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Revisiting Absorptive Capacity: Literature review and a Practice-based

Extension of the Concept

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Abstract

This paper reviews the developed body of literature on absorptive capacity over the last two decades. It identifies and discusses the main research streams and argues that the tensions in the literature originate from overlooking the importance of ?meaning? in knowledge transfer and the dominance of variance models. Following from that, and building on the recent developments in literature, we argue that a practice-based extension of the concept, which embraces aspects of meaning, participation, identity transformations, and agency can complement the extant absorptive capacity research. It is, moreover, argued that when novelty increases, the practice-based approach can offer a stronger explanatory account of absorptive capacity compared with the existing conceptualiations.

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Abstract

This paper reviews the developed body of literature on absorptive capacity over the last two decades. It identifies and discusses the main research streams and argues that the tensions in the literature originate from overlooking the importance of 'meaning' in knowledge transfer and the dominance of variance models. Following from that, and building on the recent developments in literature, the paper discusses that a practice-based extension of the concept, which embraces aspects of meaning, participation, identity transformations, and agency can complement the extant absorptive capacity research. It is, moreover, argued that when novelty increases, the practice-based approach can offer a stronger explanatory account of absorptive capacity compared with the existing conceptualisations.

Keyword: Absorptive capacity, Meaning, Participation, Agency

INTRODUCTION

After more than two decades since the introduction of Absorptive Capacity (AC) by Cohen and Leviathan (Cohen and Levinthal, 1989, Cohen and Levinthal, 1990), AC has become a widely-adopted concept in technology management and organisation studies. Defined as the ability to recognize the value of external knowledge, assimilate and apply it (Cohen and Levinthal, 1990), AC is considered as the capability for coping with environmental velocity (Van den Bosch et al., 1999, Lichtenthaler, 2009), achieving innovations (Murovec and Prodan, 2009, Nooteboom et al., 2007, Tsai, 2001, Lin et al., 2012, Robertson et al., 2012), gaining competitive advantage (Zahra and George, 2002), improving alliance performance (Mowery et al., 1996, Hoang and Rothaermel, 2005, Hurmelinna-Laukkanen et al., 2007), and handling technological sourcing (Rothaermel and Alexandre, 2009). However, despite the burgeoning contributions to AC literature, the concept remains elusive for researchers and practitioners as a result of different conceptualisations, inaccurate operationalisations, and flawed applications (Zahra and George, 2002, Lane et al., 2006, Volberda et al., 2010).

By reviewing the extant AC literature, this article aims at identifying the sources of these ambiguities and at refining its conceptualisation. I begin by exploring the origins of the concept and the way it was developed originally. Then, I elaborate on two research streams that have developed since the introduction of AC, which I classify as the cognitive approach, and the evolutionary/dynamic capability approach. Afterwards, I argue that the two inter-related factors contributing to AC elusiveness include the dominance of the variance models which take boundaries for granted (Easterby-Smith et al., 2008), and overlooking the importance of 'meaning' in knowledge transfer. Being informed by these features, I make a case that a practice approach can complement the extant AC conceptualisation through inclusion of a more complex understanding of boundaries, by attending to the meaning making processes and identity development within and across various boundaries, and through presenting a more contextualised view of boundary spanners and their agency. I, then propose a theoretical framework which links practice approach to AC. The article concludes with summarising the main features of the proposed approaches to AC and offering recommendations for future research.

THE COGNITIVE APPROACH

The importance of utilising and managing external knowledge was well-recognised by management researchers (Allen et al., 1979, Allen et al., 1983, Tushman and Scanlan, 1981)

before the introduction of the AC concept by Cohen and Levinthal (1989, 1990) in the late 80s. However, at the time of authoring the 1989 and 1990 articles, a systemised understanding of how external knowledge can contribute to a firm's prosperity was still lacking. In their 1989 article (Innovation and Learning: The Two Faces of R & D. The Economic Journal, 99(397), 569-596), Cohen and Levinthal's conceptualisation of absorptive capacity was inspired by the authors' interests in an economic understanding of firms' behaviour. At the time, the extant approach was that external knowledge is public good and there is little cost involved in identifying and assimilating it. However, Cohen and Levinthal argued that, in addition to the availability of external knowledge within the firm's environment, the ability to successfully intake external knowledge i.e. to recognise, assimilate, and apply it depends on investments in R&D.

In the 1990 article (Absorptive Capacity: A New Perspective on Learning and Innovation. Administrative Science Quarterly, 35(1), 128-152), Cohen and Levinthal expanded their conceptualisation of AC from an economic perspective into the one, which accounted for the cognitive characteristics of learning. More specifically, in this contribution, by linking the dynamics of individual into organisational learning, they offered a cognitive basis for their theory of AC.

Cohen and Levinthal's work built upon two inter-related learning views. First, it was largely influenced by organisational learning literature developed during the 80s (Levitt and March, 1988, Fiol and Lyles, 1985). This literature made a distinction between individual and organisational learning by contending that 1) organisational learning is more than the summation of individual learnings and 2) features of organisational cognition such as organisational memory, mental maps, norms and values are more enduring than those of their members (Hedberg, 1981 p.6). Second, Cohen and Levinthal deployed the work developed by cognitive psychologists who had studied the way individuals develop their memory and cognition (e.g. Bower and Hilgard, 1981, Vygotsky, 1986). As such, Cohen and Levinthal's formulation of learning linked dynamics of individual cognition into organisational ones. According to them, prior related knowledge or problem solving experience makes individuals receptive to new knowledge in the respective domain:

prior knowledge enhances learning because memory-or the storage of knowledge-is developed by associative learning in which events are recorded into memory by establishing linkages with pre-existing concepts (Cohen and Levinthal, 1990 p.129).

Then, Cohen and Levinthal proceeded to propose that organisations follow the same logic in their learning i.e. the prior knowledge that organisations accumulate determines the effectiveness of their later efforts to acquire external knowledge, and like individuals, organisations have memories, which can be used for stocking knowledge/ information. Similarly, the broader the knowledge base of organisations, the more probable that they will detect new external knowledge and 'absorb' it. Emphasising the underlying learning mechanisms of AC and discussing the psychological underpinnings of the concept enriched the theoretical power of AC making it appealing to both organisation and innovation researchers interested in understanding the usage of external knowledge by organisations. It is, therefore, not surprising that between the two articles, the 1990 article has received considerably more citations, and is widely recognised as the seminal AC paper.

However, they make three assumptions in making the analogy between individual and organisational learning. First, they assume that individuals learn through accumulating knowledge and information. Second, they assume that organisations have memories where knowledge can be stored, retrieved, disseminated, and applied. Finally, they assume that organisations, like individuals, can associate and connect ideas and thoughts in order to comprehend new forms of knowledge.

This cognitive approach has been dominant in a large body of the literature although there are two streams identifiable out of it. The first stream considers AC as an absolute concept arguing that the ability to identify, assimilate, and apply new external knowledge depends on the level of the prior knowledge the firm irrespective of the characteristics of the senders and receivers of knowledge. The second stream develops a more contextualised approach to AC arguing that AC is a relative concept, which depends on the features of the dyads involved in the learning process. Below, I discuss the two approaches in more details. Table 1 demonstrates the key contributions in both camps.

<div align="center">TABLE 1: KEY CONTRIBUTIONS IN COGNITIVE CAMP</div>

Key contributions to AC	Type of AC	Theoretical determinants of AC	Research design	Description
Cohen and Levinthal (1990)	Absolute	Organisational knowledge base	Quantitative	Prior related knowledge base of the firm determines its AC and the path it takes to develop. AC is motivated by the presence of knowledge and spillovers within the industry
Szulanski (1996)	Absolute	Knowledge stock (managerial and technical)	Quantitative	AC of the recipient business unit determines the success of best practice transfer from other units when the knowledge is sticky.
Mowery et al. (1996)	Relative	Pre-alliance technological overlap	Quantitative	The level of patent base proximity between the firms forming an alliance in a dyadic relationship determines the success of knowledge acquisition from each other
Kim (1998)	Absolute	Knowledge base Intensity of efforts	Qualitative	AC is a component of the organisational learning system. It depends on the prior knowledge and intensity of efforts, but it dynamically develops through the process of proactive crisis building.
Lane and Lubatkin (1998)	Relative	Knowledge base similarity Structural similarity Dominant logics similarity Incentive structures	Quantitative	AC depends on the context of the relationship and the relative aspect of learning between teacher and student firms. These characteristics are relational so AC is a relative concept.
Cockburn and Handerson (1998)	Absolute	R&D intensity Percentage of highly educated employees Budget deficit	Qualitative/ Quantitative	AC builds on in-house R&D and total publication per research dollar record. They conclude that in addition to AC, firm's connectedness to external community contribute to the performance
Tsai (2001)	Absolute	R&D intensity	Quantitative	AC moderates the relationship between the network position and innovation of business units. The knowledge base (captured through R&D intensity) determines the level of AC.
Lane et al (2001)	Relative and absolute	Trust between partners Cultural similarity Flexibility and adaptability Business strategy	Quantitative	The three dimensions of identification, assimilation, and application of AC are dismantled each of which having different components. While the components for identification and assimilation of AC are relative and relate to the characteristics of the dyad, the application dimension of AC relates to the competencies developed internally.
Nooteboom et al. (2007)	Relative	Cognitive proximity between firms Patent profile overlaps	Quantitative	AC depends on the cognitive proximity between two firms. Too large or too little cognitive distance result impedes learning and prevents innovations.

Absolute AC

Some authors have used AC concept as the determinant of knowledge transfer and organisational performance. The underlying assumption in these contributions is that AC leads learning and therefore affects performance. Szulanski (1996) posits that the AC of the recipient business unit positively affects the transfer of best practices. Meeus et al. (2001) analyse the relationship between AC of the focal organisation and interactive learning with suppliers and customers. They use R&D intensity, percentage of higher educated employees and budget deficit in firms as the proxies for AC. However, their findings reveal that AC is a poor predictor of interactive learning. Tsai (2001) uses R&D intensity as a proxy for AC and suggests that the relationship between the network position of a business unit and its performance is mediated by its AC. Rothaermel and Alexandre (2009) reason that AC,

captured by R&D intensity of the firm, moderates the relationship between the firms' ambidexterity and its performance. Kim (1998) develops a framework for learning system of which AC is a part. Proposing a stage-based model for organisational learning, Kim (1998) contends that AC develops through 'proactive constructed crisis'.

For these researchers, AC shares three features. Firstly, it relies on the knowledge stock of the firms, business units, research departments, etc. Secondly, it develops purely at the firm level and is less concerned with the context of inter-organisational relations. Therefore, AC of an organisation grows independent of its environment or collaborators. Thirdly, the relationship between learning and AC is blurred (Lane et al., 2006, Sun and Anderson, 2010) i.e. it is not evident which one drives the other.

Relative AC

A more contextualised approach to inter-organisational learning and its relation with AC is proposed by relational views. Dyer and Singh (1998) propose a relational view to firm theory as an extension to resource based theory of the firm. They argue that a firm's resources are not bound to their boundaries but may be embedded in inter-organisational relationships a firm maintains with others. Following this approach, Lane and Lubatkin (1998) introduce the concept of relative AC as the ability to extract knowledge from a particular teacher organisation. They posit that relative AC is represented by the similarities between firms' knowledge bases, and organisational structures and compensation policies. Lane et al. (2001) expand the formulation of AC to incorporate cultural compatibility, and trust in AC. They disaggregated the three dimensions of AC (identification, assimilation, and application), and concluded that while the former two are relational, the factors that constitute the application dimension of AC are mainly organisational. Other researchers have explored the relativity of AC within sender-receiver dyads arguing that the similarity between knowledge bases can facilitate knowledge transfer between partners (Mowery et al., 1996, Kim and Inkpen, 2005, Hoang and Rothaermel, 2005, Reagans and McEvily, 2003).

The other stream of research has employed organisational cognition approach to conceptualise relative AC. Being inspired by theories of organisations as interpretation systems (Weick and Roberts, 1993, Smircich, 1983, Daft and Weick, 1984), Nooteboom (2000) developed a more sophisticated cognitive approach compared to Cohen and Levinthal's seminal work. He defined cognitive distance as the difference in cognitive function (p.73), and reasoned that cognitive distance determines the AC of a firm. This

approach builds upon mental models and cognitive maps and assumes that a collective cognition (which is then the basis for AC) relates to the commonality between the mental models of individuals. For example, too large or too little cognitive distances will be detrimental to collaborations as firms will either dismiss the new knowledge because of the lack of AC or they will not learn anything from it as it is too close to their existing cognitive map (Nooteboom et al., 2007, Bogenrieder and Nooteboom, 2004).

In general, although in this line of research, some authors have explored the contextual dimensions in AC literature, the main assumption is that the similarity of knowledge bases between the teacher and student organisations is the main determinant of AC.

The commodification of knowledge

The main attribute of the cognitive approach to learning is that it decontextualises learning. What Cook and Brown (1999) refer to as the epistemology of possession is the dominant logic in this body of literature. Epistemology of possession considers knowledge as a thing (Orlikowski, 2002) to be acquired, stored, processed, and retrieved. It is partly inherent in the definition since AC is defined as the ability to identify, assimilate, and apply external knowledge. Gherardi (2006 p.10) argues that the notion of knowledge has become reified[1] in the knowledge management literature and knowledge is no longer different from other previously discussed concepts in literature such as information. Interestingly, Cohen and Levinthal (1990) use the notion of knowledge interchangeably with information:

> *... prior related knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends."*

This view to knowledge, however, accompanies some drawbacks. If knowledge is embodied in factual acts, which can be sent or received independent from their immediate social context, it will be relatively convenient to transfer it in time and space. However, we know from literature that it is not true, and knowledge becomes difficult to transfer when it is sticky, or tacit (Szulanski, 1996), as it becomes embedded in the context of knowing (Cook and Brown, 1999, Orlikowski, 2002, Nicolini, 2011). I will return to this point later in the article.

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[1] Luckmann and Berger (1967, p.89) define reification as: "Reification is the apprehension of human phenomena as if they were things, that is in non-human or super human or possibly supra-human terms.... Reification implies that man is capable of forgetting his own ownership of the human world, and further the *dialectic between man, the producer, and his products is lost to consciousness."*

EVOLUTIONARY APPROACH AND DYNAMIC CAPABILITIES

Another line of thinking in AC is inspired by the evolutionary approach in which, authors have argued that AC of the firms directs the evolutionary path that they take and the responses they give to environmental velocity and change (Koza and Lewin, 1998, Van den Bosch et al., 1999, Lewin et al., 2011). Koza and Lewin (1998) argue that strategic alliances co-evolve with the firm's strategy, and AC affects this co-evolutionary process if the alliance is exploratory. In exploratory alliances, because knowledge creation and learning between alliance partners becomes more challenging, the role of AC becomes more significant in determining the strategic direction that firms take. The other key contribution to AC literature which extends the definition and conceptualisation of AC is Van den Bosch et al.'s (1999) article (Lane et al., 2006). In this work, Van den Bosch et al. propose a co-evolutionary approach to AC which explains how AC of a firm co-evolves at macro level (i.e. with its knowledge environment) and at micro-level (i.e. within the firm). Within firms, AC evolves through the interactions between the level of prior related knowledge, expectation formations and combinative capabilities. Within the knowledge environment, AC evolves by utilising the opportunities of knowledge acquisition through shaping and directing the development of knowledge environment. Paying attention to the characteristics of knowledge environment is an important departure from Cohen and Levinthal's work in which the knowledge environment is benign i.e. it is 'out there' and it is up to firms to extract and exploit it. By adding the knowledge environment to the Cohen and Levinthal's (1990) loop, Van den Bosch et al. (1999) extend the conceptualisation of AC to an organisational capability which builds on the recurrent interactions and mutuality that organisations develop with their environment.

By exploring the environmental aspects, Van den Bosch et al., moreover, pave the way for future contributions to AC which adopt a dynamic capabilities (Teece et al., 1997) framework mainly because dynamic capabilities assist firms with responding to environmental stimuli. By reviewing the AC literature developed since Cohen and Levinthal's introduction of the concept, Zahra and George (2002) propose a dynamic capability formulation of AC. They argue that AC literature has suffered from two particular shortcomings. First, they contend that various empirical applications of the concept do not converge to capture the same concept as past research. Second, they argue that having been used in multiple levels of analysis including the country level (Keller, 1996, Griffith et al., 2003) , inter-organisational level (Oxley and Sampson, 2004, Lane and Lubatkin, 1998), and

organisational level (Szulanski, 1996, Kim, 1998, Van den Bosch et al., 1999), AC has become inconsistent in its manifestations and operationalisations.

Although Cohen and Levinthal had discussed the three dimensions of AC (i.e. identification, assimilation, and application), no clarity or consensus was achieved about how these three aspects are configured in firms, and more importantly, AC was mainly a black box (usually captured in the form of knowledge stock) with its antecedents and consequents. Responding to this inadequacy, Zahra and George (2002) define AC as a dynamic capability embedded in a firm's routines and processes, making it possible to analyze the stocks and flows of a firm's knowledge (p.186) and posited that AC contributes to the creation and sustainability of competitive advantage. They decompose AC into four capabilities of acquisition, referring to a firm's capability to identify and acquire externally generated knowledge that is critical to its operations(p.189); assimilation, referring to the firm's routines and processes that allow it to analyze, process, interpret, and understand the information obtained from external sources(p.189); transformation, referring to a firm's capability to develop and refine the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge(p.190); and exploitation referring to the routines that allow firms to refine, extend, and leverage existing competencies or to create new ones by incorporating acquired and transformed knowledge into its operations (p.190).

This extension of the concept inspired the next wave of research in AC literature, though fewer AC studies empirically examined Zahra and George's model. Jansen et al. (2005) identify three forms of combinative capabilities (systems capabilities, coordination capabilities, and socialisation capabilities) as the antecedents of AC that support the identified dimensions of AC in Zahra and George (2002) model. Viewing AC as a dynamic capability, Lane et al. (2006) propose a stage-based model for AC which encompasses three dimensions of exploratory learning, transformative learning, and exploitative learning. They argue that characteristics of internal and external knowledge, environmental conditions, learning relationships, firm's strategy, firm members' mental models, firm's structures and processes affect the development of AC. Lichtentahler (2009) empirically tests Lane et al.'s model, and argues that in turbulent technological and market environments, AC is more likely to demonstrate innovative outcomes.

The last key contribution in this strand of AC theorising is that of Lewin et al. (2011). This article integrates evolutionary economics (Nelson and Winter, 1982) with the dynamic

capabilities view (Teece et al., 1997) to develop a framework for AC which is rooted in internal and external AC metaroutines. Internal AC metaroutines include variation, selection, retention and replication while external AC metaroutines include identifying and recognising value of external knowledge, learning from and with partners, and transferring knowledge back to organisation. They, then, argue that the complementarity between the external and internal AC metaroutines contribute to dynamic capability and innovation output of the firms. Table 2 presents the key contributions in the camp of evolutionary and dynamic capabilities.

TABLE 2: THE KEY CONTRIBUTIONS IN EVOLUTIONARY AND DYNAMIC APABILITIES

Key contribution	Focus of theory	Description
Koza and Lewin (1998)	Evolution	AC contributes to the firm's strategic portfolio in co-evolution with its strategy. AC is more relevant in exploratory alliances compared with exploitative alliances.
Van den Bosch et al (1999)	Evolution	AC develops in macro and micro circles of co-evolutionary effects. Path-dependency of AC is not only internal but AC also directs and shapes the knowledge environment.
Zahra and George (2002)	Dynamic capability	AC is a dynamic capability which build upon the configuration of potential and realised AC. The effectiveness of AC depends on the capability of firms to strike a balance between the two.
Jansen et al (2005)	Dynamic capability	Combinative capabilities constitute the antecedents for AC. Coordination capabilities mainly enhance acquisition and assimilation while socialisation capabilities influence transformation and application
Lane et al. (2006)	Dynamic capability	AC consists of three sequential learning mechanisms of exploratory, transformative, and exploitative learning.
Lichtentahler (2009)	Dynamic capability	The complementarity between the three learning dimensions makes AC a dynamic capability. Environmental velocity, moreover, moderates the effect of AC on innovation
Lewin et al. (2011)	Evolution	AC consists of external and internal metaroutines. The balance between the two sets of metaroutines leads to their complementarity and results in innovation.

Although conceptualising AC in the form of dynamic capabilities resolves the problems associated with the extrapolation from individual cognition to organisations through introducing the organisational processes and routines to absorb knowledge, it maintains its commodified approach to knowledge as a possession to be absorbed and processed by a set of capabilities. By making knowledge discernible from its immediate context, in dynamic capabilities view, AC consists of a bundle of routines aimed at absorption of knowledge. For example, routines to search (Lewin et al., 2011), routines to analyse market information (Jansen et al., 2005), or processes to analyse new knowledge (Zahra and George, 2002) routines to store and disseminate knowledge or combining existing knowledge with new knowledge (Lichtenthaler, 2009, Jansen et al., 2005) are among the most cited constituents of AC.

There is another problem associated with the dynamic capability view. Although this approach has been championed by some scholars, there has been little explanation developed on why and how such a formulation of AC can be a dynamic capability. The underlying feature of dynamic capabilities is their contribution to change in operational routines through

higher order routines (Zollo and Winter, 2002, Winter, 2003). However, the notion of routines to change routines or the mechanisms to change operational routines within firms is less conspicuous in AC literature. In practice, there is not much dynamism involved throughout the four stages of AC (acquisition, assimilation, transformation, and exploitation) - i.e. they succeed sequentially- and it is unclear how AC components (acquisition, assimilation, transformation, and exploitation) trigger change in operational routines – i.e. they only funnel knowledge into organisations in a linear fashion. In this format, as Argyris Argyris and Schon (1978) would put it, at its best, AC is a mechanism that favours single-loop learning. If AC is a dynamic capability, it should offer ways through which organisations change their status quo and renew themselves in order to gain competitive advantage. Gaining and applying new knowledge (which is usually viewed as pieces of information) does not guarantee dynamic capability on its own.

THE PROBLEM OF VARIANCE MODELS AND THE TAKEN FOR GRANTEDNESS OF BOUNDARIES

The dominance of variance models is one of the pitfalls of the extant AC literature. According to Van de Ven (2007 p.145), variance models seek to explain causalities by virtue of the relationships between input/output variables. They model the (social) world through a linear relation between a set of variables. In many studies, AC has been researched through variance models- which explore the relationship between antecedents (managerial cognition, structure of the firm, mental models, combinative capabilities, etc.) and consequents of AC (performance, innovation, learning, competitive advantage).

Such approach has led to ignoring the internal dynamics of AC. The need to explore the internal dynamics of AC is recognised by Easterby-Smith et al. (2008). They state that the unsatisfactory development of AC literature originates from the dominance of quantitative methods which overlook exploring the inner processes of AC. According to them, there is no point to continue debates on measuring and defining AC unless we identify its features, which can only be achieved through qualitative longitudinal studies of AC. Therefore, they argue, there is a need to deploy 'process' models to explain how AC unfolds within organisations. Zahra and George's (2002) quest to introduce four capabilities of AC was the first attempt to provide a process model of AC, although their process model is a part of a broader variance model with its antecedents (knowledge complementarities, experience, and

activation triggers) and consequences (competitive advantages). Moreover, although their model is presented in process form, it does not tell how the four dimensions of AC interact.

Variance models, in addition, overlook the role of boundaries, their emergence and the mechanisms for bridging them over time. In their original conceptualization, Cohen and Levinthal (1990) emphasize the importance of organisational boundaries for AC by highlighting the role of boundary spanners and their significance in integrating external knowledge into their organisation. However, this aspect of AC is not addressed in the empirical part of the 1990 article neither it is adequately attended by the following researchers since (cf. Easterby-Smith et al., 2008 for an exception).

Although external knowledge is central to AC, and acquiring and exploiting external knowledge is key to gaining competitive advantage (Zahra and George, 2002, Todorova and Durisin, 2007), the notion of external is a problematic one. In the ever-changing context of business ecologies (Dougherty and Dunne, 2011), organisational boundaries cannot be clearly distinguished and the external-internal demarcation is blurred. Organisations, as well as their members, belong to multiple communities, networks, alliances, societies, associations, groups, etc. resulting in dynamic and constantly changing boundaries (Hernes, 2004, Mørk et al., 2012, Dougherty and Dunne, 2011). This, in turn, makes it difficult to specify boundaries as pre-established and easy-to-observe entities.

Moreover, AC does not deal with merely one type of boundary. Identification, assimilation and application of knowledge are not merely bound to organisational boundaries. Santos and Eisenhardt (2005) argue that only focusing on legal boundaries of the firm does not reflect the way organisations interact with their environment including their partners, customers, suppliers, etc. In addition to legal boundaries of organisations, the practice boundaries can impede AC. Some researchers have argued that knowing is situated in communities of practice (CoPs) (Wenger, 1998, Lave and Wenger, 1991, Boland and Tenkasi, 1995) that have boundaries, in their own right. The very fact that the practice of a community is not shared at its exterior and cannot be accessed by non-members, is the main element of the boundary. On the other hand, owing to their shared context, communities of practice can facilitate knowledge sharing across organisational boundaries. For example, Duguid (2005) explains how communities of practice can mobilise knowledge across organisational boundaries due to a priori shared knowledge context. They label this global feature of knowledge sharing among actors belonging to similar practice as 'network of practice'. Finally, projects have

boundaries. While many organisations use projects to achieve innovations or technological change, the transfer of acquired knowledge into the wider context of organisations can be challenging (Scarbrough et al., 2004, Swan et al., 2010). Projects necessitate particular governance, idiosyncratic goals and milestones, and a specific combination of human resources and skills, which make them distinct from other types of organizing. The temporality of projects, on the other hand, prevents project-based organisations from sustaining the knowledge gained in the projects (Prencipe and Tell, 2001, Lindkvist et al., 1998). Accordingly, AC does not deal with one clear (external vs. internal) type of boundary (i.e. organisational) but it deals with a mixture of boundaries scattered spatially and temporally. Organisations live in what I label as the ecology of boundaries that are produced and reproduced across various groups of actors and stakeholders.

Yet, in a large body of literature, the geography of AC is taken for granted, the distinction between external and internal is handled rather intuitively, and organisational boundaries are considered as the only sources of discontinuity which require crossing for external knowledge to be transferred, assimilated, and applied.

THE PROBLEM OF MEANING AND THE IMPORTANCE OF PARTICIPATION

Above, I stated that AC views knowledge as a commodity, but there remains a more important question. What is wrong with commodifying knowledge and how can such view weaken AC? One of the problems associated with the commodified view of knowledge is taking meaning for granted. In this view, knowledge is a body of factual statements to be sent, received disseminated, accumulated, combined, and retrieved (through AC). As discussed, this approach to knowledge has its roots in the origins of AC and in early 90s learning approaches. At the time, much of the research on knowledge transfer within and between organisations had focused on the codification and articulation of knowledge across boundaries and it was argued that using routines and procedures to codify knowledge can help with transferring decontextualized knowledge across contexts (Levitt and March, 1988, Cohen and Bacdayan, 1994).

Trying to address the difficulty of transferring contextual knowledge, some recent contributions have highlighted the stickiness of tacit knowledge arguing that tacit knowledge is difficult to codify and transfer (Nelson and Winter, 1982, Nonaka, 1994, Kogut and

Zander, 1992). According to these authors, knowledge can be transferred only if there exists a well-developed capability to successfully decontextualize, codify, and absorb it (Szulanski, 1996). Although these advancements have contributed to our understanding, they treat knowledge as a given 'thing' which can be identified, decontextualized, analysed, and freely transferred across contexts (Bechky, 2003). Such approach to knowledge transfer, however, views 'meaning' as universal. The only problem in transferring knowledge is to decode it through syntaxes. Once the 'syntaxes' are set and sufficient capability for encoding and decoding knowledge (e.g. through standard operating procedures or through formalising routines) is developed, there is little obstacle in transferring knowledge even when it is tacit and sticky. The challenge, therefore, lies in making tacit explicit (Nonaka, 1994). Following this logic implies homogeneity of contexts across various boundaries between and within organisations. In other words, it presumes that knowledge is understood similarly in different contexts bearing the same meanings for senders and receivers of knowledge. Yet, it fails to explain why some ideas remain distant, and overlooked by some communities while they are easily adopted, assimilated, and developed by others even when they become explicit and accessible.

The alternative approach to knowledge and learning contends that knowledge is situated, contextual, relational and historic (Lave and Wenger, 1991, Cook and Brown, 1999, Gherardi and Nicolini, 2000), and that meaning is inseparable from and develops only in relation to its context. "Meaning is not constituted through individual intentions; it is mutually constituted in relations between activity systems and … has a relational character" (lave, 1993 p.18). Knowledge, as a form of meaning, therefore, develops in the context of local communities and is hardly accessible to the people who do not hold any participation in those communities. In this view, participation plays a key role in the meaning making process (Lave and Wenger, 1991, Handley et al., 2006). Participation "refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities" (Wenger, 1998 p.4). It involves mutual recognition which then allows negotiations of meaning (Wenger, 1998 p.56). Through participation in the activities of local communities actors can access and appreciate the very meaning of those activities and practices.

The difference between the two approaches to knowledge transfer and learning becomes conclusive when knowledge context grows in novelty (Bechky, 2003, Carlile, 2002). In less

novel contexts, knowledge transfer can occur through coding and decoding mechanisms. Once references and syntaxes are set, knowledge can adequately reach its recipient. Developing shared language, therefore, is the key to transferring knowledge across communities and from sender to receiver (Shannon and Weaver, 1949). However, as the learning context grows in novelty, the differences across communities generate negative consequences and discrepancies in meanings. For example, Carlile (2002) argues that during new product development, there is high potential for misunderstanding, and conflicts as knowledge is at stake. Therefore, knowledge needs to be transformed across functions in order for collaboration to take place. Similarly, Bechky (2003) finds that in a new product development project, differences become conspicuous and the potentials for misunderstandings rise.

In these conditions, attempts to transfer knowledge are futile unless they involve mechanisms which allow participation. For example, consider a company which strives to solve a problem by gaining knowledge from a university partner. They have two options for acquiring the knowledge (their solution). First, they can commission a project with the academic partner and ask them to come back with a report. Once the project is finished they will have the solution in their hand, but probably they would not know how this solution was achieved in the first instance. If the problem is routine and the company exactly knows the features and dimensions of the answer, then the solution will be useful for the company. However, if the question is complex and the company is not even clear about the question to start wtih, then the solution (usually provided as a report) may not fit the requirements and the report may only stay in the archive as many research reports do.

In a second scenario, the company starts collaborating with the university through participation. They send researchers to the university labs or fund researchers from the university to be with them. However, when they start to mutually engage in the process, they understand that what they mean by 'research' is different from what their academic partner means by 'research'. It can well be the case that for the company, research means achieving the most accurate and comprehensive results while for their academic partner it means to produce novelty. This would subsequently involve an arduous process of (implicit) negotiations of meaning through which parties succeed or fail to develop shared meaning. Unless such shared meaning is developed there will be little chances that external knowledge becomes embedded and applicable for the company. Therefore, participation provides the opportunity for establishing shared meaning. It is through participation that partners can

develop shared meaning; without participation there is no room for noticing these differences, let alone negotiating them.

TOWARDS A PRACTICE VIEW TO AC

Thus far, I have reviewed the major contributions to AC literature over the last two decades followed by an effort to unveil the underlying mechanisms that have adversely affected the development of AC since its introduction. This section offers a practice framework for AC and provides a set of propositions which can inform the future AC research. Figure 1 illustrates a process model of AC which deploys a practice view (Figure 1).

As the figure suggests, I argue that there are two aspects to AC. First, there are meaning making processes within each dimension of AC, and there are key factors in each stage which contribute to this meaning making process (illustrated by boxes).

FIGURE 1: A PRACTICE MODEL OF AC
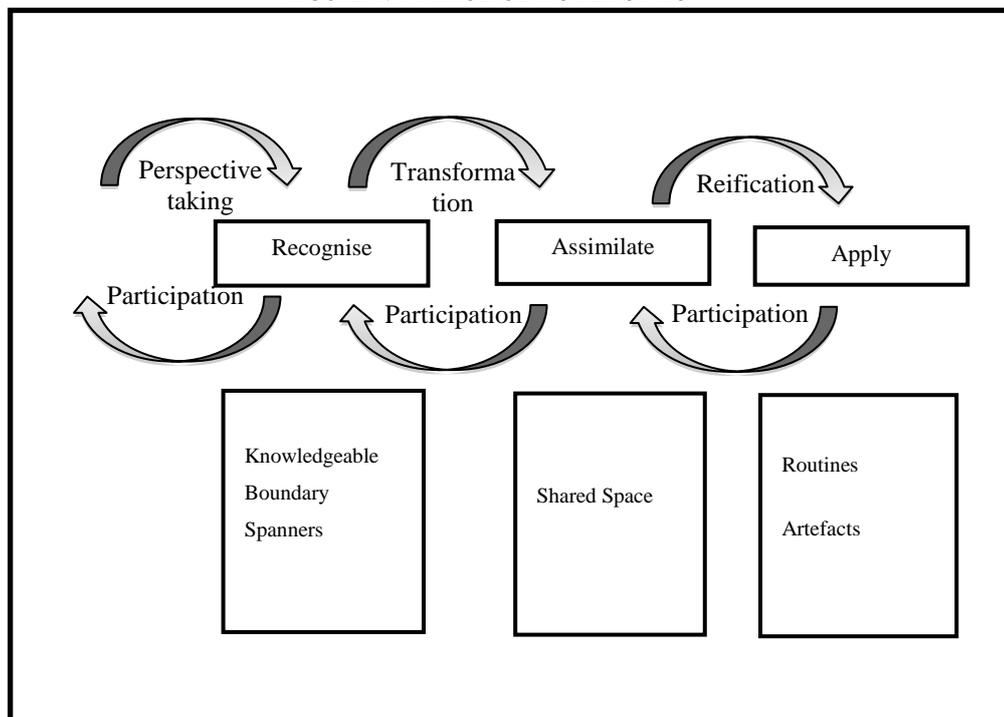
THE RECOGNISING DIMENSION OF AC

Recognising the value of external knowledge is the first dimension of AC. It entails the ability of valuing and acquiring the externally generated knowledge. It is a critical dimension of AC without which the whole absorption process may fail to start (Todorova and Durisin, 2007). Firms are often weak at recognising the value of new external knowledge as they may be locked in their existing capabilities and competencies (Leonard-Barton, 1990, Levinthal and March 1993, Gavetti and Levinthal, 2000). Cohen and Levinthal (1990) highlight that when external information is far from the expertise developed within a department some members of the group are likely to act as boundary spanners. These members not only identify new knowledge within the environment and transfer it into their unit, but also they do translate it into an understandable form for their unit. They contend that the ability of individuals and organisations to identify new external knowledge is determined by their prior accumulated knowledge. Despite this emphasis by Cohen and Levinthal, less efforts have been made to explore and explicate the role of boundary spanners and their features within AC literature (Jones, 2006), and the emphasis has been on the importance of prior knowledge in determining their role. Nevertheless, limiting this aspect of AC to prior knowledge or experience involves a risk of overlooking or filtering incompatible ideas, which do not comply with the accumulated knowledge.

As discussed, given that meaning is situated in context, and is not easily accessible to individuals and groups outside the community within which it is mutually negotiated, recognising the value of external knowledge is only plausible through accessing the very practice in which meaning is vested. When meaning is less contested, the prevailing feature of boundary spanners is to transmit information from the external sources into the organisation or between organisational members. In these settings, boundary spanners may have central position in their network of relations (Allen and Cohen, 1969) or may connect organisational participants from various departments (Tushman, 1977).

As meaning becomes more contested, the primary role of boundary spanners shifts to translating the information and knowledge across boundaries. Participation in multiple communities enables boundary spanners to access the very meaning developed within a particular context and to translate contrasting coding schemes in order to become compatible with the organisation-specific knowledge and to inform action in organisations (Harada, 2003, Hillebrand and Biemans, 2004). Some authors have discussed that developing

syntactical coordination across communities only represents one aspect of boundary spanning and that the features of boundary spanners are not limited to the communication channels and translative capabilities but they equally pertain to the identity that they can develop across the boundaries to interact with the 'others' and to the legitimacy they can establish across various communities in which they hold (peripheral) membership. These authors have argued that boundary spanning is political when knowledge is at 'stake'. In these conditions, the primary role of boundary spanners is to establish legitimacy across different communities, which empowers them to align interests and to negotiate meanings across various contexts. For example, Wright (2009) explains how managers in ambiguous roles develop an identity which enables them to retain their authority while maintaining their claims to competence when interacting with their employees. Likewise, Levina and Orlikowski (2009) discuss how in novel contexts, agents alter the institutional context of their organisation through negotiating the power relations during the joint projects. Developing this legitimacy relies on the ability to participate in multiple communities of practice and negotiating power across those communities which gives enough access to boundary spanners to the different practices and to be able to relate the elements of one side to the other. Having such ability requires developing identity trajectories in the landscape of practices (Wenger, 1998 p.118), and having the ability to modulate from one state of identity to the other (Wenger and Snyder, 2000). Therefore, I suggest that as the knowledge context becomes complex and political with diverse stakeholders, the first dimension of AC (recognising the value of external knowledge) relies on the boundary spanners who can legitimately participate in various communities and who can develop identities across those communities.

Moreover, I argue that 'perspective taking' supports recognising the value of external knowledge across boundaries. Perspective taking is a process that allows actors to become familiar with the viewpoint of others before fully integrating their approach to their own. It refers to understanding and interpreting the others' viewpoints, interests, and thoughts through positioning them in relation to own knowledge. "This taking of the other into account, in light of a reflexive knowledge of one's own perspective, is the perspective-taking process" (Boland and Tenkasi, 1995 p.362). Perspective taking is an indispensable aspect of organisational life when knowledge is scattered across multiple specialties (Boland and Tenkasi, 1995), and a mechanism to deepen the expertise of communities about each other's knowledge (Oborn and Dawson, 2010) in cross-disciplinary collaborations. It allows partners across organisational and disciplinary boundaries to empathise with the limitation of the other

side and to become receptive to new attitudes and approaches. Therefore, I posit that perspective taking contribute to recognising the value of external knowledge.

> Proposition 1: Boundary spanners who can legitimately participate in multiple communities of practice across organisational boundaries, and who can take perspectives from various communities contribute to recognising the value of external knowledge dimension of AC.

THE ASSIMILATION DIMENSION OF AC

The assimilation dimension of AC refers to the abilities to analyse, process, interpret and understand the information obtained from external sources (Cohen and Levinthal, 1990, Zahra and George, 2002). However, when it comes to the assimilation dimension of AC, there is little advancement on what constitutes it, and what it means when external knowledge is acquired in the first instance, and how it develops over the next stages. Exploring the studies, one can hardly find any contribution which unpacks the notion of assimilation beyond discussing analysis of data, dissemination of knowledge, or integration of new knowledge with existing knowledge.

By definition, any exploration of assimilation relates to the notion of 'meaning' which becomes problematic in novel contexts. In novel contexts, meaning becomes contextual and hard to access by outsiders. Under such conditions, the transfer logic becomes ineffective as meaning becomes difficult to transfer across communities, and the prevailing structures, processes, and practices become incompetent in accommodating and assimilating new meanings. Overcoming this mismatch, however, requires triggering transformation in existing structures and practices (Carlile and Rebentisch, 2003). Following a similar argument in AC research, Todorova and Durisin (2007) argue that transformation is necessary when new ideas do not fit the existing structures and new knowledge cannot be assimilated. Thus, in addition to pure interpretation and analysis of data, assimilation relates to the capabilities of transforming the prevailing practices (Gherardi and Nicolini, 2000, Bechky, 2003).

The question, however, is what mechanisms enable this transformation. If knowledge transfer logic is incompetent in novel contexts and there is need for transformation across various boundaries, how it can be achieved? Or what AC mechanisms support it? The transformation of prevailing practices and structures is challenging given that the transformational efforts generate identity conflicts and tensions across communities and boundaries. For instance, Dougherty and Hardy (1996) argue that sustainable innovations require taking into account

the role of conflicts that are likely to occur across and within organisations. In a case study of organisational learning, Nag et al. (2007) find that when organisational leaning involves radical transformation of existing practices, conflicts in identity are inevitable. At boundaries, actors' historically-developed identities start to diverge from their experience (Wenger, 2000) which can give rise to conflicts and destabilise communities: "An individual's continual negotiation of 'self' within and across multiple communities of practice may, of course, generate intra-personal tensions as well as instabilities within the community" (Handley et al., 2006). Therefore, throughout the transformation, the diverging trajectories of identities that actors have, induces potential for conflicts (Handley et al., 2006, Hong and O, 2009), and failure to align those identities, as it was in their case study, halts organisational learning/change.

Thus, developing shared Identities enables overcoming conflicts when transformation is to take place. When identities are in conflict, assimilation builds on the opportunities that actors are given for participation and development of shared identities. O'Mahony and Bechky (2008) explain how, in open-source movement, parties who challenge established practices within a closed-source system, transform contestation into collaboration. They argue that, under such conditions, parties develop boundary organisations, which enables this transformation through identifying and confronting the divergence areas and bringing the possibility for adaptation in practices. Therefore, establishing a 'shared space' across boundaries, which provides affordance for continuous participation across boundaries is essential when meaning is contested. Shared space cultivates a basis for interaction, adaptability, and learning in highly uncertain and rapidly changing circumstances (Kellogg et al., 2006). It provides the opportunities for actors' engagement which are sustained enough in time to allow assimilation. Through participation in shared space actors can develop shared meaning and 'transform' knowledge in order to be accessible at their local context and to be 'assimilated'.

> Proposition 2: The assimilation dimension of AC relates to the development of shared space across organisational and practice boundaries.

> Proposition 3: Participation in shared space contributes to the development of shared identities across various boundaries which can then initiate transformation in meanings, structures and practices.

THE APPLICATION DIMENSION OF AC

The application dimension of AC refers to the abilities of organisations to enact the newly acquired knowledge within their operations. Zahra and George (2002) state that application also refers to exploitation, i.e. continuous refinement and creation of new competencies within organisations. Therefore, application is not the final step in AC (as it is suggested by some authors) since it gives rise to new opportunities for creating new competencies or new queries (Zollo and Winter, 2002).

I argue that this capability develops in interactions between participation and reification. Once knowledge is assimilated, it needs to become operational in the daily life of organisations. Reification is the mechanism that contributes to this end by embedding knowledge into routines, procedures, and artefacts. Reification refers to "giving form to our experience by producing objects that congeal this experience into thingness" (Wenger, 1998 p.58) and is manifested in tools, symbols, instruments, artefacts, routines, and procedures which are used as the "focus for the negotiation of meaning" (Wenger, 1998 p.59). However, reification of knowledge into a form which can become operational across organisations requires a lot of participation. For instance, when R&D acquires new knowledge or technology from the external environment and decides to transfer it to the production where it becomes routinised and operational, they need to make a lot of participation to enable this reification of knowledge. They cannot simply write down manuals or give presentations, but they need to engage with the production department (e.g. operators) long enough in order to enable this reification.

On the other hand, the very reification of knowledge can give rise to multiple interpretations and confrontations. Reification facilitates transferring of knowledge across space and time and among individuals and groups within organisations. When knowledge becomes reified (i.e. in the form of routines, and artefacts), it can be easily replicated in different contexts across organisations. The replication of knowledge triggers participation by new actors. As a result, the knowledge stored in the prevailing practices becomes contradictory across groups, units, or functions, as it becomes exposed to new forms of interpretations which can induce new meanings. Contested meaning, in turn, would entail new queries for exploration and search for new knowledge or transformation of prevailing processes and structures.

Thus, the application dimension of AC relies on the inter-relation of reification and participation. Favouring one in expense of the other would hamper AC. On the one hand, if

organisations focus on participation, there is little chance that knowledge can become operational and embedded in organisational routines as the richness of experience make it difficult and complex to do so. On the other hand, if reification becomes the dominant mechanism, there is little chance for reflection and refinement of the existing competencies since new knowledge becomes so reified that neither anyone knows how and why it is developed nor there is any grounds for conflict and challenge which can trigger new learnings. Therefore:

> Proposition 4: The application dimension of AC develops through interaction of reification and participation at the organisational level. Reification requires enough participation through which knowledge becomes embedded in operating procedures and through participation it becomes exposed to new contexts which then lead into new transformations and refinements.

CONCLUSIONS

This paper reviewed AC research and identified the main tensions in the literature. It discussed the cognitive approach and evolutionary approach to AC and identified the dominance of variance models and overlooking 'meaning' as the sources of shortcoming in the literature. Afterwards, building on the recent developments in practice theories and situated learning, I developed a framework of AC which incorporated the aspects of participation, reification, perspective taking, and identity.

Table 3 summaries the main features of the practice extension of AC in comparison with extant conceptualisations. In summary, I argued that when knowledge becomes contextual, the existing AC approach might be inadequate. When knowledge is not at stake and context-specific, recognising new knowledge deals with utilizing search routines directed by prior knowledge and experience; assimilation involves analysing and distributing the newly acquired knowledge and combining it with existing knowledge through bisociasion (Zahra and George, 2002); and application concerns embedding the knowledge in operational routines and continuously refining knowledge through learning by doing. Throughout this process, the potential for conflict is minimal and absorption of knowledge does not entail any changes or conflicts in identities. Moreover, boundary spanners are in charge of connecting the internal domain to the external environment of the firm and to buffering the organisational interface with its environment. As such, their main role is to make decisions

about what counts as relevant and what counts as irrelevant so as to protect their organisation from information overload or overlook. The centrality of the boundary spanner's position within their network, and the number of internal and external ties that spanners have determines their effectiveness to AC. Moreover, their capability in translating knowledge from one context to another context is crucial.

On the other hand, I argued that in novel contexts, knowledge is at stake and meaning is contested. In these conditions, recognising the value of external knowledge relates to making sense of, and accessing the meanings that fall beyond the immediate context of organisational competencies. It also entails identifying the differences across boundaries and reflecting on those differences. Taking perspective prepares participants for later stages of boundary crossing which may require deeper transformations. I posited that perspective taking is the main mechanism to access meaning for recognising the value of external knowledge which can mainly take place through boundary spanners who can legitimately participate in multiple communities of practice.

TABLE 3: THE COMPRISON BETWEEN THE CONVENTIONAL APPROACH AND THE PRACTICE APPROACH

Key features of AC	Extant approach	Practice extension
View to knowledge transfer	Referential: once the syntaxes are harmonised knowledge transfer takes place	Meaning is contextual and situated. Hence, it is difficult to transfer knowledge across contexts
Learning mechanism	Acquisition of information/skills	Development of identity
Form of knowledge	Codified/canonical	Tacit/Embedded in community and identity
Recognising the value of external knowledge	Prior knowledge determines the recognition of new knowledge.	Boundary spanners who can legitimately participate in various communities and are able to take perspectives contribute to recognition of new knowledge
Assimilation	Distribution and analysis of knowledge Combining new knowledge with the existing knowledge	Development of shared meaning and identity through participation in shared space is the main mechanism supporting assimilation
Application	The application dimension develops through embedding knowledge within operational procedures of organisations	Application dimension develops through the interactions between reification and participation within organisations

As far as assimilation is concerned, I contended that, in novel contexts, shared meaning develops through participation in a shared space across organisational and practice boundaries. Moreover, I discussed that participation in the shared space facilitates the transformation of identity across boundaries which can then translate into the transformation of existing structures and processes should the accommodation of new knowledge necessitate transformation of prevailing structures and practices,.

Finally, I argued that in the practice approach, application dimension of AC develops through interactions between participation and reification within organisations. Once knowledge is assimilated, it becomes embedded within operational procedures and routines through reification. Such reification then facilitates replicating knowledge across various functions and units within organisations. At the same time, as different groups have a different history of identity development and meaning formations, the very replication of the reified knowledge induces new forms of experience which accompanies participation and triggers further refinements and new queries.

There is a potential research window here, both to explore and to enrich the practice-based approach to AC presented in this article and to see whether such approach can withstand empirical tests. Future research could explore the dynamics of different boundaries and the mechanisms for bridging them at the three dimensions of AC. I propose that scholars make informed decision when they decide to study AC because, as this analysis suggests, when the context of learning becomes more innovative, any appreciation of AC will inevitably deal with contextualised meanings, which requires attending to the dynamics of power, and the mechanisms of identity development. However, in agreement with Easterby-smith et al. (2008), I contend that the continuation of quantitative AC literature will not add to our understanding of the concept because a better understanding of the underlying mechanisms can only be reached through closely examining the social context of absorption, and longitudinally analysing the transformation of the practices throughout the phases of AC. This, in turn, calls for conducting even more qualitative studies with a greater emphasis on ethnographies.

REFERENCES

ALLEN, T. J. & COHEN, S. I. 1969. Information Flow in Research and Development Laboratories. Administrative Science Quarterly, 14, 12-19.

ALLEN, T. J., HYMAN, D. B. & PINCKNEY, D. L. 1983. Transferring technology to the small manufacturing firm: A study of technology transfer in three countries. Research Policy, 12, 199-211.

ALLEN, T. J., TUSHMAN, M. L. & LEE, D. M. S. 1979. Technology Transfer as a Function of Position in the Spectrum from Research Through Development to Technical Services. Academy of Management Journal, 22, 694-708.

ARGYRIS, C. & SCHON, D. 1978. Organizational learning: A theory of action perspective, Addison Wesley.

BECHKY, B. A. 2003. Sharing Meaning Across Occupational Communities: The Transformation of Understanding on a Production Floor. Organization Science, 14, 312-330.

BOGENRIEDER, I. & NOOTEBOOM, B. 2004. Learning Groups: What Types are there? A Theoretical Analysis and an Empirical Study in a Consultancy Firm. Organization Studies, 25, 287-313.

BOLAND, R. J., JR. & TENKASI, R. V. 1995. Perspective Making and Perspective Taking in Communities of Knowing. Organization Science, 6, 350-372.

BOWER, G. H. & HILGARD, E. R. 1981. Theories of Learning, NJ, Prentice-Hall.

CARLILE, P. R. 2002. A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development. Organization Science, 13, 442-455.

CARLILE, P. R. & REBENTISCH, E. S. 2003. Into the Black Box: The Knowledge Transformation Cycle. Management Science, 49, 1180-1195.

COCKBURN, I. M. & HENDERSON, R. M. 1998. Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery. The Journal of Industrial Economics, 46, 157-182.

COHEN, M. D. & BACDAYAN, P. 1994. Organizational Routines Are Stored as Procedural Memory: Evidence from a Laboratory Study. Organization Science, 5, 554-568.

COHEN, W. M. & LEVINTHAL, D. A. 1989. Innovation and Learning: The Two Faces of R & D. The Economic Journal, 99, 569-596.

COHEN, W. M. & LEVINTHAL, D. A. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. Administrative Science Quarterly, 35, 128-152.

COOK, S. D. N. & BROWN, J. S. 1999. Bridging Epistemologies: The Generative Dance between Organizational Knowledge and Organizational Knowing. Organization Science, 10, 381-400.

DAFT, R. L. & WEICK, K. E. 1984. Toward a Model of Organizations as Interpretation Systems. The Academy of Management Review, 9, 284-295.

DOUGHERTY, D. & DUNNE, D. D. 2011. Organizing Ecologies of Complex Innovation. Organization Science, 22, 1214-1223.

DOUGHERTY, D. & HARDY, C. 1996. Sustained Product Innovation in Large, Mature Organizations: Overcoming Innovation-to-Organization Problems. The Academy of Management Journal, 39, 1120-1153.

DUGUID, P. 2005. "The Art of Knowing": Social and Tacit Dimensions of Knowledge and the Limits of the Community of Practice. The Information Society, 21, 109-118.

DYER, J. H. & SINGH, H. 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. The Academy of Management Review, 23, 660-679.

EASTERBY-SMITH, M., GRAÇA, M., ANTONACOPOULOU, E. & FERDINAND, J. 2008. Absorptive Capacity: A Process Perspective. Management Learning, 39, 483-501.

FIOL, C. M. & LYLES, M. A. 1985. Organizational Learning. The Academy of Management Review, 10, 803-813.

GAVETTI, G. & LEVINTHAL, D. 2000. Looking Forward and Looking Backward: Cognitive and Experiential Search. Administrative Science Quarterly, 45, 113-137.

GHERARDI, S. & NICOLINI, D. 2000. To Transfer is to Transform: The Circulation of Safety Knowledge. Organization, 7, 329-348.

GRIFFITH, R., REDDING, S. & VAN REENEN, J. 2003. R&D and Absorptive Capacity: Theory and Empirical Evidence. Scandinavian Journal of Economics, 105, 99-118.

HANDLEY, K., STURDY, A., FINCHAM, R. & CLARK, T. 2006. Within and Beyond Communities of Practice: Making Sense of Learning Through Participation, Identity and Practice*. Journal of Management Studies, 43, 641-653.

HARADA, T. 2003. Three steps in knowledge communication: the emergence of knowledge transformers. Research Policy, 32, 1737-1751.

HEDBERG, B. 1981. How organizations learn and unlearn? In: NYSTROM, P. C. & STARBUCK, W. H. (eds.) Handbook of organi- zational design. London: Oxford University Press.

HERNES, T. 2004. Studying Composite Boundaries: A Framework of Analysis. Human Relations, 57, 9-29.

HILLEBRAND, B. & BIEMANS, W. G. 2004. Links between Internal and External Cooperation in Product Development: An Exploratory Study*. Journal of Product Innovation Management, 21, 110-122.

HOANG, H. & ROTHAERMEL, F. T. 2005. THE EFFECT OF GENERAL AND PARTNER-SPECIFIC ALLIANCE EXPERIENCE ON JOINT R&D PROJECT PERFORMANCE. Academy of Management Journal, 48, 332–345.

HONG, J. F. L. & O, F. K. H. 2009. Conflicting Identities and Power Between Communities of Practice: The Case of IT Outsourcing. Management Learning, 40, 311-326.

HURMELINNA-LAUKKANEN, P., BLOMQVIST, K., CAMARINHA-MATOS, L., AFSARMANESH, H., NOVAIS, P. & ANALIDE, C. 2007. Fostering R&D Collaboration – The Interplay Of Trust, Appropriability And Absorptive Capacity Establishing The Foundation Of Collaborative Networks. Springer Boston.

JANSEN, J. J. P., VAN DEN BOSCH, F. A. J. & VOLBERDA, H. W. 2005. Managing Potential and Realized Absorptive Capacity: How do Organizational Antecedents Matter? Academy of Management Journal.

JONES, O. 2006. Developing Absorptive Capacity in Mature Organizations. Management Learning, 37, 355-376.

KELLER, W. 1996. Absorptive capacity: On the creation and acquisition of technology in development. Journal of Development Economics, 49, 199-227.

KELLOGG, K. C., ORLIKOWSKI, W. J. & YATES, J. 2006. Life in the Trading Zone: Structuring Coordination Across Boundaries in Postbureaucratic Organizations. Organization Science, 17, 22-44.

KIM, C.-S. & INKPEN, A. C. 2005. Cross-border R&D alliances, absorptive capacity and technology learning. Journal of International Management, 11, 313-329.

KIM, L. 1998. Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. ORGANIZATION SCIENCE, 9, 506-521.

KOGUT, B. & ZANDER, U. 1992. Knowledge of the firm, combinative capacities and the replication of technology. Organization Science, 3, 383-397.

KOZA, M. P. & LEWIN, A. Y. 1998. The Co-Evolution of Strategic Alliances. Organization Science, 9, 255-264.

LANE, P. J., KOKA, B. R. & PATHAK, S. 2006. The Reification of Absorptive Capacity: a Critical Review and Rejuvenation of the Construct. Academy of Management Review, 31, 833-863.

LANE, P. J. & LUBATKIN, M. 1998. Relative absorptive capacity and interorganizational learning. Strategic Management Journal, 19, 461-477.

LANE, P. J., SALK, J. E. & LYLES, M. A. 2001. Absorptive capacity, learning, and performance in international joint ventures. Strategic Management Journal, 22, 1139-1161.

LAVE, J. 1993. The practice of learning. In: CHAIKLIN, S. & LAVE, J. (eds.) Understanding practice: perspectives on activity and context. Cambridge: Cambridge university place.

LAVE, J. & WENGER, E. 1991. Situated learning: Legitimate peripheral participation, Cambridge, Cambridge university press.

LEONARD-BARTON, D. 1990. A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. Organization Science, 1, 248-266.

LEVINA, N. & ORLIKOWSKI, W. J. 2009. Understanding Shifting Power Relations within and across Organizations: A Critical Genre Analysis. Academy of Management Journal, 52, 672-703.

LEVINTHAL, D. A. & MARCH , J. G. 1993. The Myopia of Learning. Strategic Management Journal, 14, 95-112.

LEVITT, B. & MARCH, J. G. 1988. Organizational learning. Annual review of sociology, 319-340.

LEWIN, A. Y., MASSINI, S. & PEETERS, C. 2011. Microfoundations of Internal and External Absorptive Capacity Routines. Organization Science, 22, 81-98.

LICHTENTHALER, U. 2009. Absorptive Capacity, Environmental Turbulance, and the Complementarity of Organizational Learning processes. Academy of Management Journal, 52, 822–846.

LIN, C., WU, Y.-J., CHANG, C., WANG, W. & LEE, C.-Y. 2012. The alliance innovation performance of R&D alliances—the absorptive capacity perspective. Technovation, 32, 282-292.

LINDKVIST, L., SODERLUND, J. & TELL, F. 1998. Managing Product Development Projects: On the Significance of Fountains and Deadlines. Organization Studies, 19, 931-951.

MEEUS, M. T. H., OERLEMANS, L. A. G. & HAGE, J. 2001. Patterns of Interactive Learning in a High-tech Region. Organization Studies, 22, 145-172.

MØRK, B. E., HOHOLM, T., MAANINEN-OLSSON, E. & AANESTAD, M. 2012. Changing practice through boundary organizing: A case from medical R&D. Human Relations, 65, 263-288.

MOWERY, D. C., OXLEY, J. E. & SILVERMAN, B. S. 1996. Strategic alliances and interfirm knowledge transfer. Strategic Management Journal, 17, 77-91.

MUROVEC, N. & PRODAN, I. 2009. Absorptive capacity, its determinants, and influence on innovation output: Cross-cultural validation of the structural model. Technovation, 29, 859-872.

NAG, R., CORLEY, K. G. & GIOIA, D. A. 2007. THE INTERSECTION OF ORGANIZATIONAL IDENTITY, KNOWLEDGE, AND PRACTICE: ATTEMPTING STRATEGIC CHANGE VIA KNOWLEDGE GRAFTING. Academy of Management Journal, 50, 821-847.

NELSON, R. R. & WINTER, S. G. 1982. An evolutionary theory of economic change, Cambridge, The Belknap press of harvard university press.

NICOLINI, D. 2011. Practice as the Site of Knowing: Insights from the Field of Telemedicine. Organization Science.

NONAKA, I. 1994. A Dynamic Theory of Organizational Knowledge Creation. Organization Science, 5, 14-37.

NOOTEBOOM, B. 2000. Learning by interaction: absorptive capacity, cognitive distance and governance. Journal of Management & Governance, 4, 69.

NOOTEBOOM, B., VAN HAVERBEKE, W., DUYSTERS, G., GILSING, V. & VAN DEN OORD, A. 2007. Optimal cognitive distance and absorptive capacity. Research Policy, 36, 1016-1034.

O'MAHONY, S. & BECHKY, B. A. 2008. Boundary Organizations: Enabling Collaboration among Unexpected Allies. Administrative Science Quarterly, 53, 422-459.

OBORN, E. & DAWSON, S. 2010. Learning across Communities of Practice: An Examination of Multidisciplinary Work. British Journal of Management, 21, 843-858.

ORLIKOWSKI, W. J. 2002. Knowing in Practice: Enacting a Collective Capability in Distributed Organizing. ORGANIZATION SCIENCE, 13, 249-273.

OXLEY, J. E. & SAMPSON, R. C. 2004. The scope and governance of international R&D alliances. Strategic Management Journal, 25, 723-749.

PRENCIPE, A. & TELL, F. 2001. Inter-project learning: processes and outcomes of knowledge codification in project-based firms. Research Policy, 30, 1373-1394.

REAGANS, R. & MCEVILY, B. 2003. Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. Administrative Science Quarterly, 48, 240-267.

ROBERTSON, P. L., CASALI, G. L. & JACOBSON, D. 2012. Managing open incremental process innovation: Absorptive Capacity and distributed learning. Research Policy, 41, 822-832.

ROTHAERMEL, F. T. & ALEXANDRE, M. T. 2009. Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity. Organization Science, 20, 759-780.

SANTOS, F. M. & EISENHARDT, K. M. 2005. Organizational Boundaries and Theories of Organization. Organization Science, 16, 491-508.

SCARBROUGH, H., SWAN, J., LAURENT, S. P., BRESNEN, M., EDELMAN, L. & NEWELL, S. 2004. Project-Based Learning and the Role of Learning Boundaries. Organization Studies, 25, 1579-1600.

SHANNON, C. & WEAVER, W. 1949. The Mathematical Theory of Communication, Urbana, Universityo f Illinois Press.

SMIRCICH, L. 1983. Organizations as Shared Meanings. In: PONDY, L. R., FROST, P. J., MORGAN, G. & DANDRIDGE, T. C. (eds.) Organizational symbolism. London: Greenwich, Connecticut.

SUN, P. Y. T. & ANDERSON, M. H. 2010. An Examination of the Relationship Between Absorptive Capacity and Organizational Learning, and a Proposed Integration. International Journal of Management Reviews, 12, 130-150.

SWAN, J., SCARBROUGH, H. & NEWELL, S. 2010. Why don't (or do) organizations learn from projects? Management Learning, 41, 325-344.

SZULANSKI, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. Strategic Management Journal, 17, 27-44.

TEECE, D. J., PISANO, G. & SHUEN, A. 1997. Dynamic Capabilities and Strategic Management. Strategic Management Journal, 18, 509-533.

TODOROVA, G. & DURISIN, B. 2007. ABSORPTIVE CAPACITY: VALUING A RECONCEPTUALIZATION. Academy of Management Review, 32, 774-786.

TSAI, W. 2001. Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. The Academy of Management Journal, 44**,** 996-1004.

TUSHMAN, M. L. 1977. Special Boundary Roles in the Innovation Process. Administrative Science Quarterly, 22**,** 587-605.

TUSHMAN, M. L. & SCANLAN, T. J. 1981. Boundary Spanning Individuals: Their Role in Information Transfer and Their Antecedents. The Academy of Management Journal, 24**,** 289-305.

VAN DE VEN, A. 2007. Engaged Scholarship: A Guide for Organisational and Social Research, New York, Oxford University Press.

VAN DEN BOSCH, F. A. J., VOLBERDA, H. W. & DE BOER, M. 1999. Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms and Combinative Capabilities. Organization Science, 44**,** 551-568.

VOLBERDA, H. W., FOSS, N. J. & LYLES, M. A. 2010. Absorbing the Concept of Absorptive Capacity: How to Realize Its Potential in the Organization Field. ORGANIZATION SCIENCE, 21**,** 931-951.

VYGOTSKY, L. S. 1986. Thought and language, MIT press.

WEICK, K. E. & ROBERTS, K. H. 1993. Collective Mind in Organizations: Heedful Interrelating on Flight Decks. Administrative Science Quarterly, 38**,** 357-381.

WENGER, E. 1998. Communities of Practice: Learning, Meaning, and Identity, Cambridge, Cambridge University Press.

WENGER, E. 2000. Communities of Practice and Social Learning Systems. Organization, 7**,** 225-246.

WENGER, E. C. & SNYDER, W. M. 2000. Communities of Practice: The Organizational Frontier. Harvard Business Review, 78**,** 139-145.

WINTER, S. G. 2003. Understanding dynamic capabilities. Strategic Management Journal, 24**,** 991-995.

WRIGHT, C. 2009. Inside Out? Organizational Membership, Ambiguity and the Ambivalent Identity of the Internal Consultant. British Journal of Management, 20**,** 309-322.

ZAHRA, S. & GEORGE, G. 2002. Absorptive capacity: a review, reconceptualization, and extension. Academy of Management Review, 27**,** 185-203.

ZOLLO, M. & WINTER, S. G. 2002. Deliberate Learning and the Evolution of Dynamic Capabilities. Organization Science, 13**,** 339-351.