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An Empirical Study

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ABSTRACT

This paper assesses the differential performance effects of learning mechanisms on the development of alliance capabilities. Prior research has suggested that different capability levels could be identified in which specific 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 learning mechanisms are indeed useful in advancing a firm's alliance capability. This paper analyzes to what extent intra-firm learning mechanisms help firms develop their alliance capability. Differential learning may explain in what way firms yield superior returns from their alliances in comparison to competitors. The empirical results show that different learning mechanisms have different performance effects at different stages of the alliance capability development process. The main lesson from this paper is that firms can steer the creation and speed of their alliance capability development as different learning mechanisms have differential performance effects and are more appropriate at different levels of alliance capability.

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

JEL classification: L14

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INTRODUCTION

Recently, various studies have analyzed the inside-out view by examining the simultaneous restrictive and contributive role capabilities play in explaining firm heterogeneity (Teece et al., 1997; Helfat, 2000; King and Tucci, 2002). Founded in such theories as the resource-based view, evolutionary economics and organizational learning theory, such studies have introduced an interesting 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 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). This paper relies on these theories to investigate whether alliance experience drives the use of intra-firm learning mechanisms and how this explains alliance capability development.

Prior research has suggested that intra-firm learning mechanisms form the basis for organizational routines and help explain competitive heterogeneity (Winter, 1995; Teece et al., 1997; Zollo and Winter, 2002; Knott, 2003). In spite of growing amount of work on firm capabilities, little attention has been devoted to unravel sound individual actions or micro-level considerations (Felin and Foss, 2005); nor has the issue of how learning mechanisms contribute to enhance a firm's capability been sufficiently addressed. We suggest that learning mechanisms can help firms develop their alliance capabilities. In doing so, we look at two types of knowledge

transfer (i.e. integration and institutionalization) and suggests how these cause heterogeneity in alliance capability development.

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 examined. We first examine whether firms with extensive alliance experience make use of different learning mechanisms than firms with little experience. 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 3477 alliances.

THEORY

Over recent years, extensive attention has been paid to the role resources and capabilities play in explaining competitive heterogeneity (Teece et al., 1997; 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. Wernerfelt, 1984; Barney, 1991; Henderson and Cockburn, 1994), significantly less attention has been paid so far to how such capabilities are developed. Only recently have some scholars addressed such issues as capability lifecycles and intra-firm mechanisms which are elementary in order to improve our understanding of the origins of firm capabilities (Kogut and Zander, 1992; Anand and Khanna, 2000; Zollo and Winter, 2002; Draulans et al., 2003; Helfat and Peteraf, 2003). Moreover, 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 the resource-based view, organizational learning theory 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 (Dyer and Singh, 1998; Madhok and Tallman, 1998; Khanna et al., 1998) and (2) those that examine intra-firm learning in alliances and the generation of firm-specific rents (Simonin, 1997; Kale et al., 2002; Sarkar et al., 2004). Similarly, Hamel (1991) refers to respectively knowledge acquisition and knowledge internalization and Leonard-Barton (1995) differentiates between to learning outside and inside the firm. The first group of studies mainly looked at the acquisition of capabilities through alliances and the extent to which firms learn to cooperate with one another (e.g. Bleeke and Ernst, 1991, 1995; Makhija and Ganesh, 1997; Inkpen and Dinur, 1998; Larsson et al., 1998; Tsang, 2002; Zollo et al., 2002; Rosenkopf and Almeida, 2003). An interesting recent study by Mayer and Argyres (2004) finds that –in addition to asset specificity- contractual changes are linked to inter-partner learning and trust. Moreover, Kumar and Nti (1998) analyzed differences between partners with respect to the impact of absorptive capacity on collaborative payoff. Typically in such studies dyadic factors influencing relationship quality and the extent to which they enhance the creation of -or deprive partners to appropriate- collaboration-specific rents and common benefits are of central concern (Khanna et al., 1998; Madhok and Tallman, 1998). By nature they focus on individual relationships and 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; Carlile and Rebentisch, 2003). These studies center around the rents arising from unique and imperfectly mobile resources and capabilities, so-called firm-specific rents (Peteraf, 1993; Madhok and Tallman, 1998). While both groups of studies examine the role

resources and capabilities play in understanding performance heterogeneity, the obvious distinction lies in the fact that the second group is dedicated to understanding the internal processes underlying advances in firm capabilities. As such, the unit of analysis in applied studies shifts: rather than looking at the individual alliances it is the firm's alliance portfolio that is relevant to study. The role certain intra-firm mechanisms, such as alliance offices or departments, play in developing alliance capabilities and routines has been investigated (e.g. Simonin, 1997; Anand and Khanna, 2000; Kale et al., 2002; Zollo 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). While earlier studies claims that firms differ in terms of their alliance capabilities (Simonin, 1997; Anand and Khanna, 2000; Lambe et al., 2002), they also acknowledge that future work should address intra-firm elements that help build these alliance capabilities (Kale et al., 2002; Simonin, 2002). This paper aims to contribute to extant literature by analyzing intra-firm learning mechanisms and the extent to which these advance a firm's ability to perform in its alliances.

DEFINING ALLIANCE CAPABILITIES

In this paper, we define an alliance capability as a higher-order resource that is difficult to obtain or imitate and has the potential to enhance the performance of the firm's alliance portfolio (Makadok, 2001; Thomke and Kuemmerle, 2002; Kale et al., 2002). In line with Draulans et al. (2003) and Helfat and Peteraf (2003), who suggest that firms can go through different 'development paths' deploying different types of intra-firm mechanisms along the way, we posit that as firms gain experience in alliance management their alliance capabilities advance as a consequence of the learning mechanisms it

uses.[1] We expect that firms use different learning mechanisms as they gain experience. This logic is in line with recent organizational learning literature, which suggests that learning cycles -like the 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.

While we are aware of the fact that earlier studies have relied on a variety of definitions (see e.g. Simonin, 1997; Dyer and Singh, 1998; Kale and Singh, 1999; Anand and Khanna, 2000; Sivadas and Dwyer, 2000; Hoang and Rothaermel, 2005), we rely on this definition for a number of reasons. First, we expect alliance capabilities to be high-order resources. Prior research confirms that superior firm performance stems from firm-specific resources and capabilities (e.g. Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). So far, alliance research has built on resource-based reasoning in three distinct ways. A first stream of research treats alliances vehicles to gain access to certain assets or resources (e.g. Hamel et al., 1989). This means that, if firms wish to nullify resource scarcity, trading and accumulation of resources becomes a strategic necessity (Eisenhardt and Schoonhoven, 1996). A second stream has outlined the role of dedicating specific resources to the alliance, which can positively influence alliance success and rent-yielding capacity of the alliance at hand (Madhok and Tallman, 1998; Das and Teng, 2000a; Harrison et al., 2002; Robins et al., 2002). This contribution in particular has aimed to resolve the causal ambiguity issue in relation to alliances by

[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).

[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).

shedding light on the contribution of idiosyncratic resources to improve alliance performance. A third stream of research has –in contrast to the former two streams- looked at the effect of firm-specific resources (e.g. the presence or absence of an alliance department) on a firm's ability to successfully manage its alliances (Kale et al., 2002).

A second reason is inherently related to the fundamental logic of evolutionary economics: advances in a firm's alliance capabilities improve its ability to embed critical alliance knowledge in repeatable patterns of action (Nelson and Winter, 1982). These routines allow for the transfer, copying and recombination of knowledge by managers within the firm (Zollo and Winter, 2002). Moreover, they consist of or can be captured by learning 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).

A third reason pertains to organizational learning theory which argues that learning occurs when new knowledge is translated into meaningful action and different behaviors that are replicable (Argyris and Schon, 1978). As firms learn 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). This approach to understanding how alliance capabilities are developed has some parallels with 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 (e.g. Parise and Casher, 2003).

In spite of the contribution of prior studies to enhance insight into alliance performance antecedents, many firms still have difficulty to materialize potential benefits of its alliances and lack a micro-level understanding of the effect of learning mechanisms on alliance performance (Madhok and Tallman, 1998; Park and Ungson, 2001). There are a number of reasons for this. First, our understanding of the internal development process underlying alliance capabilities is at best meager. While various studies have attempted to shed light on critical intra-firm drivers of alliance performance, little is known about the micro-level activities firms can undertake in order to counter alliance failure. Consequently, even though firms develop alliance capabilities in many different ways, we do not know *how* they do that (Alliance Analyst, 1994; Hill and Hellriegel, 1994). Second, idiosyncratic resources and dyadic factors such as commitment, trust and partner fit remain essential to ensure a smooth functioning of a firm's alliances (Luo, 2002; Jap and Anderson, 2003). A recent study by Poppo and Zenger (2002) confirms that both relational governance and formal contract complement one another, confirming that relational issues remain critical to alliance success. And third, many firms seem ignorant to or overlook the inherent advantages of adopting learning mechanisms to transfer the lessons learned in prior alliances thereby limiting their ability to perform. In this way, as Knott (2003) argues, management itself creates the isolating mechanism as it hinders itself to learn from their experiences.

HYPOTHESES

Previous research primarily relied on alliance experience as a proxy for alliance capabilities (e.g. Anand and Khanna, 2000; Hoang and Rothaermel, 2005). As we consider this to be a rather rudimentary form of operationalization that lacks specificity and scrutiny with respect to intra-firm processes, this paper intends to specify micro-level elements that

underlie the development of alliance capabilities. We expect that different levels of alliance capability are related to 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 types of learning have a different impact on the creation of knowledge (Nonaka and Takeuchi, 1995). As knowledge becomes more tacit, which is more evident as knowledge becomes more embedded in for instance routines and established practices, it becomes more difficult to transfer (Szulanski, 1996, 2000). In this respect, it is insightful to distinguish between group level and organization level learning, not only because they tend to involve different types of knowledge (i.e. group level predominantly relies on explicit knowledge whereas organization level learning mainly involves tacit components) but also because they serve different purposes (i.e. group level learning mainly pertains to train or share knowledge between individuals whereas organization level learning involves developing institutionalizing routines and structures) (e.g. Hansen et al., 1999). For instance, firms having large alliance portfolios are more prone to develop common practices that subsequently are embedded in structures and processes (Goerzen, 2005). This is likely to have a different impact than for instance sharing of best practices on e.g. partner selection or choice of governance mode among a group of employees. While the use of the former types of group of mechanisms is likely to increase when firms manage larger sets of alliances, the latter is expected to be of particular interest to firms that have only recently started to ally as it transfers generic insights of which managers responsible for alliance portfolios will already be aware (Harbison and Pekar, 1998; Spekman et al., 1999; Hoffmann, 2005).

Second, we expect the nature of knowledge to differ in the various stages. Group level and organization level learning are likely to rely on different types of knowledge (for an overview see Venzin et al. 1998; Zack, 1999). 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 (Hedberg, 1981; 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 and Rothaermel, 2005). Acknowledging the lack of specificity in this relationship, Simonin (1997) found that alliance experience only becomes valuable after dispersion of the lessons learned. 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). On the basis of these arguments, we expect that learning mechanisms in general 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 of learning mechanisms is highest when they are used simultaneously. 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. More specifically, we expect that different learning mechanisms are more effective at specific levels of alliance capability.[3] 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

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

room for specialization. As firms become more experienced, they tend to embed knowledge into processes and structures as a consequence of which knowledge transfer becomes more of a tacit nature (Kieser et al., 2001; Carroll et al., 2003) and more 'sticky' (Szulanksi, 1996). For instance, Kale et al. (2002) from their findings deduct that an alliance department is an important element to stimulate the adoption of firm-wide routines and practices. Within this logic, e.g. sharing best practices among employees is unlikely to nurture specialists and is likely to lead to emphasize general knowledge, or so-called "do's and don'ts". 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 are likely to not fit the firm's needs. Therefore, we posit that:

H3A: For firms with little alliance experience, increasing group level learning mechanisms has a stronger positive effect on alliance performance than increasing organization level learning mechanisms.

H3B: For firms with extensive alliance experience, increasing organization level learning mechanisms has a stronger positive effect on alliance performance than increasing group level learning mechanisms.

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

DATA AND METHODS

Survey

The empirical part of this paper is based on a survey about alliance capabilities. It 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 cause unnecessary bias (see appendix 1). 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 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 and often used technique when gathering information at the corporate level (Philips, 1981).

After sending a reminder message to all the potential respondents, we received 206 responses.[4] 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, 2002; 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 in our dataset employed over 1000 employees, while 40% generates sales revenues of over US$ 1 billion. 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 (Das and Teng, 2000b; Park and Ungson, 2001). As the firms included in our dataset each manage over 18 alliances, the total dataset refers to 3477 alliances.[5]

[4] The database was gathered over two periods. The first group consisted of 161 respondents who filled out the questionnaire at the end of 2001; the second group, which consisted of 45 respondents, did so at the beginning of 2004. The responses of the two groups were compared on several key variables, but did not show considerable deviations. Moreover, 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 three key variables (χ^2-value of 2.386, p-value=0.122 for number of employees; χ^2-value of 1.947,p-value=0.163 for sales revenues and χ^2-value of 3.133, p-value=0.077 for alliance performance). Therefore, no significant correlations were observed between item scores and survey response time, which implies that there is no significant non-response bias in our dataset (Kanuk and Berenson, 1975; Armstrong and Overton, 1977).

[5] The variable measuring the number of alliances consists of five categories (0-5, 6-15, 16-25, 25-40 and >40 alliances). For the last category (>40 alliances), the average was set at 50 alliances. Hence, the total number of alliances is an estimate of 3477 alliances.

--insert table 1 about here--

Expert interviews

In addition to the survey, in-depth expert interviews were conducted. For these interviews, twelve experts in the field of alliances and capability development were selected worldwide. Within the group of experts, there was a sound division between practitioners (seven in number) and academics (five in number). However, some of the experts are active in both academia and business. The experts interviewed were selected on basis of their established reputation in the field and ability to sufficiently contribute to the goal of these interviews on basis of their prior experience and related knowledge.

The interviews served two purposes. On the one hand, they allowed for a verification of the empirical findings. On the other hand, the interviews were aimed at validating and extending the argumentations for expected and unexpected results and the reasons why the study's findings were appropriate. Mirroring our findings against the opinion and insights of practitioners and academics should nurture stronger and more reliable results. The interviews consisted of two sections, were semi-structured and lasted between sixty and ninety minutes (see appendix 2). The interview questions were partly exploratory and mostly open-ended (Greer et al., 2000). Before interviewing the envisioned experts, a panel of interviewees allowed for informal pre-testing of the questionnaire (Churchill and Iacobucci 2001). After the pre-tests, the interviews were recorded with consent of the interviewees and thereafter transcribed to allow for comparison of the different interviews. Moreover, the results were summarized during the interview in order to ensure an adequate representation of the expert's answers. The results of these interviews were used to verify our findings. Analyses of the results were done by comparing individual arguments and

comments of the interviewees to our findings and categorize any arguments given to provide additional support for our findings.

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. Bleeke and Ernst, 1991, 1995; Olk, 2002). An obvious drawback of using this 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 the use of certain intra-firm mechanisms and alliance-related processes.

Explanatory variables

We included three main (groups of) explanatory variables in our paper: alliance experience, alliance capability and their interaction effect. The first explanatory variable is the number of alliances that a firm has established 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; Vanhaverbeke et al., 2002; Zollo et al., 2002). A 5-point scale defined different categories representing a firm's number of alliances (0-20%, 21-40%, .. 81-100%).

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 make use of 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).

--insert figure 1 about here--

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 process of alliance capability development, we deemed it more appropriate to proxy it at the micro-level using learning mechanisms. Salk and Simonin (2003) argue that: *"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. Given the inherent complexity of managing alliances, we expect that measuring alliance

capabilities 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 (Bleeke and Ernst, 1991; 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 measured at an ordinal level and the item is based on a 5-point scale (0-20%, 21-40%, … 81-100%).

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 containing the 30 mechanisms for our 192 respondents. The database 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 was used since this program is able to perform factor analyses with binary variables (for an overview see Muthen, 1978; Bartholomew, 1987).[6] 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 mechanisms have been measured as nominal variables, the factor analysis made use of dichotomous variables (Muthen and Christoffersson, 1981). On the basis of an iterative process, we compared and contrasted different factor structures. The results revealed two factors with eigenvalues greater than 1 and are presented in table 2. 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). 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 .70 level (Nunally and Bernstein, 1994). Whereas the second factor is slightly below the recommended level (0.63), the first factor is substantially higher (0.82). However, both factors are adopted as it may drop to the .60 level in exploratory research settings (Robinson et al., 1991).

[6] 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).

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). The factor correlation is .551, which is a moderate level of intercorrelation, suggesting that the factors overlap to some degree but also represent conceptually distinct measures.

-- insert table 2 about here--

In order to verify whether firms use different learning mechanisms as alliance experience increases, we compared the use of learning mechanisms for firms with low and high levels of alliance experience and set up a two-stage least square model. 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 us 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 lists the unstandardized descriptive statistics and the correlation matrix. The table shows that in our dataset, firms on average -out of the ten mechanisms listed in table 2- make use of 3.69 organization level learning mechanisms; and 1.41 group level learning mechanism. In our

dataset, firm have an average alliance performance of 52% (refers to the 3.22 as a mean listed in the table).[7]

-- insert table 3 about here--

Having centered our data, we compared the use of learning mechanisms in order to verify whether firms use different learning mechanisms with increased alliance experience. From the results it was evident that there was a difference: the means of the variables by experience level were calculated and are reported in table 4.

-- insert table 4 about here--

The table presents three predefined levels of experience: a low experience group (0-15 alliances); a moderate experience group (16-25 alliances); and a high experience group (>26 alliances). This allows us to test hypothesis 1. The bold figures shown in table 4 represent the 'relative' mean use of the mechanisms. In relative figures, firms in the low experience group make relatively more use of group level (.22) than organization level learning mechanisms (.205).[8] 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. These figures also show that firms with little experience make more use of group level learning mechanisms. Growing experience can therefore be linked to growing use of both group and organization level learning mechanisms but the relative use

[7] In order to calculate the average number of alliances, we used five categories to measure the firm's number of prior alliances over the last 5 years. The last category (>40 alliances), we set the average at 50 alliances. The total number of alliances in our dataset then is an estimated 3477 alliances or 18.11 alliances per firm.

[8] The relative figures represent 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).

of group level learning mechanisms compared to organization level learning mechanisms decreases substantially as firms gain more experience. This is confirmed by that fact that the proportion of variance explained, as shown in table 4 by the eta square, by organization-level is substantially (eta =.284) larger than that of group-based learning mechanisms (eta =.037). This indicates that as firms gain experience, firms start to make more use of learning mechanisms aimed at institutionalization (i.e. organization level learning mechanisms).

To measure the impact of learning mechanisms on alliance performance (hypothesis 2A and 2B), a number of tests where performed. First, the F-tests shown in table 4 confirm not only that the use of both groups of learning mechanisms increases with the level of alliance experience (fifth column) but also that both groups of mechanisms have a positive impact on alliance performance (last column). However, this is a univariate test and it is important to test whether these variables also have an impact on alliance performance in a multivariate setting. Therefore, we also conducted ordered logit regression analyses. In order to verify the robustness of our results, we also tested ran ordered probit regression analysis. The results were similar for both methods. Both techniques take into account the fact that the dependent variable, alliance performance, is measured at an ordinal scale (Tabacknick and Fidell, 2001; Cohen et al., 2003). The results are shown in the next table.

-- insert table 5 about here--

Model I is the baseline model that summarizes the findings when only control variables such as firm size (based on annual revenues), and dummy variables for the ICT sector and service sector are introduced. Only the coefficient of firm size is weakly statistically significant. The positive sign indicates that being small is a liability in creating alliance success. However, this effect is

no longer significant when alliance related independent variables are introduced (see models II and III). Hence, larger firms might be more experienced in alliance management, and firm size is simply capturing the effect of an omitted variable that is related to alliance learning. Alliance performance is also not influenced by the industry to which the allying companies belong: alliance failures seem to be a potential threat to firms regardless of the industry the firm is active in. The results are similar for the ordered probit regression.

The next model, model II, introduces the main effects of intra-firm learning. Neither alliance experience nor -somewhat surprisingly- organization level learning has a significant impact on alliance performance. Hence, simply having experience with alliances is no guarantee for success. Similarly, organization level learning techniques are not sufficient to lead to success. The coefficient of group level learning mechanisms, however, is positive and significant ($B= 0.35$, $p<0.05$). The results for the ordered probit analysis are highly comparable to those of the ordered logit. As a result, organizing for alliance management by sharing generic alliance knowledge (e.g. deploying mechanisms such as best practices and external alliance trainings) helps companies to be successful in their alliances with other firms. As mentioned, in contrast to earlier studies (e.g. Kale et al., 2002), the effect of organization level learning mechanisms is not significantly correlated with alliance performance. There are a number of reasons for that. First, our results suggest that merely installing processes and structures does not substantially impact a firm's ability to perform in alliances. This implies that prior experiences only become valuable once they are shared at a group level which is in line with the findings of a study by Simonin (1997). It therefore makes little sense for firms that have limited alliance experience to install organizational processes and structures; the critical knowledge or lessons learned will first need to be genuinely understood by the employees involved. These results mark an important extension of current

understanding and provide empirical validation of what prior studies suggested (Kale et al., 2002): while structural mechanisms such as e.g. an alliance department are relevant to firms when developing alliance capabilities, it is not so much the effect of the actual installment of the department itself that positively influences alliance performance but rather the ability of the firm to transfer generic and codified alliance knowledge via different types of group level learning mechanisms and have people actively share their knowledge.

Second, alliances should be treated as heterogeneous phenomena (De Rond and Bouchikhi, 2004). In order to become more successful in managing alliances, organizations should guard against becoming inertial when it comes to managing alliances (Ernst and Bamford, 2005). The impact of alliance experiences from (other) recent alliances that encapsulate new lessons and insights is essential to avoid applying routinized behavior to different settings. As Leonard and Swap (2004: 94) put it: *"mindless repetition can hone the wrong skills"*. Instead it should be used to instill new practices and ultimately change organizational routines (Nelson and Winter, 1982).

And third, alliances are executed by people or a firm's employees, which implies that the actual improvement in alliance performance is very likely to essentially come from people rather than officially installed organizational level learning mechanisms such as intranet or databases (Ghoshal and Bartlett, 1999).[9]

Model III in addition to the earlier introduced variables also takes several interaction effects into account. The main effects for group level and organization level learning do not change compared to the results of model II. In contrast, alliance experience does affect alliance performance when

[9] This should be even less of a surprise if we acknowledge that alliance departments are often positioned as staff departments given it a 'status aparte' and often at considerable distance of those actually involved in day-to-day management of alliances (e.g. Bamford et al., 2003: 334-342).

companies do not have both types of learning mechanisms in place. Concerning the interaction terms, we first tested for the possible interaction between alliance experience and organization level learning. This interaction effect has a negative and significant effect on alliance performance (B=-0.13, $p<0.05$ for the ordered logit and B=-0.08, $p<0.01$ for the ordered probit). This means that the positive impact of "alliance experience" is gradually attenuated the more a company is relying on organizational learning mechanisms for the management of its alliance portfolio. Closer inspection of the alliance tools by which organization level learning is composed shows (see table 2) that this type of learning is based on processes and structures that may create inertia at an organizational level. In other words, companies can learn through alliance experience but this effect is rapidly decreasing once they start to manage their alliance portfolio by means of organizational structures and processes. The interaction between alliance experience and group level learning has no impact on the success rate, but the interaction between group and organization level learning has a significant and negative effect on the success rate (B=-.08, $p<.05$ for the ordered logit and B=-.04, $p<0.10$ for the ordered probit). Thus, group level learning and alliance experience mutually have no effect on each other's positive impact on alliance portfolio performance. This means that both can be used simultaneously without affecting their joint effect on alliance performance. On the contrary, organization level learning has a negative moderating effect on the positive impact of group level learning on alliance performance. Hence, organizational mechanisms hardly foster learning since they negatively affect the impact of alliance experience and group level learning mechanisms on alliance performance. Imposing processes and structures on alliance management seems to only decrease a company's ability to translate cumulated alliance experience and group level working into better alliance performance. These results indicate that alliance experience and group level learning are the key drivers of alliance performance. Moreover, installing too much structures and

processes (i.e. organizational level learning mechanisms) hinders alliance performance.

The findings of model III in which ordered probit estimates of model III are shown, allow us to compare the effect of group (GLM) and organization level learning mechanisms (OLM) on alliance performance for firms with different levels of experience. The next figures elucidate our findings.

-- insert figures 2 about here--

-- insert figure 3 about here--

-- insert figure 4 about here--

Figure 2 depicts the relationships between alliance experience, group level learning mechanisms and alliance performance for low levels of organization level learning mechanisms.[10] The figure clearly shows that both group level learning mechanisms and alliance experience have a strong positive effect on alliance performance. More specifically, the effects add up each other resulting in high values for the dependent variable in the right-back end of the figure. Figure 3 shows the results for firms with mean values for organizational learning mechanisms. This figure nicely illustrates that organizational learning mechanisms have an attenuating effect on the impact on alliance performance of both alliance experience and group level learning mechanisms. Figure 4 shows that companies with high values for organizational learning mechanisms have a dysfunctional effect on alliance experience and group level learning mechanisms.

[10] We kept the level of the organizational learning mechanisms at the mean minus one standard deviation in figure 1, at the mean level in figure 2 and at the mean plus one standard deviation in figure 3.

We can test hypotheses 3A and 3B by analyzing how alliance performance is improving or worsening when a firm increases the number of group or organization level mechanisms *all else equal*.[11] The results, which are again based on the ordered probit regression of Model III, are represented in figure 5.

-- insert figure 5 about here--

The impact of GLM is represented by the upward sloping lines. The five curves represent five levels of the group level learning mechanisms. The upward slope indicates that group level learning mechanisms are more helpful in improving alliance performance the higher the experience level.[12] Higher levels of OLM decrease the impact of GLM on alliance performance (downward shift of the curves). Similarly, the effect of organization level learning mechanisms is illustrated by the (dotted) downward sloping lines. The curves have a negative slope because of the negative coefficients for the interaction term with alliance experience. Higher levels of GLM also shift down these curves. The effect of organization level learning mechanisms on alliance performance is only positive at low levels of alliance experience.

Combining both sets of curves allow us to test hypotheses 3A and 3B. First, we do not find any evidence for hypothesis 3B. On the contrary, at high levels of experience, group level learning mechanisms have a positive and organization level learning mechanisms have a negative effect on alliance performance. The situation is a bit more complex at low levels of alliance experience. The results in Figure 5 indicate that hypothesis 3A cannot be rejected for low levels of OLM. In that case, an increase in GLM always has a

[11] These results are obtained from deriving Model III with respect to OLM and GLM respectively.
[12]. Although we know from the coefficient of the interaction term between alliance experience and GLM in Model III that this increase in impact with higher levels of alliance experience is not statitically significant.

stronger positive effect on alliance performance than OLM (see two upward sloping curves at the top of Figure 5). The situation is different for higher levels of OLM especially when GLM is low. Hence, hypothesis 3A cannot be rejected only for a small range of (low) OLM values. As a result, we can conclude that at low levels of alliance experience a firm gains most from using group level learning when organization level learning mechanisms are barely present and structures only play a marginal role. Organization level learning has a stronger effect on alliance performance when group level learning mechanisms are only used to a marginal extent and organization level learning has above average values. Hence, these results point our attention to two important observations: first, alliance experience indeed changes the way firms learn; however, secondly, in order to yield superior rents from their alliances, firms should be cautious not to install too many structural and procedural mechanisms (i.e. organization level learning mechanisms) but ensure to pay attention to disperse new experiences using group level learning mechanisms to improve their ability to perform in alliances.

DISCUSSION & CONCLUSION

This paper served to answer the question of how alliance capabilities are developed and what role intra-firm learning plays in this respect. The analyses revealed a number of important findings. First, using exploratory factor analysis we derived two latent variables that help explain learning effects in the development of alliance capabilities: group level learning mechanisms (fostering 'integration') and organization level learning mechanisms (fostering 'institutionalization'). Our analyses confirm 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 embedding routine

behavior and capabilities in systems, processes and structures. Henderson and Clark (1990) address the same issue when they outline the need for firms to reconfigure architectural or embedded knowledge.

Second, we found that indeed in our sample firms at different capability levels make use of different sets of learning mechanisms. Firms with little alliance capabilities (i.e. those positioned in the low and moderate experience groups), make relatively more use of group level learning mechanisms in comparison to organization level learning mechanisms. Firms with higher levels of alliance capabilities, on the other hand make relatively more use of organization level mechanisms. As firms gain 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. In other words, the more alliance experience the higher the ratio of organization to group level mechanisms as a consequence of which alliance knowledge becomes embedded in the firm's processes and structures.

Third, we found that different types of learning mechanisms have a different performance impact. Our findings suggest that generic lessons on common pitfalls in alliances have a positive effect on alliance performance independent of their level of experience. In other words, even when firms have extensive experience in alliances, our analyses suggest that organizational learning does not contribute to improving their alliance performance. Instead the opposite holds: organization level learning mechanisms only positively impact alliance performance at low levels of alliance experience. These findings are in sharp contract with prior research by Haleblian and Finkelstein (1999), who found that intra-firm transfer effects at low levels of experience negatively influence performance due to the heterogeneity and specificity of generalization. However, the findings are in line with reasoning of 'sticky' alliance knowledge (Szulanksi, 1996). Our results suggest that only in relatively absence of group level learning mechanisms have an effect on alliance performance. In other words, only *in*

absence of other learning and transfer mechanisms do organizational level learning mechanisms contribute to improving alliance performance. In any other circumstance, group level learning mechanisms have a much greater effect on alliance performance. These findings confirm what Brown and Duguid (1991: 40) suggest: *"the ways people actually work usually differ fundamentally from the ways organizations describe"*. Hence, reliance on espoused practice (or canonical practice) can distort the use of usually valuable practices of its members (Brown and Duguid, 1991). In other words, embedded organizational prescriptions can cause sub-optimal performance as the prescribed practice does not match the requirements of the particular circumstance (Levinthal and March, 1993). Moreover, although it may sound inherently paradoxical and will be challenging to apply, it implies that organizational processes and structures should be aimed at rejuvenation of routines rather then merely installment. Or as Holmqvist (2004: 71) puts it: *"An organization eventually becomes 'closed' in the sense that it only experiences what is in accordance with its history"*, as a consequence of stickiness (Szulanski, 1996) and inertia (Tripsas and Gavetti, 2000). Instead a firm should avoid such 'competence traps' (Levitt and March, 1988) by opening up to new experiences and having employees share these lessons thereby renewing organizational practices and routines (Feldman, 2000). Hence, our results confirm what research in related areas has suggested: in order to outperform others in alliances, firms should develop an ability to share and adjust their practices (Nelson and Winter, 1982; Bruderer and Singh, 1996; Teece et al., 1997).

Fourth, although it is difficult to define an optimal mix of learning mechanisms, our findings do give information on how firm can balance their investments in order to optimize performance effects. In our dataset, firms with moderate alliance experience seem to make use of an 'optimal' mix of group level and organization level learning mechanisms as their average alliance performance is 63.8%, substantially higher than the other categories.

It appears that as a firm's alliance portfolio continues to grow, firms should guard against installing too many organization level learning mechanisms that hinder transfer of new lessons drawn from novel experiences. Nonetheless, in spite of the fact that the organization level learning does not have a significantly positive effect on alliance performance and does therefore not contribute to improving alliance performance (see table 5), we should acknowledge that such structures and processes are likely to provide for the necessary organizational structure to develop alliance capabilities. As Levinthal (1991: 140) notes: *"In complex decision problems the discovery of the optimum is an extremely difficult task … This makes it imperative to use building blocks derived from previous 'good' solutions (Holland, 1995) even though doing so contributes to inertia."*

We interpret these finding as follows. First, from these findings, an important observation can be distilled: alliance experience not only changes the way firms learn, it also creates organizational rigidities or inertia in alliance management (Hannan and Freeman, 1984; Leonard Barton, 1995). Prior research on intra-firm elements causing performance heterogeneity in alliances many paid attention to alliance experience (e.g. Lyles, 1988; Chan et al., 1997; Anand and Khanna, 2000; Li and Rowley, 2002; Vanhaverbeke et al., 2002). However, explaining performance heterogeneity in alliance management should mainly be attributed to the learning effect that results from dispersing novel insights. The results indicate that firms which primarily rely on creating reliabilities in experience (i.e. exploiting experiences in inert processes and structures or organization level learning) under perform in comparison to those that also favor the use of creating variety in experience (i.e. exploring experiences by favoring the transfer of new experiences via group level learning) (Holmqvist, 2004). An over reliance on organizational learning creates stickiness (Szulanski, 1996). Hence, in contrast to the firms in our dataset which have extensive alliance experience, firms should strive to find the right balance between gaining new experiences

in alliances and renewing practices and exploiting existing knowledge and practices.

Second, not only do organization level learning mechanisms seem to cause inertia in alliance management, they also seem to represent a discrepancy between what processes and structures prescribe and what action is needed in alliances. As (Bamford et al., 2003: 334-342) show, different firms use different structures. However, our results suggest that such organizational design solutions do not solve the problem but rather create new 'distances' between the employees that manage alliances and those that 'merely think about and support it'. Hence, organizational level learning mechanisms can cause practices inside firms to become 'out of touch' with what their alliances require. Instead, by e.g. sharing best practices at a group level awareness of successful practices is raised which creates a mechanism through which new experiences are adopted rather than a mechanism in which old ideas 'get stuck'; thereby creating dynamism rather than inertia in the firm's alliance capability (Teece et al., 1997). Management attention should therefore be directed at transferring knowledge at the group level rather than at the organizational level.

The interpretations of the empirical analyses were supported by the results of various expert interviews. Among these experts were Vice-Presidents and alliance managers from firms in different industries that are world-renowned for their alliance capabilities such as Royal Philips Electronics and GlaxoSmithKline. The interviews demonstrate that there is not one best way to develop alliance capabilities since firms may use a different mix of mechanisms to reach the same goal. However, a remarkable observation is that all experts indicated their firms either deliberately or organically followed a certain development path. One expert argued: *"Initially, alliances were managed individually. At that point, we primarily relied on exchanging best practices. However, as we reckoned alliances were a major contributor to the business development of our firm, we started building*

alliances competences; this was done by consolidating our knowledge. This way, we anticipated, we could develop the discipline called alliance management. … We set up an alliance department through which institutional learning could take shape, in which knowledge could be developed and processes could be adopted more easily." He added that it appeared important to continue to use group level mechanisms aside structural elements e.g. an alliance department.

As this expert also implied, organization level mechanisms (i.e. Vice-President of alliances, alliance manager, local alliance manager, internal alliance training, partner selection program, intranet, comparison of alliance evaluations, rewards for alliance managers tied to success, formally structured knowledge exchange between alliance managers and country-specific alliance policies) primarily capture the aspects that allow firms to move beyond mere group-based practices. These become 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.

Another expert stressed that there is a difference between mechanisms aimed at exchanging knowledge of dyadic and day-to-day management issues and those aimed at managing portfolios of alliances, such as a Vice-President of alliances who is responsible for managing a group of alliances. Consequently, he added, there is a sort of hierarchy in the mechanisms investigated. On the one hand, group level mechanisms involve tool-based learning, which is based on instruments that mainly makes use of generalized and codified knowledge. It provides for the foundation for successful alliance management. On the other hand, organization level mechanisms allow for the institutionalization of specific and most often tacit knowledge. For instance, partner selection programs are useful to firms that

rely on information from their network and seek to select the right partner that has a reliable reputation.

Using formally structured knowledge exchange meetings between alliance managers is another example of a mechanism that is highly useful to exchange tacit knowledge, which refers to specific or contextual experiences in prior alliances. One expert added that certain mechanisms such as intranet are specifically useful to help institutionalize alliance-related knowledge. This finding is consistent with Dyer's (2000) findings, which suggest that superior capabilities at Toyota and Chrysler are derived from the knowledge transfer mechanisms used. Toyota, for instance, has deployed a number of mechanisms, such as problem solving teams and employee transfers, to transfer its knowledge and develop its alliance capabilities. Hence, only when experiences and lesson learned are integrated and institutionalized can firms really develop their alliance capabilities (Winter, 2003). These capabilities can be renewed or made dynamic using intra-firm mechanisms.

Theoretical contributions

The results of this paper extend previous literature in various ways. First of all, it explains what role intra-firm plays in alliance capability development. Our findings are in line with but extend insights from earlier studies (e.g. Simonin, 1997; Kale et al., 2002): learning mechanisms explain differential rates of learning and group level learning mechanisms are more important than organization based learning mechanisms when it comes to developing alliance capabilities. In other words, it appears that Kale et al. (2002) findings should be refined: it is not so much the alliance function or department that explains performance heterogeneity in alliances but it is rather the acquaintance and transfer of alliance knowledge at a group level that engenders a firm-wide capability to manage alliances. More specifically, the role of processes and structures or organization level learning appears on

average to restrict rather than facilitate transfer and renewal of alliance practices.

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. These results have a direct link to the literature on absorptive capacity and confirm the need for firms to balance exploration and exploitation in this respect (e.g. March, 1991; Benner and Tushman, 2003). Our findings provide micro-level insight into how firms

can counter an overreliance on exploitative learning, i.e. by more installing and paying attention to processes that foster group level learning (e.g. Paulus and Yang, 2000).

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 learning 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 mechanism is inherent in whether the firm succeeds in institutionalizing alliance related knowledge and developing routines (Knott, 2003).

Finally, 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 likely 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.

Limitations and future research

While this paper contributes to our understanding of how firms develop alliance capabilities, a number of limitations should not remain unmarked. First, the results are based on a cross-sectional database. For future research, it would be interesting to analyze how learning mechanisms impact alliance performance over time and to what extent incremental investments pay off. Second, as Grant (1996: 114) notes: "*transferring knowledge is not an efficient approach to integrating knowledge*". Therefore, individual contributions of mechanisms could be examined and extended upon. Third, this paper did not measure to what extent different learning mechanisms contain different

types of knowledge (e.g. Inkpen and Dinur, 1998; Hansen, 2002). The majority of the mechanisms either help disseminate tacit knowledge by means of communication (e.g. alliance training), verbalization (e.g. alliance training or formalized knowledge exchange between alliance managers) or refer to explicit knowledge and are directed toward codification (e.g. partner selection program or partner program). However, the effectiveness of mechanisms to capture different types of knowledge they contain might be an issue for future research.

There are a number of interesting issues that could complement this paper. For instance, 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"*. In line with Grant's (1996) argument, 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.

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FIGURES AND TABLES

Figure 1 Learning mechanisms

	Learning 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

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

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
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	
Cronbach's alpha	0.82	0.63
Eigenvalue	6.864	1.778

[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)

Table 3 Descriptive statistics and correlation matrix

	Mean[b]	S.D.	(1)	(2)	(3)	(4)	(5)	(6)
Alliance performance[a]	3.2216	1.3057	.054	.166*	.207**	.145	.050	.098
Alliance experience (1)	2.1302	1.4100	1					
Organization level learning mechanisms OLM (2)	3.6927	2.9292	.047	1				
Group level learning mechanisms GLM (3)	1.4063	1.3773	.013	.474**	1			
Firm size[c] (4)	2.7240	1.3072	-.085	.540**	.237**	1		
ICT sector (5)	.4271	.4960	-.026	.221**	-.133	.046	1	
Service sector (6)	.6458	.4795	-.030	-.093	-.035	-.057	-.087	1

*** *p<0.001; **p<0.01; *p<0.05 (two-tailed),* N=192.

[a] Categorical variable representing alliance performance

[b] Mean and standard deviation are uncentered, while correlations are given for centered variables

c Firm size = annual sales revenues

Table 4 Mean differences by experience level

	Relative 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	(2.21)	(2.79)	(2.23)	32.388***	.284	4.369**
Factor 2[e]	**.220**	**.298**	**.348**			
Group level learning mechanisms	(1.31)	(1.32)	(1.39)	3.120*	.037	3.878**
Interaction effect	3.70	7.17	11.45	10.131***	.111	1.791
Factor 1*factor 2	(6.93)	(9.75)	(10.15)			
Dependent						
Alliance performance	2.78	3.67	3.37	7.713***		
	40.8%	63.8%	57.9%			

Note that the figures which are bold represent the 'relative' mean, i.e. the mean divided by the number of mechanisms included in the factor (the figures not in bold represent the unadjusted mean; standard deviation in mentioned between brackets). This is done to facilitate easy comparison of the use of organization and group level learning mechanisms.

****p<0.001;** p<0.01; *p<0.05; St dev in parentheses,* N=192

[a] One-way on alliance experience

[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).

Table 5 Ordered logit and probit analyses explaining alliance performance

	Ordered logit			Ordered probit		
	Model I	Model II	Model III	Model I	Model II	Model III
Explanatory variables						
Alliance experience		0.0653	0.3386*		0.0553	0.2036**
		(0.0941)	(0.1800)		(0.0577)	(0.1002)
Group level learning mechanisms (GLM)		0.3520**	0.4062**		0.1882**	0.2119**
		(0.1425)	(0.1594)		(0.0782)	(0.0858)
Organization level learning mechanisms (OLM)		-0.0264	-0.0364		-0.0132	- 0.0192
		(0.0679)	(0.0686)		(0.0387)	(0.0387)
(Alliance experience)* (Organization level learning mechanisms)			-0.1287**			-0.0775***
			(0.0503)			(0.0281)
(Alliance experience)* (Group level learning mechanisms)			0.0404			0.0391
			(0.0891)			(0.0511)
(Group level learning) * (Org. level learning)			-0.0757**			-0.0386*
			(0.038()			(0.0228)
Control variables						
Sales	0.2204*	0.1926	0.2241	0.1059	0.0900	0.01106
	(0.1264)	(0.1590)	(0.1603)	(0.0696)	(0.0870)	(0.0873)
ICT	0.1822	0.3353	0.3324	0.0895	0.1806	0.1762
	(0.2770)	(0.2889)	(0.2917)	(0.1603)	(0.1676)	(0.1707)
Services	0.3929	0.4032	0.3848	0.2362	0.2536	0.2368
	(0.2936)	(0.3013)	(0.3141)	(0.1727)	(0.1756)	(0.1778)
# of observations	176	176	176	176	176	176
Wald chi^2	6.07	15.04**	24.08***	4.79	13.33**	21.98***
Pseudo R^2	0.0116	0.0291	0.0493	0.0090	0.0254	0.0441

Note: Heteroskedastic-consistent standard errors in brackets.
****p<0.001;** p<0.01; *p<0.05;$^+$ p<0.10*

Figure 2 Alliance performance with low levels of organization learning mechanisms

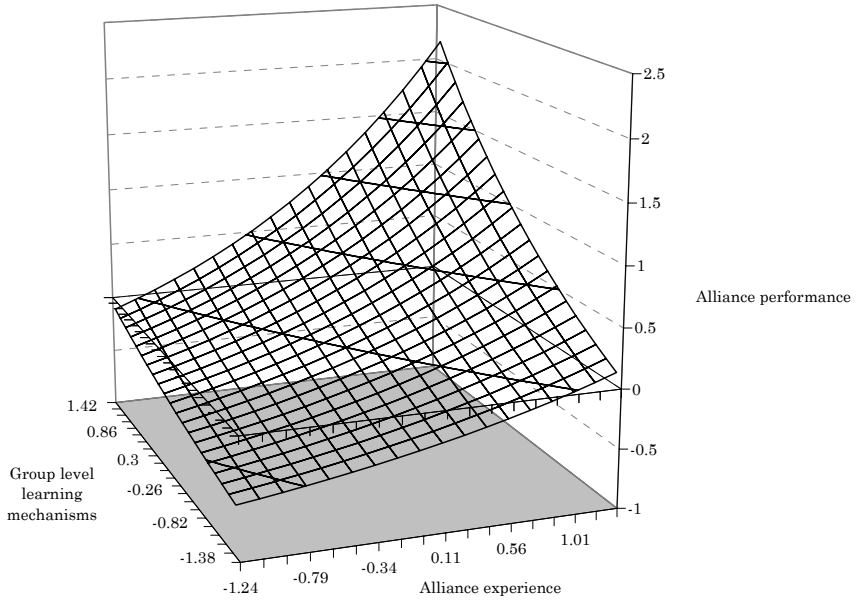


Figure 3 Alliance performance with organization level learning mechanisms at mean level

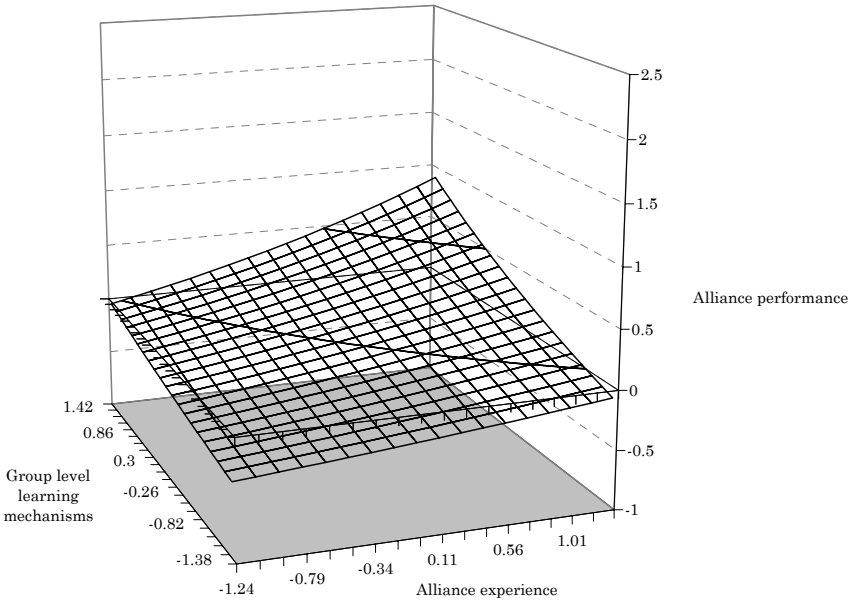


Figure 4 Alliance performance with high levels of organization level learning mechanisms

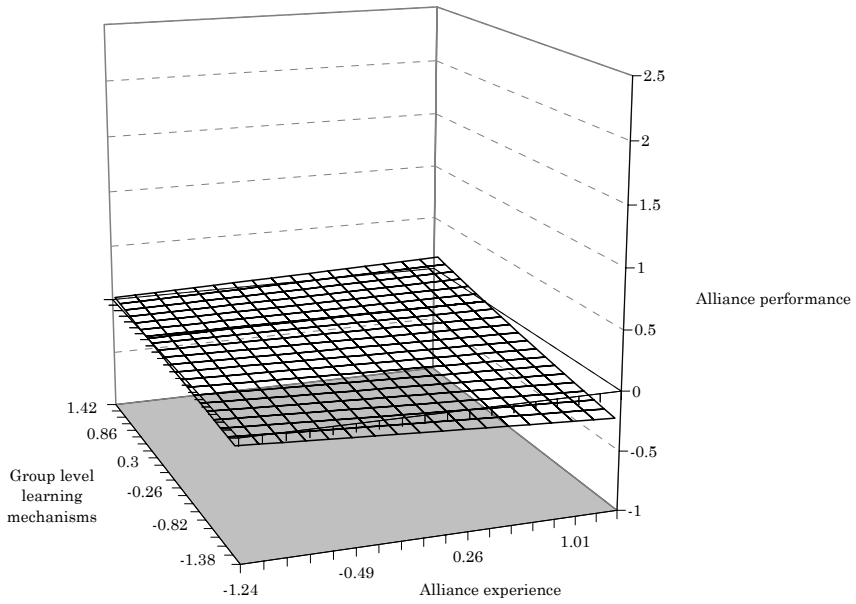
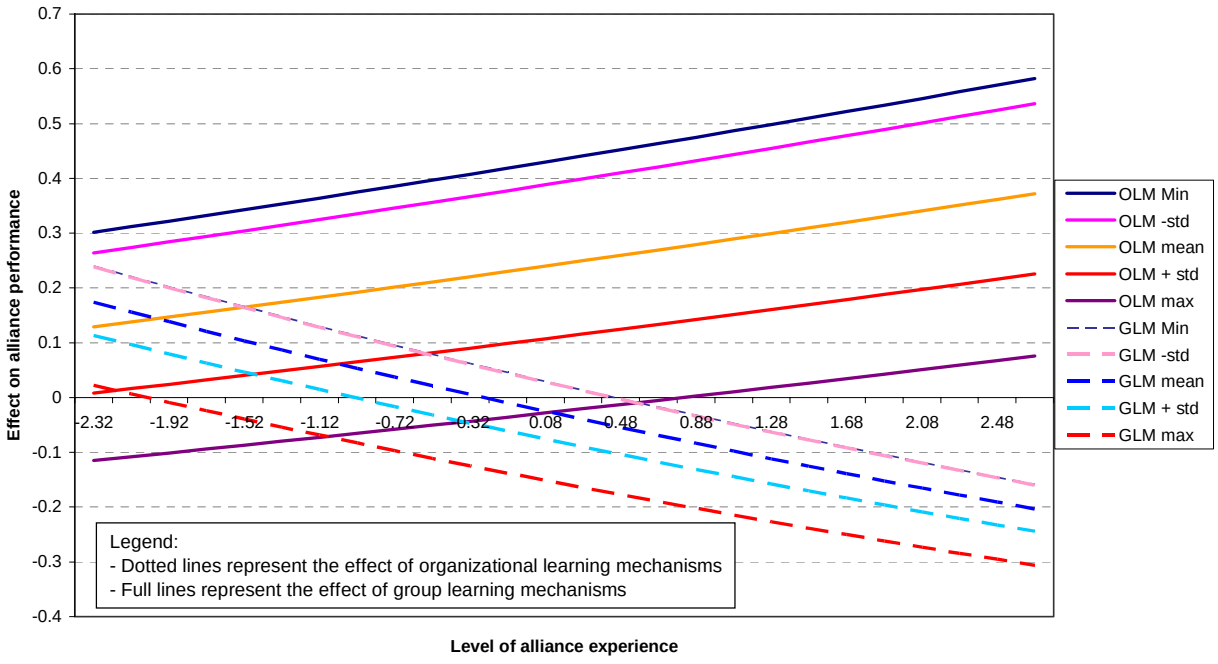


Figure 5 Effect of group and organization level learning mechanisms on alliance performance for different levels of alliance experience



APPENDICES

Appendix 1 Survey items

1. Company demographics
a. Number of employees: 1-500, 500-1000, >1000
b. Total worldwide sales volume in 2000 in USD$: <1m, 1-100m, 100m-1b, 1b-50b, >50b.
c. Primary industry your company is active in:

2. Alliance background
a. How many alliances has your company formed over the last 5 years? 0-5, 6-15, 16-25, 26-40, >40.
b. What is your company's overall alliance success rate (% of alliances where the initial goals were realized) over the last 5 years? 0-20%, 21-40%, 41-60%, 61-80%, 81-100%.

3. Alliance mechanisms
(0-1 scale, all items were defined and explained in the questionnaire)
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 intercultural management; (10) partner selection program; (11) joint business planning; (12) alliance database; (13) use of intranet; (14) alliance best practices; (15) culture program; (16) partner program; (17) individual alliance evaluation; (18) comparison of alliance evaluation; (19) joint alliance evaluation.
Control and management processes
(20) rewards and bonuses for alliance managers tied to alliance success; (21) rewards and bonuses for business managers tied to alliance success; (22) structural knowledge exchange between alliance managers. (23) use of own knowledge about cultural differences; (24) alliance metrics; (25) country specific alliance policies.
External parties
(26) consultants; (27) legal experts; (28) mediators; (29) financial experts.

Appendix 2 Interview protocol

Section A
From your experience, why do you think the following mechanisms are of particular importance to successful alliance management?
Why do you think alliance experience positively influences alliance performance?
To what extent do you the following mechanisms help firms develop alliance capabilities? And why?
At what experience level(s) do you expect the following mechanisms to be especially relevant to improve a firm's alliance performance? Please add comments with regard to motivations why you listed certain mechanisms at a certain level.
To what extent do you think alliance capabilities are developed by dispersing alliance experience using learning mechanisms to develop alliances routines inside the firm?

Section B
Did your firm follow a specific path when it comes to developing its ability to transfer knowledge with regard to alliance management? If so, please shortly describe the process.

If your firm followed a certain path to develop its alliance capabilities, could you specify on basis of what arguments certain mechanisms were selected?

From your experience, what purposes do you think group level and organization level learning mechanisms serve when it comes to alliance management?

Our interpretation of the findings is that: (1) group A mechanisms mainly serves to transfer knowledge at a group level and that the mechanisms mainly allow for transferring knowledge about dyadic or bilateral alliance issues whereas (2) group B mechanisms help transfer knowledge at the organization level and help institutionalize knowledge on alliance portfolio issues. On basis of your experience, do you share these insights?

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