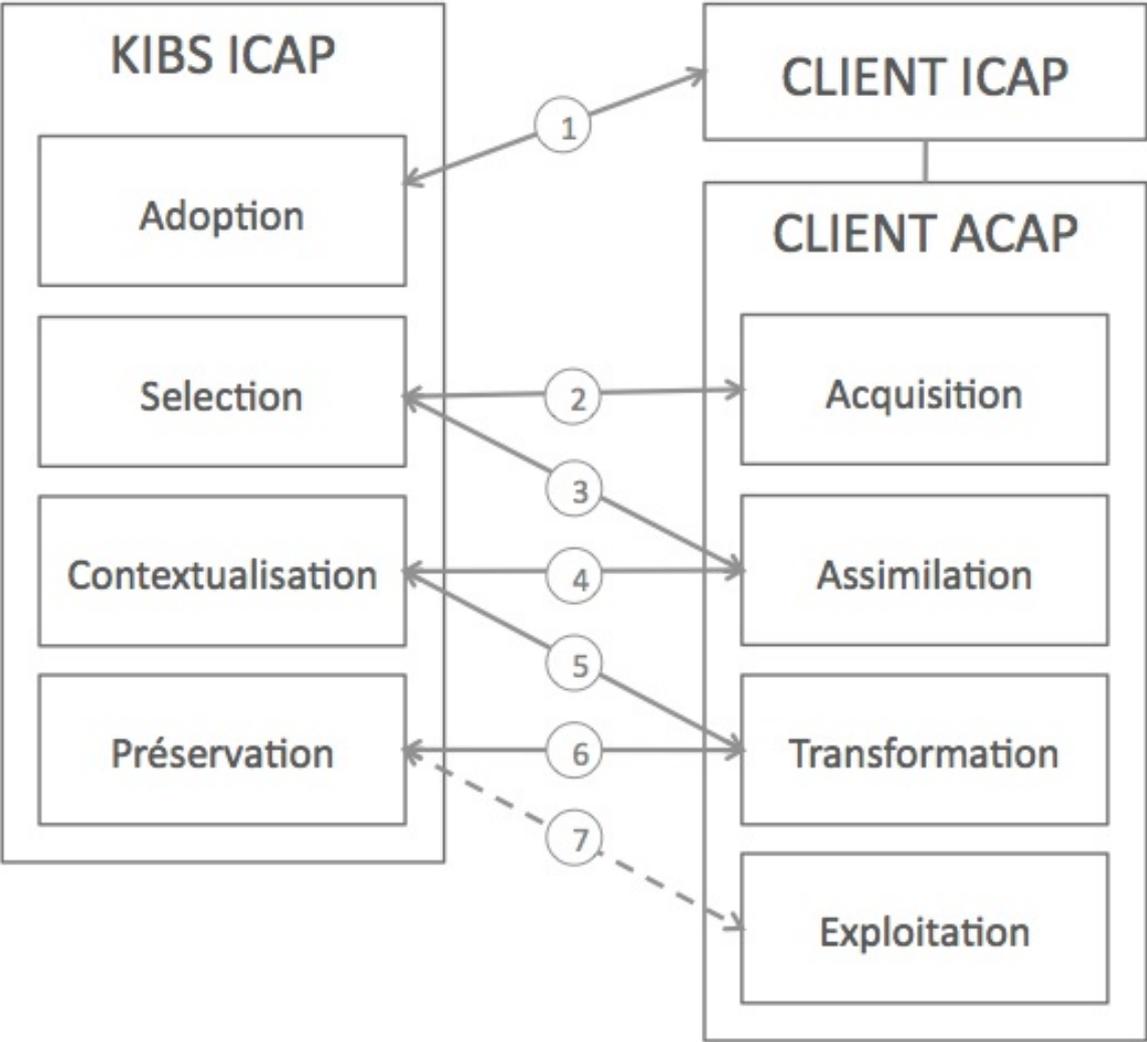


Figure 2. Relationships between ICAP and ACAP

The empirical exploration of these relationships is the core of this study. With this research, we explore the role of KIBS and innovative companies on the later absorption process through a dyadic and dynamic view and investigate the links between ICAP and ACAP. Hence, we address the most basic questions: What are the outputs of ICAP ? What are the correspondences between ACAP and ICAP dimensions ? What kind of interdependencies between KIBS and clients are involved in this relationship ?

2. METHODOLOGY: EXPLORATORY CASE STUDIES

To stress the need for an extended and dynamic view of ACAP, we seek an unconventional point of view of ACAP, namely that of the dyadic relationship. This research investigates the role of both supplier and client to absorb external knowledge in the context of exploration innovation contracts. Since the relationship between ICAP and ACAP has not been described in the literature, we conducted an exploratory research which presents exploration innovation activities in the form of contracts between a design agency and his clients.

Focusing on understanding the « how » and « why » of phenomena (Yin, 2003) and the issue of temporality (Rispoli, 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. This research relies on three exploration innovation contracts between a KIBS (a design agency) and his clients, in the household appliances and agri-food sectors. We present the cases and briefly describe the context of the contracts and the main knowledge absorption issues in table 1.

Clients	Context of contracts	Main issues
Client 1 is the 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.	<ul style="list-style-type: none"> ▪ The design methodologies of the KIBS are step away from the client's one. ▪ The client's contact person disseminates these methods internally. ▪ There is a gap between the transformation and the exploitation of concepts.
Client 2 is a 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,	<ul style="list-style-type: none"> ▪ Knowledge explorations have to be « business oriented ». ▪ The client's multidisciplinary team (R&D, innovation, marketing) facilitates

	suggest new areas of innovation and new concepts of products.	<p>knowledge dissemination across units.</p> <ul style="list-style-type: none"> ▪ Knowledge and concepts need the support of a high-ranking manager to reach the « exploitation stage ».
Client 3 is the 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 and long term.	<ul style="list-style-type: none"> ▪ Knowledge exploration is torn between the client's innovation and marketing teams. ▪ Innovation manager is focused on the development of methodological aspects and long-term vision whereas marketing team is focused on concrete results and short-term concepts.

Table 1. A brief presentation of the cases

We focused data collection on tracking the capacity of KIBS to impact the absorptive capacity of its clients. We used two primary sources: interviews and participant observation. One of us worked for four years as an innovation consultant in the KIBS company and participated to KIBS workshops and client's meetings. These datas were completed with in-depth interviews that were carried out with managers, each lasting from 100 to 150 min. We collect 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. In this view, we designed the guide interview so as to obtain a correspondence between datas and a better validity. The first interview guide has three main sections: the first one address the theme of service-provider relationship in exploration innovation contracts and the second one focused 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 methodology 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 insemination roles of KIBS and the correspondences between ICAP and ACAP respective dimensions which constitute the main parts of the results. However, the analyse is still in progress as we did not operate data reduction and

coding on data from the KIBS side. Finally, the inter-case analysis provides key elements of the discussion.

3. RESULTS

Our findings provide evidence of the active role of KIBS on the absorption process of their clients in the context of exploration innovation contracts. In a first part, we analyse the role of KIBS on the client's absorptive capacity. Then, we study correspondences between ICAP and ACAP respective dimensions.

3.1. The role of KIBS on the client's absorptive capacity

The results of this research confirm the significant role of knowledge-intensive business services on the client's absorption process. Despite the performance of exploration innovation contracts largely relies on the knowledge absorption of the client, strengthening a client's absorptive capacity is not an explicit objective of the contract.

Yet, the acquisition and use of new knowledge is a core objective of exploration innovation contracts:

« 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).

However, clients have to face various difficulties to absorb external knowledge. Through their insemination capacity, KIBS provides help in initiating and perpetuating a knowledge absorption sequence. Their insemination role acts in several ways that we develop later.

Our findings show this insemination role is exercised through subtle and intensive knowledge management activities that require mutual understanding of the partners. On one side, KIBS seeks usable and contextual knowledge from his client through the adoption process. He pulls knowledge, sometimes with unexpected results:

« From first meeting, they (the client's managers) give us all about figures, projects, strategy...absolutely everything. It blows my mind »

On other side, clients 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 their sensibility » (Client 1).

The 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 ».

This kind of knowledge reciprocal is supported by co-innovation activities and provides the basis for the mutual adjustments we analyse in the correspondences between ICAP and ACAP.

Finally, this research highlights the critical role of the client in supporting the insemination capacity of KIBS. This role is carried out in the favourable 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, insemination capacity 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 provides 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 ».

3.2 The Correspondences between ACAP and ICAP respective dimensions

Our findings show significant interaction between the respective dimensions of ACAP and ICAP. We analyse this relationships on the base of our theoretical framework (Figure 2). In keeping with our findings relative to the mutual adaptation of the partners, we adopt a dyadic view, considering both insemination capacity and absorptive capacity dimensions.

(1) The client – adoption correspondence

Our results suggest this correspondence is as a preliminary stage of insemination process. Indeed, KIBS needs to recognize, pull, and adapt external knowledge from clients. This study confirms the KIBS seeks relevant knowledge actively, through the adoption process and absorbs it through its own absorptive capacity:

« 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).

Our findings show the active role of the client. The latter actively disseminate his own knowledge such as technical, market, or historical knowledge:

« 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! ».

(2-3) The selection – acquisition/assimilation correspondence

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

« Managing prospective and research activities involve you must not deprived a source of ideas, of innovation, another vision or angle of approach » (Client 1.)

However, the KIBS aims at disseminating valuable knowledge for the client and select 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 » (Client 2)

Thus, knowledge selection eases the acquisition of external knowledge, reduce the gap between the partners knowledge bases and make the absorption process more fluid:

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

To enhance assimilation process, KIBS carefully selects knowledge supports and use 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 ». (Client 1).

(4-5) The contextualization – assimilation/transformation correspondence

Our findings 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 conduct:

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

Communication is critical and KIBS provides knowledge in a dynamic and personalized way, so as to make knowledge explicit for the client. 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 1)*

Involving interpretation, confrontation and questioning process by the client, KIBS actively disseminates knowledge. It appears as a complementary resource to database:

« Data accumulates [...] 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 » (Client 1).

(6-7) The preservation – transformation/exploitation correspondence

Links between preservation and exploitation appears weaker than previous ones. The design supplier was not involved in the downstream phases of the exploration projects which involve technical and commercial development. As most clients consider they are qualified to perform the exploitation phase, the role of KIBS is restricted. However, our results show 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 management). 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 ».

This may endanger the value of knowledge involved in the project. Finally, personal turnover also affects knowledge as managers retire with valuable knowledge. KIBS manages these issues through their knowledge preservation role. In this respect, KIBS may act as an external 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 guarantee knowledge preservation outside. There is an internal back-up and an external back-up ».

Despite the fact that we present these results in 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 ».

This verbatim underlines another issue relative to feedback loops: the transition from individual to team and organizational levels of ACAP. For example, when a manager disseminate knowledge to his team, he already has acquired, assimilated knowledge. These offsets were also observed between the KIBS and the clients and feedback loops affect both the absorption and insemination process.

4. DISCUSSION AND CONCLUSION

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 the knowledge absorption process of innovative companies is enhanced by the KIBS insemination capacity. The empirical exploration of the correspondences between the respective dimensions of the insemination capacity of KIBS and the absorptive capacity of their clients provides new insights relative to the innovation performance in the service contracts. Beyond this, three main contributions are worthy of further discussion here.

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 multidimensionnal role of KIBS on the ACAP performance of their clients. Three main roles and the associated consequences on ACAP merit to be discussed. We suggest KIBS act as:

- ACAP triggers.

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 involded when the

knowledge base or firms are so distant it makes the recognition of value difficult (Cohen and Levinthal, 1990). The, 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 thanks to its insemination capacity. The adoption, selection, contextualization and exploitation capacities of the KIBS fluidifie transitions between ACAP dimensions. In this view, we KIBS act as ACAP dimensions triggers that accelerates and facilitates the process. We suggest a fluidier absorption process enhances the global knowledge absorption performance, in somewhat similar to Zahra and George (2002). The authors pointed out social integration mecanisms reduce the gap between potential absorptive capacity and realized absorptive capacity. Hower, we suggest ACAP facilitation mechanisms have broader impact as they trigger all dimensions of absorptive capacity.

- ACAP developer.

Our findings highlight the role of KIBS on 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 come back to this issue in the third point of the discussion.

- ACAP teacher.

Although KIBS does not aim to strengthen the client's 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. In the previous point, 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 does not

make part of the contract but we suggest that KIBS may undertake this role despite themselves and under certain conditions. In economics, Stiglitz'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. Case n°1 provides some insights. As a reminder, the absorption of external knowledge was the main objective of the contract: *« 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).* 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.

Despite the fact that the development of insemination capacity is not their priority, KIBS might engage too much efforts to develop this capacity, i.e. more than the client really needs to absorb knowledge. Following the idea that benefits of suppliers' integration « may be curvilinear, where costs start to outweigh benefits at some tipping point » (Das *et al.*, 2006, from, Newey, 2010), we suggest KIBS should adapt their level of ICAP to the context and the client. In that sense, the intensive interactions observed in this study should play a major role. Overall though, KIBS must seek some kind of balance based on the first knowledge exchanges of the two firms. If the ICAP level developed by the KIBS is too low, the client cannot absorb the knowledge. At the opposite, too much ICAP could also limit organizational learning and "weaken" the client's ACAP, which can affect contract performance across both firms.

Secondly, this research highlights the role of interactive processes and mutual adjustments on the absorption performance of the client. It suggests different types of absorptive capacity and insemination capacity co-exist. Studying ACAP in the context of

open innovation, Newey (2010) introduced the concepts of customer and supplier absorptive capacity. The first one refers to inbound open innovation whereas the supplier absorptive capacity refers to outbound innovation. Indeed, the author argues that a single firm sometimes acts as an upstream supplier only to become then the supplier to a downstream customer. The firm can be compelled to be skilful at both. Thus, « The focus of and way that absorptive capacity is leveraged is different in both cases » (Newey, 2010: 704). Following on from that, we raise the issue of symmetrical absorption and insemination processes, where both partners need their knowledge to be absorbed by the other. On one side, this research confirms that the insemination capacity of KIBS is based on their own absorptive capacity, expressed on slightly different as much of the knowledge is transferred from the KIBS to the client. On the other side, this research provides new elements on the role of clients. Not only clients open their knowledge bases to the KIBS. They also manage the dissemination of their own knowledge and rely on a kind of insemination capacity. To sum up, both KIBS and clients need resort to their own ACAP and ICAP, realized on slightly different way as they do not have the same goals.

Thirdly, in furtherhance of the previous point, we 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 (ICAP), process and know-how (innovation, communication, interpersonal skills...).

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 contracts. 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 lack of absorptive capacity. Explorations in this way should offer interesting and differentiated results as ICAP 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 affect 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 measure the outputs of insemination capacity on the absorptive capacity of the clients to better explain the role of KIBS. Indeed, this study provides exploratory results that do not address this assessment issue. As recent research provides great scale mesure of ACAP (Flatten *et al.*, 2011; Jiménez-Barrionuevo *et al.*, 2011) that could be use in the context of innovation contracts, we suggest futur work should develop and use a multidimensional scale mesure of ICAP in order to measure the role of the insemination capacity of KIBS on their client's 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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