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The evolution of alliance capabilities

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Key words: learning mechanisms, alliance capabilities and competitive heterogeneity.

ABSTRACT

This paper assesses the effectiveness and differential performance effects of learning mechanisms on the evolution of alliance capabilities. Relying on the concept of capability lifecycles, prior research has suggested that different capability levels could be identified in which different intra-firm learning mechanisms are used to enhance a firm's alliance capability. However, empirical testing in this field is scarce and little is known as to what extent different micro-level learning mechanisms are indeed useful in advancing a firm's alliance capability. This paper analyzes to what extent intra-firm learning mechanisms help firms evolve their alliance capability and create competitive heterogeneity. Differential learning may induce firms to yield superior returns in their alliances in comparison to competitors. We present a conceptual model that assumes capabilities evolve through different types of learning. The results show that different learning mechanisms have different performance effects at different stages of the alliance capability development process. This points to differential learning effects of learning mechanisms at the different levels of alliance capability. The main lesson from this paper is that firms can influence the evolution of their alliance capability as different mechanisms have differential performance effects and are more appropriate at different levels of alliance capability.

INTRODUCTION

Recently, some scholars have advanced the notion of dynamic capability cycles (e.g. Sanchez, 2001; Draulans et al., 2002; Helfat and Peteraf, 2003). These studies have deepened the inside-out view on performance denominators by highlighting the simultaneous restrictive and contributive role capabilities play in explaining firm heterogeneity. Founded in such theories as the resource-based view, evolutionary economics and organizational learning theory, such studies have introduced an interesting new look at how capabilities evolve. Although these theories deploy different terminologies (Ray et al., 2004), they are often included in eclectic theoretical frameworks that are needed to construct sound operationalizations of the concepts under

investigation (e.g. Mahoney and Pandian, 1992; Montgomery, 1995; Foss, 1997). Whereas the resource-based view investigates the impact of firm resources on competitive advantage (Barney, 1991), evolutionary economics is concerned with the impact of organizational routines on performance (Nelson and Winter, 1982) and organizational learning theory has concerned itself to a greater degree with answering how firms evolve and learn (Vera and Crossan, 2003). In line with Zollo and Winter (2002), this paper relies on these three theories to explain competitive heterogeneity and investigate how alliance capabilities evolve and what the impact of intra-firm learning mechanisms is at different capability levels.

In earlier research, intra-firm learning mechanisms have been suggested to form the basis for organizational routines and have been posited to be a key determinant of competitive heterogeneity (Winter, 1995; Teece et al., 1997). However, the issue of how these learning mechanisms contribute to enhance a firm's capability has to our knowledge been rarely addressed. We propose a model of capability development that seeks to shed light on how learning mechanisms can help firms leapfrog the learning curve and boost the evolution of their alliance capabilities. In doing so, we look at two types of knowledge transfer (i.e. integration and institutionalization) and suggests how these are linked to advances in alliance capabilities.

The paper starts with a more detailed overview of theory on capability lifecycles and organizational learning in the area of alliances. Thereafter, the hypotheses relating to the impact of intra-firm learning mechanisms are investigated. We first examine whether at firms different capability levels indeed make use of different learning mechanisms. Next, we examine whether these intra-firm learning mechanisms help yield superior rents. We end with sections on methods and results. Our conclusions are based on 192 firms that in total have an alliance portfolio of 2973 alliances.

THEORY AND DEFINITIONS

Over recent years, extensive attention has been paid to the role certain resources and capabilities play in explaining competitive heterogeneity (Dosi et al., 2000; Hoopes et al., 2003). While various studies have empirically validated the assertion that competitive

heterogeneity can be explained by valuable resources and capabilities (e.g. Henderson and Cockburn, 1994; Knott, 2003), significantly less attention has so far been paid to how such capabilities evolve. Only recently has some scholarly attention been devoted to investigate capability lifecycles and the intra-firm mechanisms allowing advances in firm capabilities (Draulans et al., 2002; Helfat and Peteraf, 2003).[1] Hence, only a handful of studies have been directed at empirically investigating how capabilities evolve (e.g. Kogut and Zander, 1992; Anand and Khanna, 2000; Zollo and Winter, 2002). To date, empirical validation of what intra-firm learning mechanisms are involved and how these contribute to capability development is virtually non-existent.

So far, alliance research relying on resource-based view and organizational learning and evolutionary economics can be categorized along two dimensions: (1) those that contribute to investigating inter-firm learning in alliances and the generation of relation-specific rents and (2) those that examine intra-firm learning in alliances and the generation of firm-specific rents. Similarly, Hamel (1991) refers to respectively knowledge acquisition and knowledge internalization and Leonard-Barton (1995) refers to learning outside and inside the firm. The first group of studies mainly looked at the acquisition of capabilities through alliances (e.g. Makhija and Ganesh, 1997; Inkpen and Dinur, 1998; Larsson et al., 1998; Tsang, 2002). For instance, Kumar and Nti (1998) analyzed differences between partners with respect to the impact of absorptive capacity on collaborative payoff. Typically, dyadic factors influencing relationship quality and the extent to which they enhance the creation of collaboration-specific rents and common benefits are of central concern (Khanna et al., 1998; Madhok and Tallman, 1998). Such studies by nature focus on individual relationships and hence the unit of analysis is the individual alliance.

The second group of studies looks at internal sources of capabilities. Rather than examining the influence of relation-specific antecedents of alliance performance, this group of studies analyzes processes inside the firm that nurture knowledge dissemination and integration (e.g. Henderson and Clark, 1990; King and Zeithalm, 2001). These studies center around the rents arising from unique and imperfectly mobile resources, or

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[1] . Anand and Khanna (2000) stress that the trade press has also referred to a life-cycle model where firms move through different stages of alliance capabilities. Gaining experience, firms move from an initial stage to a lone-ranger stage and finally to more formal models for managing alliances (Alliance Analyst, 1996).

firm-specific rents (Peteraf, 1993; Madhok and Tallman, 1998). While both studies center around the role resources and capabilities play in understanding performance heterogeneity, the obvious distinction lies in the fact that the second group is dedicated to understand the internal processes underlying alliance capability development. As such, the unit of analysis in these types of studies is the firm's alliance portfolio rather than the individual alliance. The role certain mechanisms, such as alliance offices or departments, play in developing alliance capabilities and routines is investigated (e.g. Simonin, 1997; Anand and Khanna, 2000; Kale et al., 2002). Alliance experience and capabilities are often found to explain persistent performance differences between firms. However, rarely have these studies been able to provide micro-level and specific evidence of the building blocks of alliance capabilities (Gulati, 1998).

In this paper, we define alliance capabilities as a firm's ability to capture, share, disseminate and apply alliance management knowledge (Eisenhardt and Martin, 2000; Kale et al., 2002). This ability of the firm refers to the extent to which the firm can ensure this knowledge becomes embedded in its repeatable patterns of action and refers to identifiable and specific routines (Nelson and Winter, 1982). These routines allow for the transfer, copying and recombination of knowledge by managers within the firm. This alliance capability can consist of or be captured by micro-level mechanisms, which can increase a firm's ability to, for instance, identify partners, initiate relationships or restructure individual alliances as well as an alliance portfolio (Simonin, 1997). Firms learn when they acquire a skill or know-how (i.e. ability to produce some action) and know-why (i.e. ability to articulate conceptual understanding of experience) (Kim, 1993). Learning occurs when new knowledge is translated into meaningful action and different behavior that is replicable (Argyris and Schon, 1978). This approach to understanding alliance capability development is related to prior studies investigating absorptive capacity. While absorptive capacity is also proxied as inter-partner trust in joint venture studies (e.g. Lane et al., 2001), others use it primarily as a determinant of intra-firm learning ability (Minbaeva et al., 2003; Lenox and King, 2004). Hence, given the surge in studies on alliances, absorptive capacity is used in the first group of studies mentioned earlier to explain how differential learning generates uneven distribution of rents between partners, while the second groups of studies focuses on processes that optimize the firm's

learning ability and rent generation of its entire alliance portfolio. This paper builds on the logic underlying the second group of studies.

Consequently, in order to understand how differential learning explains the evolution of alliance capabilities, micro-level mechanisms are suggested to act as a higher-order organizing principle or routine to facilitate the transfer of knowledge to a wider circle of individuals (Winter, 2003: 191). This capability is valuable at the firm level, which supports the firm in raising and maintaining the alliance performance of their entire alliance portfolio. In line with Kusunoki et al. (1998), we view alliance capabilities as being multilayered. Whereas their study focused on types of knowledge, our paper focuses on the development of alliance capabilities using different levels of organizational learning. As a capability reaches the mature stage, learning mechanisms help firms move from one capability level to the next.

CONCEPTUAL MODEL

In order to understand how alliance capabilities evolve, we investigate the way in which firms commit to intra-firm learning. In line with Draulans et al. (2002) and Helfat and Peteraf (2003), who suggest that firms can go through different 'development paths' deploying different types of mechanisms along the way, we posit that different cycles or stages are suggested to require different mechanisms in order to develop a firm's alliance capability. Different mechanisms and routines are therefore suggested to be of particular use at different stages of the development cycle. This logic is in line with recent organizational learning literature, which suggests that learning cycles –like 4I framework by Crossan et al. (1999)[2] or the knowledge transformation cycle by Carlile and Rebentisch (2003)- lie at the basis of organizational learning. These studies also suggest that firms learn via internal mechanisms. Kusunoki et al. (1998) for instance show that firms develop capabilities through different layers of knowledge. In the same vein, the

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[2] . The 4I framework is summarized by Mintzberg et al., 1998, in Vera and Crossan, 2004: 225): "*Intuiting* is a subconscious process that occurs at the level of the individual. It is the start of learning and must happen in a single mind. *Interpreting* then picks up on the conscious elements of this individual learning and shares it at the group level. *Integrating* follows to change collective understanding at the group level and bridges to the level of the whole organization. Finally, *institutionalizing* incorporates that learning across the organization by imbedding it in its systems, structures, routines and practices". (1998: 212)

next figure presents the organizational learning process which are linked to capability cycles. It shows the conceptual model that combines different earlier research and underlying theories. Essentially, the model combines organizational learning theory and dynamic capability view logic as it links three levels of organizational learning to capability cycles.[3] On the x-axis, the cumulative amount of activity is depicted; the y-axis represents the level of capability. The former represents a firm's prior cumulative experience in the area of alliance activity, while the latter in this case infers to the level of a firm's alliance capability.

Figure 2 Levels of capability and the role of learning mechanisms
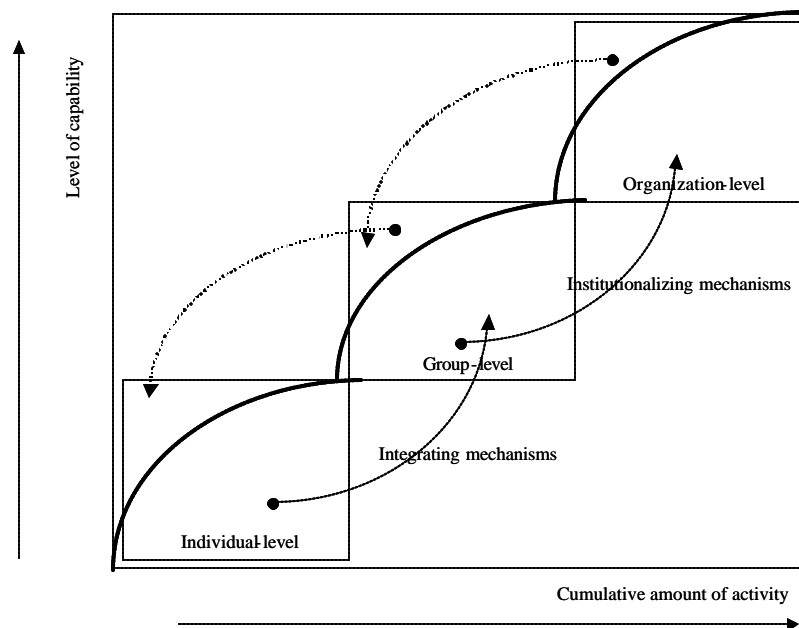
Source: (adapted from) Crossan et al., 1999; Draulans et al., 2002; Helfat and Peteraf, 2003.

The figure attempts to enhance our understanding of what role intra-firm learning mechanisms play in the evolution of alliance capabilities. It depicts three capability curves that represent different stages of capability development. A capability curve

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[3] . We acknowledge that improvements in capabilities are attributable to a variety of factors. It requires an interplay between learning-by-doing at the individual level as well as group-based learning activities which should be deliberate and clearly directed (Helfat and Peteraf, 2003). Given prior conceptual and empirical findings (e.g. Draulans et al., 2002), we posit that there is sufficient evidence to link levels or stages of capability development to different levels at which learning occurs.

consists of several phases: (1) founding, (2) development and (3) maturity. Once established, a capability may be transformed by for instance renewal or recombination (Helfat and Peteraf, 2003). Each capability curve is related to an experience level. Each stage is linked to a level at which learning is most likely to be predominantly observable. Therefore, whereas the first stage is related to individual-level learning, the second stage is linked to group-level learning and the third stages is linked to organization-level learning. The first curve refers to a stage where a firm has merely started to develop an alliance capability. This is a level where individual learning defines the level of alliance capability achieved. For instance, personal experience by top management involved in some alliances can be seen as catalyst of capability development at this stage. The second stage is characterized by group-based interactions. As firms start to form more alliances, it becomes more important to share knowledge. Prior experience and lessons learned are then used as input to let more people be aware of common pitfalls. For instance, trainings or courses can be used to create shared understanding among group members and foster common practices and routines (Brown and Duguid, 1991). The third stage of capability development is related to organization-level learning. Organizational learning occurs when individual and group-level learning become institutionalized (Crossan et al., 1999). In this case, knowledge becomes embedded in routines, systems and structures (Nelson and Winter, 1982) and the capability is engrained in the firm's memory structure (Helfat and Peteraf, 2003).

Moreover, the figure also suggests that firms can reach the next stage by making use of integrating or organization level learning mechanisms[4]. While integrating mechanisms are learning mechanisms that foster group level learning, institutionalizing mechanisms are aimed at enhancing a firm's organizational level learning. The former type of learning mechanism can be used to create shared understanding and mutual adjustment on basis of interactive systems at the group level (Crossan et al., 1999: 525); the latter primarily serves to create organizational routines. The group-level mechanisms can help firms move from the inherent disadvantages of the first to the second level of capability. When starting to form their first alliances, firms typically hold top

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[4] . Although we adopt the 4I framework and therefore acknowledge the learning effects of intuiting and interpreting at the individual level, this paper focuses on the effects of integrating and institutionalizing at respectively the group and organization level (Mintzberg et al., (1998), in Crossan et al., 1999).

management responsible for their management. However, when the alliance portfolio starts to grow, middle management tends to become involved. Relying on individual level learning, or intuiting and interpreting (Vera and Crossan, 2004), is unlikely to ensure success in a complex matter as alliance management is. In this setting, group level learning facilitate the sharing and dispersal of practices. In this way, experiences and lessons learned are shared between those involved.

The organization-level mechanisms primarily capture the aspects that allow firms to move beyond mere group-based practices. This becomes essential when a firm's alliance portfolio is such that it is generates a substantial percentage of a firm's revenues. These mechanisms can actually help institutionalize certain routines and practices that are necessary to help advance a firm's alliance capability to the third capability level. Hence, only when experiences and lesson learned are integrated and institutionalized can firms develop operating and dynamic capabilities or operating and search routines (Winter, 2003). These dynamic capabilities or search routines enable firms to adjusts and renew their capabilities and routines via the micro-level mechanisms. The ability to renew capabilities is of particular importance in complex and highly volatile settings (Kusunoki et al, 1998), like for instance successfully managing a diverse alliance portfolio.

HYPOTHESES

Previous research on alliance capability development primarily paid attention to the role alliance experience played. As we consider this to be a rather rudimentary form of operationalization that discourages specificity and scrutiny with respect to intra-firm processes, this paper intends to specify micro-level elements that underlie the evolution of alliance capabilities. When looking at the different levels of alliance capability as presented in figure 2, we suggested that different levels of alliance capability involve different levels of organizational learning. Consequently, different transfer or learning mechanisms are probably more useful at different levels. Various reasons can be suggested to explain that. First, different levels of learning involve different types of learning which have an impact on the creation of knowledge (Nonaka and Takeuchi, 1995). As firms start to form alliances, generally top management assumes responsibility.

Consequently, the primary level at which learning occurs is the individual level. As firms start to form more alliances, more people tend to become involved and prior lessons are diffused throughout the organization. Therefore, the primary level of learning at this stage will be the group level. As firms become heavily engaged in alliances, practices become embedded in their routines. The primary level of learning at this stage will be the organization level. Second, we expect the nature of knowledge to differ in the different stages. Group level and organization level learning are likely to rely on different types of knowledge (for an overview see Venzin et al. 1998). Whereas group level learning concerns integration of knowledge, codified and explicit knowledge are most suitable (Nonaka and Takeuchi, 1995; Crossan et al., 1999). As firms gain experience, knowledge tends to become more embedded (Fiol and Lyles, 1985). Third, the sophistication of the transfer mechanisms used is likely to increase as firms form more alliances. Whereas firms that only manage a couple of alliances will deploy relatively elementary types of mechanisms to transfer knowledge, more sophisticated means will be used to manage a complex portfolio of alliances. Therefore, referring to the logic outlined in this paper's conceptual model and the arguments put forward, we expect that:

H1: The higher the level of alliance experience, the higher the ratio of organization level learning mechanisms to group level learning mechanisms.

Although it is important to know what intra-firm learning mechanism firms use at what level of alliance capability, it is perhaps even more interesting to analyze what impact these mechanisms have on alliance performance. There are a number of reasons why we expect the mechanisms to explain performance heterogeneity. First, a vast amount of empirical evidence is available on the positive impact of alliance experience on alliance performance (e.g. Gulati, 1999; Hoang et al., 2003). Acknowledging the lack of specificity in this relationship, Simonin (1997) and Heimeriks and Duysters (2003) found that learning mechanisms mediate between experience and performance. Second, despite the fact that both mechanisms contribute to organization learning in a different way (i.e. group level mechanisms foster integration, while organization level mechanisms nurture institutionalization), they both allow for the transfer of alliance experience (Cohen and

Bacdayan, 1994). More specifically, these mechanisms function as a catalyst for alliance capability development via the (1) the assimilation, coordination, dispersion of alliance knowledge, (2) coordination of activities and allocation of resources, (3) monitoring and evaluation of alliance activities, (4) support day-to day activities in alliances and therefore prevent falling prey to common pitfalls (Kale et al., 2002; Heimeriks and Duysters, forthcoming). On basis of these arguments, we expect that learning mechanisms are valuable resources that potentially explain performance heterogeneity:

H2A: Both group level and organization level learning mechanisms positively influence alliance performance.

Moreover, as Zollo and Winter (2002) posit that dynamic capabilities result from the co-evolution of tacit experience accumulation with knowledge codification and articulation, we expect that the performance impact learning mechanisms is greatest when they are both used. Therefore, we also hypothesize that:

H2B: The more the firm simultaneously uses both group and organization level learning mechanisms, the higher its alliance performance.

Moreover, we expect that different learning mechanisms have different performance effects depending on the experience level. Referring to figure 2, we expect that different learning mechanisms are more effective at different levels of alliance capability.[5] There are a number of reasons for that. First, group level learning embodies a different type of learning than does organization level learning. Levinthal and March (1993) differentiate between simplification and specialization as mechanisms of learning. Integration of individuals' experiences aims to create coherent and collective action. Facilitating the integration of knowledge implies simplification, since experiences are inferential and transcribed when transferred (Levinthal and March, 1993). Organization level learning mechanisms leave much more room for specialization. Given the need to embed

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[5] . For an overview of factors from cognitive psychology that influence transfer effects, we refer to Zollo and Reuer (2003).

knowledge into processes and structures, knowledge transfer tends to be tacit. Second, the complexity of integrating knowledge increases as the number of groups involved and their dependency increases (Carlile and Rebentisch, 2003). As firms form more alliances, more groups will become involved. It will more difficult to coordinate and transfer knowledge, therefore requiring different learning mechanisms. Third, it is important to adjust the learning mechanisms to the need for learning. If firms have little experience, the learning curve tends to be steep only if the right mechanisms are used. For instance, it would not make sense to install an alliance department or function when a firm has a small amount of alliances to manage. The costs would not outweigh the benefits created and the learning mechanisms chosen is likely to not fit the firm's needs. Therefore, we posit that:

H3A: For firms with little alliance experience, group level learning mechanisms have higher performance impact than organization level learning mechanisms.

H3B: For firms with high alliance experience, organization level learning mechanisms have greater performance impact than group level learning mechanisms.

The next sections will present the results and interpret our findings.

DATA AND METHODS

Survey

A survey was used to gather information on alliance practices and routines and the mechanisms firms use to develop alliance capabilities (Beamish, 1984). A survey questionnaire was send to 650 Vice-Presidents and alliance managers worldwide. The survey was aimed at collecting data on managerial assessments of a firm's alliance portfolio performance. The questionnaire was developed along the steps proposed by Oppenheim (1966), Nunally and Bernstein (1994) and Churchill and Iacobucci (2001). This ensured that aspects such as questionnaire length, style of question and scoring were taken into account. Moreover, the questionnaire was extensively pre-tested with various

experts so as to finalize it and erase any inconsequent aspects or aspects that could unnecessarily cause bias. The database of the Association of Strategic Alliance Professionals (ASAP) and the Internet Society (ISOC) were used as primary data source to collect large-sample data. Using these databases, we were able to address the right people who can be considered to be appropriate when gathering data on the performance of alliance portfolios. These persons were used as key informants on their firm's alliance activities and related management practices. As Tippins and Sohi (2003: 757) note, the use of key informants is currently the standard methodology in strategy research. Using key informants is an established way of gathering data (Philips, 1981) and often used technique when gathering information at the corporate level (see e.g. Simonin, 1997; Kale et al., 2002).

After sending a reminding message to all the potential respondents, we received 206 responses[6]. This resulted in a response rate of 31.7%, which is considerably higher than most international mail surveys (Harzing, 2000) but comparable to other studies on alliances (see e.g. Kale et al., 2002; Reuer et al, 2002a; Zollo et al., 2002). After data screening, the final dataset consisted of 192 valid cases from the following industries: ICT (17%), ICT services (26%), financial services (5%), other services (e.g. consultancies) (30%), pharmaceuticals and biotechnology (3%), chemicals (3%), other manufacturing (10%) and public sector (e.g. education and non-profit organizations) (4%). The rest (2%) is missing data. However, in spite of the mixture of the dataset, as a consequence of the above-average use of alliances in technology-intensive (see e.g. Hagedoorn, 2002), the majority of our respondents were active in ICT (43%) and service-related sectors (61%). Table 1 shows the size of the firms in our dataset. Over 52% of the firms employed over 1000 employees, while 40% generates sales revenues of over US$ 1 billion.

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[6] . In order to ensure that our data was not biased as a result of non-response, various analyses were performed. Chi-square tests allowed us to compare early with late respondents with respect to a number of key variables (i.e. number of employees of parent firm, worldwide sales revenues and alliance performance). The results show that there is no difference between the two categories, which implies that there is no significant non-response bias in our dataset (Kanuk and Berenson, 1975; Armstrong and Overton, 1977).

Table 1 Distribution of firm size

	N	%
(1) Number of employees		
1-500	81	42.19
-1000	8	4.17
> 1000	101	52.60
Missing cases	2	1.04
Total	192	100
(2) Sales revenues (in US$)	N	%
Less than 1 million	46	24
-100 million	44	22.9
- 1 billion	24	12.5
- 50 billion	68	35.4
Over 50 billion	9	4.7
Missing cases	1	0.5
Total	192	100

The average percentage of alliances that were considered to be successful of the firms included in our sample amounted to 52 %, which is comparable to other studies (Park and Ungson, 2001). As the firms included in our dataset each manage over 15 alliances, the total dataset refers to 2973 alliances.

Alliance portfolio as unit of analysis

In line with the logic of Ray et al. (2004), who compare two types of dependent variables deemed credible in studies relying on the resource-based logic, this paper uses a firm's alliance portfolio as a unit of analysis. This unit is deemed appropriate as we try to illuminate our understanding of how learning mechanisms involved in intra-firm processes help evolve alliance capabilities. Earlier studies relied primarily on measuring the performance of the individual alliance or on measuring the partner benefits from the alliance (e.g. Olk, 2002). An obvious detriment to using the level of analysis is that each alliance is treated as a single and independent transaction (Doz and Prahalad, 1991). Recently, researches have sought to understand how learning occurs *within* firms. A dyadic or partner level of analysis seems to no longer suit the issue under investigation (Levinthal, 2000). Consequently, building on the premises of this recent research, we use the performance of a firm's alliance portfolio as unit of analysis. We expect this unit of

analysis to be a reliable representation of a firm's average alliance performance because it allows us to analyze the *average* impact of a firm's alliance capability on its alliance performance. The impact of a firm's alliance capability is by nature not restricted to one alliance but is centered on the creation of a firm-wide ability to deal with its entire alliance portfolio (Anand and Vassolo, 2002). Although this unit of analysis has so far been rarely used, it is useful as it allows us to observe the impact of certain business processes involving alliance practices on alliance performance. This allows us to verify whether heterogeneity in alliance performance is attributable to different in use of certain intra-firm alliance-related processes.

Explanatory variables

We included three main (groups of) explanatory variables in our paper: alliance experience, alliance capability and their interaction effect. For the first explanatory variable, we use the number of alliances that a firm has formed (in our case over the last five years) as a proxy for alliance experience, which is in line with earlier studies (Kale et al., 2002; Li and Rowley, 2002; Zollo et al., 2002). A 5-point scale defined different categories representing a firm's number of alliances.

With respect to the second explanatory variable, we chose to operationalizes a firm's alliance capability as a sum of its learning mechanisms, which is in line Knott (2003: 937) who proxied routines as a sum of practices. All mechanisms are calculated as dichotomous variables as a firm either has or does not have a certain mechanism. On basis of the input of an expert panel, a list of mechanisms critical to alliance management was generated (see figure 1 for an overview). Some earlier studies use alliance experience as a proxy for alliance routines (Zollo et al., 2002) or measure one mechanism such as an alliance department (Kale et al., 2002). However, as our aim to uncover what the role of learning mechanisms is in the evolution of alliance capabilities, we deemed it more appropriate to proxy it at the micro-level using learning mechanisms. Salk and Simonin (2003) say: *"mechanisms through which learning is realized and potentially converted into performance, often directly inferred rather than directly observed, imply structures and processes at the organizational and sub-organizational levels"*. This clearly

underlines the fact that sound operationalizations should be sought in organizational attributes reflecting the absence or presence of such mechanisms.

Figure 1 Micro-level mechanisms

	Micro-level mechanisms [a]
Functions	(1) vice-president of alliances, (2) alliance department, (3) alliance specialist, (4) alliance manager, (5) gatekeeper, (6) local alliance manager
Tools	(7) internal alliance training, (8) external alliance training, (9) training in intercultural management, (10) partner selection program, (11) joint business planning, (12) alliance database, (13) use of intranet to disperse knowledge, (14) best practices, (15) culture program, (16) partner program, (17) individual alliance evaluation, (18) comparison of evaluations, (19) joint evaluations
Control and management processes	(20) responsibility level for alliances (a. top management, b. business development, c. marketing, d. M&A department, e. research & development, f. strategy), (21) rewards and bonuses for alliance managers, (22) rewards and bonuses for business managers, (23) formally structured knowledge exchange between alliance managers, (24) use of own knowledge about national cultural differences, (25) alliance metrics, (26) country-specific alliance policies
External parties	(27) consultant, (28) lawyer, (29) mediator, (30) financial expert

Given the inherent complexity of managing alliances, we expect that measuring alliance capability using thirty separate items is more likely to give a solid representation of a firm's ability to fully master all aspects involved in managing alliances.

Dependent variable

Triggered by the dissatisfaction with performance of many alliances (Khanna et al., 1998), the topic of alliance performance and its measurement has been dealt with extensively over the last years. Although this area has been baptized as being 'challenging' due to measurement problems and data access (Anderson, 1990; Gulati, 1998), various studies have used different measures and levels of analysis (for a critical review see Gulati, 1998; for an overview see Park and Ungson, 2001). Various studies

have investigated the need to use objective, subjective or a composite index to measure alliance performance. Geringer and Hebert (1991) have shown that objective and subjective measures tend to have a high correlation. Consequently, in spite of early criticism on the use managerial assessments as a measure for alliance performance, there seems be an emerging consensus that managerial assessments of performance provides a sound reflection of alliance performance (Kale et al., 2002). Given the fact that companies form alliances for specific reasons, asking alliance managers to what extent the stated alliance objectives were achieved, is an effective and scientifically established manner to assess the success of an alliance (Geringer and Herbert, 1991; Tuchi, 1995; Kale and Singh, 1999). Consequently, in line with previous studies (Hamel, 1991; Hamel et al., 1989), alliance performance is defined as the percentage of alliances in which the original goals were realized. The dependent variable (alliance portfolio performance) is a 5-category measure.

ANALYSIS & RESULTS

In line with Davies and Walters (2004), we made use of EFA to construct our scales and verify the validity of our constructs. We used the original dataset to construct a 30 x 192 matrix containing the 30 mechanisms for our 192 respondents. The matrix consists of mechanisms that are all dichotomous (see earlier discussion on measurement). A statistical package called Mplus was used to perform the factor analysis. Given the categorical nature of the data, Mplus instead of more conventional packages were used since this program is able to perform factor analyses with binary variables (for an overview see Muthen, 1978; Bartholomew, 1987)[7]. In these factor analysis, factor rotation PROMAX rather than VARIMAX was used, as the latter assumes that there is no intercorrelation between the independents (Tucker and MacCallum, 1997). Since we do expect the various mechanisms to be correlated, PROMAX was chosen. As the micro-level mechanisms have been measured as nominal variables, the factor analysis made use of dichotomous variables (Muthen and Christoffersson, 1981). On basis of an iterative

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[7] . Mplus replaces an earlier program called LISCOMP (also distributed by Muthen & Muthen). For an overview and comparison of the programs used for factor analyses, we refer to Bartholomew (1987) and Uebersax (2000).

process, we compared and contrasted different factor structures. The results for the multi-item measures are presented in next table. With a sample size of approximately 200 cases, the factor loadings should be .40 or higher in order to be significant at the 5% level (Hair et al., 1998: 112).

Table 2 Exploratory factor analysis and reliability of factor-based scales[a]

Subordinate Variables[b] (Questionnaire items)	Factor 1 Organization level learning mechanisms	Factor 2 Group level learning mechanisms
Cronbach's alpha	0.83	0.63
Eigenvalue	6.864	1.778
VP of alliances (1)	0.728	
Alliance manager (4)	0.885	
Local alliance managers (6)	0.784	
Internal alliance training (7)	0.463	
External alliance training (8)		0.557
Training in intercultural management (9)		0.551
Partner selection program (10)	0.516	
Intranet (13)	0.541	
Alliance best practices (14)		0.938
Culture program (15)		0.589
Comparison of alliance evaluations (18)	0.532	
Rewards for alliance managers tied to alliance performance (21)	0.960	
Formally structured knowledge exchange between alliance managers (23)	0.591	
Alliance metrics (25)		0.688
Country-specific alliance policies (26)	0.521	

[a] Factor analysis and cronbach's alpha were performed for the entire sample (N=192)
[b] All variables used are measured as dichotomous items (0 = mechanisms is not used; 1 = mechanism is used)

The cronbach's alpha was calculated in order to verify the consistency of the derived factors. The coefficient alphas are allowed to decrease to the .60 level in an exploratory research as this is (Robinson et al., 1991). As our two measures are all above the .60 level which suggest high levels of reliability (Nunally, 1978). The table also shows the eigenvalues of the factors, which is a criterion for the number of factors to extract from the analysis. As the values of the latent root or eigenvalues are all greater than 1, they are all above the cut-off level of 1 (Hair et al., 1998: 103). This indicates that these factors explain more than the variance of a single variable and hence they can be included. The root mean square residual is 0.0707, which is an acceptable level (Hair et al., 1998).

In order to verify if indeed firms with different levels of experience use different mechanisms, the mean differences of variables were analyzed. However, a first analysis of the data showed that the independent variables seemed to be highly correlated with the interaction term. This is a recurring problem in extended models containing mediating variables (Mason and Perreault, 1991). In order to solve this problem, we centered our data in order to overcome the problems associated with multicollinearity (see e.g. Aiken and West, 1991). Applying this method allows on the one hand to reduce the correlation between the variables and on the other to render more meaningful results (Aiken and West, 1991; Long, 1997). Table 3 provides the descriptive statistics and the correlation matrix.

Table 3 Descriptive statistics and correlation matrix (N=192)

	Mean	S.D.	1	2	3	4
Alliance performance	3.2216	1.30572				
1. Alliance experience	0	1.23987	1			
2. Organization level learning mechanisms (F1)	0	2.92924	.047	1		
3. Group level learning mechanisms (F2)	0	1.37729	0.13	.474 ***	1	
4. Interaction effect (F1*F2)	1.9009	3.91639	-.080	.202**	.273***	1

****p<0.001;** p<0.01; *p<0.05; + p<0.10 (two-tailed)*

Having centered our data, the mean differences by experience level were calculated and are reported in table 4. This allows us to test hypothesis 1. The comparison of mean differences shows that as experience increases, firms tend to make increasing use of both organization-level and group-level learning mechanisms. The relative figures, presented in bold, indicate the mean divided by the number mechanisms included in the factor (see table 2 for details; factor 1 consists of 10 separate mechanisms; factor 2 consists of 5 separate mechanisms). These figures show that firms with little experience make more use of group level learning mechanisms in absolute terms. However, the relative use of group level learning mechanisms compared to organization level learning mechanisms decreases substantially as firms gain more experience. This indicates that as firms gain

experience, firms start to make more use of learning mechanisms aimed at institutionalization. This is confirmed by that fact that the proportion of variance explained by organization-level is substantially (eta =.284) larger than that of group-based learning mechanisms (eta =.037). Therefore, hypothesis 1 can be accepted. Hence, table 4 shows that indeed difference experience levels make use of different types of learning mechanisms. This marks an important finding, since hints have been made at differential learning rates (e.g. Kumar and Nti, 1998; Zott, 2003), but little insight has yet been generated what micro-level mechanisms fundamentally cause this differentiation.

Table 4 Mean differences by experience level

	Mean (sd)			F-test[a]	Eta sq[b]	F-test[c]
	Low experience group (N=88)	Moderate experience group (N=47)	High experience group (N=31)			
Control						
Firm size				6.937***	.078	
ICT industry				.929	.011	
Service industry				1.683	.020	
Factor 1[d]	**.205**	**.381**	**.597**			
Organization level learning mechanisms	2.05 (2.21)	3.81 (2.79)	5.97 (2.23)	32.388***	.284	4.369**
Factor 2[e]	**.220**	**.298**	**.348**			
Group level learning mechanisms	1.10 (1.31)	1.49 (1.32)	1.74 (1.39)	3.120*	.037	3.878**
Interaction effect						
Factor 1*factor 2	3.70 (6.93)	7.17 (9.75)	11.45 (10.15)	10.131***	.111	1.791
Performance						
Alliance performance	2.78	3.67	3.37	7.713***		

Note that the figures which are bold represents the mean divided by the number of mechanisms included in the factor. This is done to compare the use of organization and group level learning mechanisms.
***p<0.001;** p<0.01; *p<0.05; St dev in parantheses.
[a] T-test for mean difference
[b] Eta is a measure of association and reflects the proportion of variance in the dependent variable (alliance experience) that is explained by differences among groups. It is the ratio of the between-groups sum of squares and the total sum of squares.
[c] One-way ANOVA on alliance performance
[d] The number of mechanisms included in this factor is 10, therefore the average of this factor is divided by ten to obtain a comparable figure with group level learning mechanisms (factor 2).
[e] The number of mechanisms included in this factor is 5, therefore the average of this factor is divided by five to obtain a comparable figure with organization level learning mechanisms (factor 1).

Interestingly, when dividing the high experience group into two (i.e. a high experience group i.e. between 25-40 alliances and a very high experience group i.e. >40 alliances experience group), we found that the latter group makes substantially more use of organization level learning mechanisms than the former (6.29 versus 5.88). Moreover, the highest performance group makes less use of group based learning mechanisms than the high performance group (1.57 versus 1.79). Although only 7 firms fall within the highest experience category, they make extensive use of organization level learning mechanisms while their alliance performance is very high (3.71 versus 3.25). This underlines our earlier finding (on basis of the eta statistic), which suggested that that the learning mechanisms tested indeed have differential learning effects.

In order to test whether indeed certain learning mechanisms have an impact on alliance performance, it is important to test these variables in a multivariate setting. Therefore, we conduct a multinomial logistic regression analysis including all independent variables and test these again on alliance performance. Multinomial logistic regression analysis is a good alternative to OLS regression when the dependent variable is categorical or non-metric. The results are shown in the next table. As chi-square statistics can be influenced by large sample sizes, we mention both the Nagelkerke pseudo R-square and the percentage correct classification to verify the overall model fit (Hair et al., 1998: 280). Given the fact that we use a five-scale dependent variable, the correct classification is relatively high for all models. All the models provide sufficient explanatory power and are significant at the 0.05 level. The likelihood ratio test shows whether the null hypothesis that the effects of the dependent variables are simultaneously equal to zero can be rejected. The results of the likelihood ratio tests were also included as this test compares models with and without the predictors used and tends to be preferred over common tests such as the Wald test (Tabachnick and Fidell, 2001: 539).

Model I shows that the intra-firm learning mechanisms alone explain 20.4% of the variance. This is comparably to recent findings by Knott (2003), who finds that her measures of routines alone explain approximately 18% of the variance. Model II is a baseline model that summarizes our findings when only control variables are included in the logistic regression. The control variables included in this paper, which are firm size (on basis of annual sales revenues), ICT sector and service sector, conjointly explain

approximately 13% of the total variance. In this model, firms in the ICT sector seem to be somewhat in advantage over firms from other industries. In order to verify whether indeed, as hypothesis 2 suggests, both organization-level and group-level mechanisms play an important role in explaining alliance performance heterogeneity among firms, model III was run. In contrast to prior studies, alliance experience does not have a significant effect on alliance performance. The effect of alliance experience is likely to be substituted by the learning mechanisms included.

Table 5 Associations between learning mechanisms and alliance performance

	Model I		Model II		Model III		Model IV	
	Likelihood ratio tests	B	Likelihood ratio tests	B	Likelihood ratio tests	B	Likelihood ratio tests	B
Intercept	18.790***	.846	4.100	-.265	1.608	.753	1.320	-.631
Alliance experience					6.176	.079	11.047*	-.431
Factor 1								
Organization level mechanisms	18.676***	.335**			10.601*	.335**	2.959	.329
Factor 2		-.609**						
Group level mechanisms	16.957**				16.888--	-.538**	14.956**	-.579+
Interaction effect								
Factor 1*factor 2	3.031	-.043			2.230	-.033	1.971	-.054
Control								
Firm size (sales revenues)			12.799*	.140	4.381	-.093	3.618	1.161*
ICT sector			7.863+	1.009*	4.298	.428	4.907	1.206+
Service sector			2.738	.050	2.525	.219	3.663	.152
Model summary (? chi-square)	38.212***		22.925*		55.625***		52.158**	
df.	12		12		28		28	
Nagelkerke R^2	0.204		0.128		.284		.368	
Percentage correct classification	39.8%		33.5%		39.2%		41.7%	
N	176		176		176		120	

***p<0.001;** p<0.01; *p<0.05; + p<0.10
For all models, we used the results from category 4 with category 5 in order to see how above-average performing firms acted.

We find that organization level learning or institutionalizing mechanisms are much more effective in enhancing alliance performance than the integrating mechanisms. The positive coefficient for organization level learning mechanisms (B=.335, p<.01) indicate that low values for this explanatory variable are associated with low alliance performance. The negative sign of the coefficient for group level mechanisms (B=-.538, p<.01) indicates that low values of group level mechanisms are related to higher values of

alliance performance. Organization level learning mechanisms therefore prove to have a stronger performance effect than group level mechanisms. Hypothesis 2A and 2B are therefore rejected: only organization level learning mechanisms positively influence alliance performance (2A) and our data also indicate that it is not advantageous to simultaneously use both group and organization level mechanisms. Hence, although organizations have proved to commit to deliberate learning in the area of alliances in different ways (Alliance Analyst, 1994), this paper finds that it does not necessarily pay to invest in group level learning mechanisms.

In order to test hypothesis 3A and 3B, we verified whether different mechanisms are more effective at different levels of alliance capability. Model IV shows the results when only firms with low and moderate alliance experience are selected (i.e. experience group 1 and 2). The results show that for this subset of our dataset, the only independent variable that is slightly significant is the group level mechanisms (B=-.579, p<.1), but it has a negative sign to the coefficient. This indicates that low values of group level mechanisms are related to high values of alliance performance, which suggests a non-positive impact of this factor on alliance performance. Interestingly, in this model the control variable for firm size is significant (B=1.161, p<.05), which shows that in the little experience group large firms have an advantage over small firms. On basis of these results, we have to reject hypothesis 3A, which suggested that for firms with little alliance experience, group level learning mechanisms have a greater performance impact than organization level mechanisms.

With respect to hypothesis 3B, which states that for firms with extensive alliance experience organization level mechanisms have a greater performance impact than group level mechanisms, we find convincing support. Table 4 shows that the F-test of organization level learning mechanisms, which performs a one-way ANOVA on alliance performance, is significant (4.369**). Moreover, the same table indicates that firms start to use relatively more organization level mechanisms than group level mechanisms as they gain experience. Since model III indicates that organization level learning mechanisms have a positively impact on alliance performance (B=.335, p<.01) and group level learning mechanisms do not (B=-.538, p.01), this indicates that the former has a greater impact on performance than the latter. The results were identical when a model

was run which only contained the moderate and high experience group: organization level learning mechanisms have a higher performance impact than group level learning mechanisms. This confirms the expected differential learning effect of the learning mechanisms investigated.

DISCUSSION & CONCLUSION

This paper served to answer the question of how alliance capabilities evolve and what role learning mechanisms play in this respect. The analyses revealed a number of interesting findings. First, using exploratory factor analysis we derived two latent variables that help explain learning effects in the evolution of alliance capabilities: group level learning mechanisms (fostering 'integration') and organization level learning mechanisms (fostering 'institutionalization'). We expect that group level learning mechanisms are more often used to disperse generic alliance knowledge and process routines and capabilities, while organization level learning mechanisms will be better capable of changing routine behavior and disperse dynamic capabilities. Second, we found that indeed in our sample firms at different capability levels make use of different sets of learning mechanisms. While firms with little alliance capabilities, which are positioned the low and moderate experience groups, make relatively more use of group level learning mechanisms (F2) in comparison to organization level learning mechanisms (F1) (means are respectively .22 for F1 and .205 for F2). Moreover, firms with higher levels of alliance capabilities make relatively more use of organization level mechanisms. As firms gain more experience, and therefore move up in terms of the level of their alliance capability level, the mean of the dependent variable alliance performance also increased significantly. Third, testing whether the different learning mechanisms have different performance impacts, we find that firms with different levels of alliance experience invest in different sets of learning mechanisms. While firms with lower experience levels tend to prefer group level over organization level learning mechanisms, the performance impact of the former group is negative. This shows that group level learning mechanisms do not improve a firm's ability to perform in alliances; on the contrary, they seem to restrict rather than enhance the ability to perform. These findings

seem to suggest that generic lessons on common pitfalls in alliances do not necessarily pay off. This is in line with prior research by Haleblian and Finkelstein (1999), who intra-firm transfer effects at low levels of experience negatively influence performance due to the heterogeneity and specificity of generalization. Instead, firms should develop organizational routines, which nurture successful practices on basis of their own experience.

The results of this paper extend previous literature in various ways. First of all, this paper finds evidence of the role of learning mechanisms the evolution of alliances capabilities. This finding is in line with earlier studies (e.g. Simonin, 1997; Kale et al., 2002), which means that learning mechanisms explain differential rates of learning: organization level learning mechanisms are more effective than group based learning mechanisms in develop alliance capabilities. Second, routines are resources that explain performance heterogeneity in alliances. Using learning mechanisms as micro-level building blocks of alliance-related routines and practices, these mechanisms prove to positively impact alliance performance. More specifically, we find that different mechanisms have a differential learning effect and that organization level learning mechanisms are most effective. While some other studies find that organizations become inert when a capability becomes deeply embedded in its memory structure, our paper finds that learning mechanisms that foster institutionalization are most conducive to enhancing alliance performance. Activities related to the capability are likely to be executed in a more routinized fashion as a consequence of which actions may become less conscious and specific. As Winter (2003: 993) stresses, it is not necessarily advantageous to develop 'a dynamic alliance capability'. However, it appears that in highly dynamic and complex settings as alliances are, one would indeed expect that a foundation of patterned activities which are thoroughly embedded in a firm's infrastructure could be advantageous to nurture flexible and creative solutions (Miner et al., 2001). The advantages created as a consequence of developing and maintaining the ability to change repeated patterns of action with respect to alliance management practices seem outweigh the costs involved. Third, when alliance experience is used as control variable for organizational inertia (Li and Rowley, 2002), we find that it does not influence the effectiveness to perform in our dataset. This implies that firms in our

dataset are not restricted by prior experiences and are able to adjust practices on basis of new lessons learned. Fourth, although organizational processes are frequently subject to causal ambiguity (Lippman and Rumelt, 1982), this paper has partly resolved the casual ambiguity surrounding the evolution of alliance capabilities by showing that micro-level mechanisms play an important role in the development of alliance capabilities. While isolating mechanisms are often referred to as a requirement for superior resources, we find that the isolating mechanisms is especially inherent in whether the firm succeeds in institutionalizing alliance related knowledge and developing routines. Last, the findings of this study also contribute to other studies that focus on dyadic issues in alliances. Observing great differences in firms' ability to learn, firms that have little alliance experience are more like to jeopardize the continuity and success of their alliances. Hence, they are likely to be less successful in maintaining good relationships with their partners. Firms with little alliance capabilities are therefore more prone to overlook critical relationship issues, which may negate long-term and sound dyadic relationships.

In addition to some obvious limitations in generalizing from this paper's findings, there are a number of interesting issues that could complement this paper. Future research may more specifically aim to distill to what extent embedded knowledge tends to be forgotten. As Carile and Rebentisch (2003: 1188) say: *"knowledge embedded in practices, processes, or artifacts may be stored in a way that causes it to be 'forgotten' or otherwise unavailable during future knowledge retrieval"*. The effectiveness of certain mechanisms to capture and transfer knowledge may therefore differ. Another interesting area of research, which is linked to the results of this study, would be the extent to which different mechanisms are able to renew capabilities. Whereas in this study, all mechanisms were treated similarly with respect to their ability to contribute to rejuvenation of a firm's capability, it would interesting to verify to what extent mechanisms differ in that respect.

REFERENCES

Aiken LS, West SG. 1991. *Multiple regression: Testing and interpreting interactions.* Sage: Newbury Park, CA.

Alliance Analyst. 1994. *Two Grandmasters at the Extremes.* November 1994. NewCap Communications: Philadelphia, PA.

Alliance Analyst. 1996. *Managing Alliances- Skills for the modern era.* March 1996. NewCap Communications: Philadelphia, PA.

Anand BN, Khanna T. 2000. Do firms learn to create value? The case of alliances. *Strategic Management Journal* **21**(3): 295-315.

Anand J, Vassolo RS. 2002. An examination of dynamic capabilities: is evolutionary theory under-determined? Paper presented at SMS Conference, Paris.

Anderson E. 1990. Two firms, one frontier: on assessing joint venture performance. *Sloan Management Review* **31**(2): 19-30.

Argyris C, Schon D. *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley: Massachusetts.

Armstrong JS, Overton TS. 1977. Estimating nonresponse bias in mail surveys. *Journal of Marketing Research* **14**: 396-402.

Barney JB. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**: 99-120.

Bartholomew DJ. 1987. Latent variable models and factor analysis. Oxford University Press: New York.

Beamish PW. 1984. Joint venture performance in developing countries. Doctoral dissertation, University of Western Ontario, London.

Brown JS, Duguid P. 1991. Organizational learning and communities of practice: toward a unified view of working, learning, and innovation. *Organization Science* **2**(1): 40-57.

Carlile PR, Rebentisch ES. 2003. Into the black box: the knowledge transformation cycle. *Management Science* **49**(9): 1180-1195.

Churchill GA, Iacobucci D. 2001. *Marketing Research: Methodological Foundations.* 8th edition. South-Western College Publishing: Mason, OH.

Cohen M, Bacdayan P. 1994. Organizational routines are stored as procedural memory: evidence from a laboratory study. *Organization Science* **5**: 554-568.

Cohen WM, Levinthal DA. 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly* **35**: 128-152.

Crossan M, Lane H, White R. 1999. An organizational learning framework: from intuition to institution. *Academy of Management Review* **24**(3): 522-538.

Davies H, Walters P. 2004. Emergent patterns of strategy, environment and performance in a transition economy. *Strategic Management Journal* **25**(4): 347-364.

Dosi G, Nelson RR, Winter SG (eds). 2000. *The Nature and Dynamics of Organizational Capabilities.* Oxford University Press: New York.

Doz YL, Prahalad CK. 1991. Managing DMNCs: a search for a new paradigm. *Strategic Management Journal* **12**: 145-164.

Draulans J, De Man A-P, Volberda HW. 2002. Building alliance capability: management techniques for superior alliance performance. *Long Range Planning* **36**(2): 151-166.

Eisenhardt KM, Martin JA. 2000. Dynamic capabilities: what are they?. *Strategic Management Journal* Special Issue **21**(10-11): 1105-1121.

Fiol CM, Lyles MA. 1985. Organizational learning. *Academy of Management Review* **10**(4): 803-813.

Foss NJ (ed).1997. *Resources, Firms and Strategies, A Reader in the Resource-Based Perspective*. Oxford: Oxford University Press.

Geringer JM, Hebert L. 1991. Measuring performance of international joint ventures. *Journal of International Business Studies* **22**(1): 41-62.

Gulati R. 1998. Alliances and Networks. *Strategic Management Journal* **19**: 293-317.

Gulati R. 1999. Network location and learning: the influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* **20**(5): 397-420.

Hagedoorn J. 2002. Inter-firm R&D partnerships- an overview of major trends and patterns since 1960. *Research Policy* **31**: 477-492.

Hair JF, Anderson RE, Tathmam RL. 1998. *Multivariate Data Analysis*. Macmillan: New York.

Haleblian J, Finkelstein S. 1999. The influence of organization acquisition experience on acquisition performance. *Administrative Science Quarterly* **44**(1): 29-56.

Hamel G. 1991. Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal* Special Issue **12**(Summer): 83-103.

Hamel G, Doz Y, Prahalad C. 1989. Collaborate with your competitors and win. *Harvard Business Review* **67**(1): 133-139.

Harzing A-W. 2000. Cross-national industrial mail surveys. Why do response rates differ between countries? *Industrial Marketing Management* **29**: 243-254.

Heimeriks KH, Duysters GM. A study into the alliance capability development process. In *Research in Competence Management*, Sanchez R, Heene A (eds), forthcoming.

Heimeriks KH, Duysters GM. 2003. Alliance capability as mediator between experience and alliance performance: an empirical investigation into the alliance capability development process. White paper, Eindhoven University of Technology.

Helfat C. 2000. Guest editor's introduction to the special issue: the evolution of firm capabilities. *Strategic Management Journal* Special Issue **21**: 955-959.

Helfat CE, Peteraf MA. 2003. The dynamic resource-based view: capability lifecycles. *Strategic Management Journal* **24**(10): 997-1010.

Henderson R, Clark K. 1990. Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly* **35**: 9-30.

Henderson R, Cockburn I. 1994. Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal* Special issue **15**: 63-84.

Hoang HT, Rothaermel FT, Simac S. 2003. The impact of general and partner-specific alliance experience on joint R&D project performance. INSEAD, white paper.

Hoopes DG, Madsen TL, Walker G. 2003. Guest editors' introduction to the special issue: why is there a resource-based view? Toward a theory of competitive heterogeneity. *Strategic Management Journal* Special Issue **24**: 889-902.

Inkpen AC, Dinur A. 1998. Knowledge management processes and international joint ventures. *Organization Science* **9**(4): 454-468.

Kale P, Singh H. 1999. Alliance capability and success: a knowledge-based approach. working paper Wharton School, University of Pennsylvania.

Kale P, Dyer JH, Singh H. 2002. Alliance capability, stock market response, and long term alliance success: the role of the alliance function. *Strategic Management Journal* **23**(8): 747-767.

Kanuk L, Berenson C. 1975. Mail surveys and response rates: a literature review. *Journal of Marketing Research* **12**: 440-453.

Khanna T, Gulati R, Nohria N. 1998. The dynamics of learning alliances: competition, cooperation, and relative scope. *Strategic Management Journal* **19**(3): 193-210.

Kim DH. 1993. The link between individual and organizational learning. *Sloan Management Review* **35**(1): 37-50.

King AW, Zeithaml CP. 2001. Competencies and firm performance: examining the causal ambiguity paradox. *Strategic Management Journal* **22**(1): 75-99.

Knott AM. 2003. The organizational routines factor market paradox. *Strategic Management Journal* **24**(10): 929-943.

Kogut B, Zander U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* **3**: 383-397.

Kumar BN, Nti KO. 1998. Differential learning and interaction in alliance dynamics: a process and outcome discrepancy model. *Organization Science* **9**(3): 356-367.

Kusunoki K, Nonaka I, Nagata A. 1998. Organizational capabilities in product development of Japanese firms: a conceptual framework and empirical findings. *Organization Science* **9**(6): 699-718.

Lane PJ, Lubatkin M. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal* **19**(5): 461-477.

Lane PJ, Salk JE, Lyles MA. 2001. Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal* **22**(12): 1139-1161.

Larsson R, Bengtsson L, Henriksson K, Sparks J. 1998. The interorganizational learning dilemma: collective knowledge development in strategic alliances. *Organization Science* **9**(3): 285- 305.

Lenox M, King A. 2004. Prospects for developing absorptive capacity through internal information provision. *Strategic Management Journal* **25**(4): 331-345.

Leonard-Barton D. 1995. *Wellsprings Of Knowledge.* Harvard Business School Press, Mass: Boston.

Levinthal D. 2000. Organizational capabilities in complex worlds. In *The Nature and Dynamics of Organizational Capabilities*, Dosi G, Nelson RR, Winter SG (eds). Oxford University Press: Oxford, New York; 363-379.

Levinthal DA, March JG. 1993. The myopia of learning. *Strategic Management Journal* Special Issue **14**: 95-112.

Li SX. Rowley TJ. 2002. Inertia and evaluation mechanisms in interorganizational partner selection: syndicate formation among U.S. investment banks. *Academy of Management Journal* **45**(6): 1104-1119.

Lippman S, Rumelt R. 1982. Uncertain imitability: an analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics* **13**: 418-438.

Long JS. 1997. *Regression models for categorical and limited dependent variables*. Sage Publications: Thousand Oaks, CA.

Madhok A, Tallman SB. 1998. Resources, transactions and rents: managing value through interfirm collaborative relationships. *Organization Science* **9**(3): 326-339.

Mahoney JT, Pandian JR. 1992. The resource-based view within the conversation of strategic management. *Strategic Management Journal* **13**(5): 363-380.

Makhija MV, Ganesh U. 1997. The relationship between control and partner learning in learning-related joint ventures. *Organization Science* **8**(5): 508-527.

Mason CH, Perreault WD. 1991. Collinearity, power, and interpretation of multiple regression analysis. *Journal of Marketing Research* **28**: 268-280.

Miller D, Friesen PH. 1980. Momentum and revolution in organizational adaptation. *Academy of Management Journal* **23**(4): 591-614.

Minbaeva D, Pedersen T, Björkman I, Fey, CF, Park HJ. 2003. MNC knowledge transfer, subsidiary absorptive capacity, and HRM. *Journal of International Business Studies* **34**(6): 586-599.

Miner AS, Bassoff P, Moorman C. 2001. Organizational improvisation and learning: a field study. *Administrative Science Quarterly* **46**: 304-337.

Mintzberg H, Ahlstrand B, Lampel J. 1998. *Strategy Safari: A Guided Tour through the Wilds of Strategic Management*. Free Press: New York.

Montgomery CA. 1995. *Resource-based and evolutionary theories of the firm: towards a synthesis*. Kluwer: Norwell, CA.

Muthen B. 1978. Contributions to factor analysis of dichotomized variables. Psychometrika **43**: 551-560.

Muthen B, Christoffersson A. 1981. Simultaneous factor analysis of dichotomous variables in several populations. *Psychometerika* **48**: 485-500.

Nelson R, Winter S. 1982. *An Evolutionary Theory of Economic Change.* Harvard University Press: Cambridge, MA.

Nonaka I, Takeuchi H. 1995. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press: New York.

Nunally JC. 1978. *Psychometric Theory*. McGraw Hill: New York (2nd ed).

Nunally JC, Bernstein IH. 1994. *Psychometric Theory*. 3rd edition. McGraw-Hill: New York.

Olk P. 2002. Evaluating Strategic Alliance Performance. In *Cooperative Strategies and Alliances*. Contractor FJ, Lorange P (eds). Elsevier Science: Oxford: 119-143.

Oppenheim AN. 1966. *Questionnaire Design and Attitude Measurement*. Heinemann: London.

Park SO, Ungson GR. 2001. Interfirm rivalry and managerial complexity: a conceptual framework of alliance failure. *Organization Science* **12**(1): 37-53.

Peteraf M. 1993. The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal* **14**(3): 179-191.

Philips LW. 1981. Assessing measurement error in key informant reports: a methodological note on organizational analysis in marketing. *Journal of Marketing Research* **18**(4): 395-415.

Ray G, Barney JB, Muhanna WA. 2004. Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal* **25**(1): 23-37.

Reuer JJ, Park KM, Zollo M. 2002. Experiential learning in international joint ventures: the roles of experience heterogeneity and venture novelty. In *Cooperative Strategies and Alliances*. Contractor FJ, Lorange P (eds). Elsevier Science: Oxford: 321-344.

Robinson JP, Shaver PR, Wrightsman LS. 1991. Criteria for scale selection and evaluation. In *Measures of Personality and Social Psychological Attitudes*, Robinson JP, Shaver PR, Wrightsman LS (eds). Academic Press: San Diego, CA: 1-15.

Salk JE, Simonin BL. 2003. Beyond alliances: towards a meta-theory of collaborative learning. In Easterby-Smith M, Lyles MA (eds). *Handbook of Organizational Learning and Knowledge Management*. Blackwell: Oxford: 253-277.

Sanchez R. 2001. Managing Knowledge into Competence: The Five Learning Cycles of the Competent Organization. In *Knowledge Management and Organizational Competence*, Sanchez R (ed). Oxford University Press: Oxford, New York: 3-37.

Simonin BL. 1997. The importance of collaborative know-how: an empirical test of the learning organization. *Academy of Management Journal* **40**(5): 1150-1174.

Tabachnick BG, Fidell LS. 2001. *Using Multivariate Statistics*. 4th edition. Allyn and Bacon: Needham Heights, MA.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* **18**(7): 509-533.

Tippins MJ, Sohi RS. 2003. IT competency and firm performance: is organizational learning a missing link? *Strategic Management Journal* **24**(8): 745-761.

Tsang EWK. 2002. Acquiring knowledge by foreign partners from international joint ventures in a transition economy: learning-by-doing and learning myopia. *Strategic Management Journal* **23**(9): 835-854.

Tuchi C. 1995. Firm heterogeneity and performance of strategic alliances: a synthesis of conceptual foundations. Working paper, Sloan School of Management.

Tucker LR, MacCallum RC. 1997. Introduction to exploratory factor analysis. In Tucker LR, MacCallum RC (eds). *Exploratory factor analysis*. pp. 144-178. Downloaded from: http://www.unc.edu/~rcm/book/factornew.htm

Uebersax JS. 2000. Binary data factor analysis and multidimensional latent trait/Item Response Theory (IRT) Models. http://ourworld.compuserve.com/homepages/jsuebersax/binary.htm Accessed June 19th, 2003.

Venzin M, Von Krogh G, Roos J. 1998. Future research into knowledge management. In *Knowing in Firms, Understanding, Managing and Measuring Knowledge* Von Krogh G, Roos J, Kleine D (eds). Sage: London: 26-66.

Vera D, Crossan M. 2003. Organizational learning and knowledge management: toward an integrative framework. In Easterby-Smith M, Lyles MA (eds). *Handbook of Organizational Learning and Knowledge Management*. Blackwell: Oxford: 122-141

Vera D, Crossan M. 2004. Strategic leadership and organizational learning. *Academy of Management Review* **29**(2): 222-240.

Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171-180.

Winter SG. 1995. Four Rs of profitability: rents, resources, routines and replication. In Montgomery CA (ed). *Resource-based and Evolutionary Theories of the Firm: Towards a Synthesis*. Kluwer: Norwell, MA: 147-178.

Winter SG. 2003. Understanding dynamic capabilities. *Strategic Management Journal* **24**: 991-995.

Zollo M, Reuer JJ. 2003. Experience spillovers across corporate development activities. Working paper, INSEAD.

Zollo M, Reuer JJ, Singh H. 2002. Interorganizational routines and performance in strategic alliances. *Organization Science* **13**(6): 701-713.

Zollo M, Winter SG. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science* **13**(3): 339-351.

Zott C. 2003. Dynamic capabilities and the emergence of intraindustry differential firm performance: insights from a simulation study. *Strategic Management Journal* **24**(2): 97-125.

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