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Alliance Management Capability: An Investigation of the Construct and Its Measurement

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This research conceptualizes and operationalizes alliance management capability. The authors develop alliance management capability as a second-order construct to capture the degree to which organizations possess relevant management routines that enable them to effectively manage their portfolio of strategic alliances. In addition to identifying and measuring specific organizational routines as critical dimensions of alliance management capability, the authors advance knowledge on the performance effects of dedicated alliance structures and alliance experience based on survey data from 204 firms. Their primary contribution is a theoretically sound alliance management capability measure that is reflected by five underlying routines: interorganizational coordination, alliance portfolio coordination, interorganizational learning, alliance proactiveness, and alliance transformation. One of the key findings is that alliance management capability has a positive impact on alliance portfolio performance and mediates the performance effects of dedicated alliance structures and alliance experience.

Keywords: *strategic alliances; interorganizational networks; experience; dynamic capabilities; structural equation models*

Strategic alliances have evolved as an important strategic tool, as evidenced by their frequent use in many industries. Despite the proliferation of strategic alliances, however, previous studies have indicated high failure rates; in fact, empirical evidence shows that approximately 50% of alliances do not live up to expectations (e.g., Koza & Lewin, 2000). As such, the search for the drivers of alliance performance has become a critical issue to both practitioners and scholars (Dyer & Singh, 1998; Koka & Prescott, 2002).

Previous research has shown that alliance performance differs substantially among firms (Anand & Khanna, 2000). Although some firms are able to benefit significantly from alliances, many others experience failure (e.g., Harbison & Pekar, 1998, refer to high- and low-success alliance companies). Alliance researchers have thus become increasingly interested in the organizational-level factors that explain why some companies have greater alliance success than others (e.g., Kale, Dyer, & Singh, 2002; Reuer & Ragozzino, 2006).

Recently, scholars have begun also to consider firm capabilities as an organizational-level domain relevant to strategic alliances.[1] In fact, extant empirical studies explicitly incorporating certain capabilities in their research models have found that these constructs are significantly associated with alliance success (Heimeriks & Duysters, 2007; Kale & Singh, 2007). The empirical study by Heimeriks and Duysters, for example, investigated capabilities in terms of "learning mechanisms potentially critical to a firm's ability to manage alliances" (p. 35), and Kale and Singh studied an alliance learning process that "is directed toward learning, accumulating, and leveraging alliance management know-how to develop a firm's alliance management skills" (p. 982). Thus, previous work has advanced our knowledge about the learning capacities that enable firms to improve their alliance management capability. Yet, none of these empirical studies has specifically conceptualized or measured the construct of alliance management capability, as previous authors have themselves acknowledged in their suggestions for future research (Heimeriks & Duysters, 2007, p. 43; Kale & Singh, 2007, p. 996). Thus, important questions still remain as to which aspects of alliance management are relevant to such a capability, how they can be measured, and how alliance management capability is related to other key constructs.

To address these questions, we conceptualize and measure the concept of alliance management capability as reflected by a set of key alliance management routines. Recent work on dynamic capabilities suggests that alliance management can be regarded as a distinct dynamic capability (Eisenhardt & Martin, 2000; Zollo & Winter, 2002), alluding to a set of organizational routines that are the building blocks of dynamic capabilities (e.g., Helfat et al., 2007; Teece, 2007; Zahra, Sapienza, & Davidsson, 2006). In conceptualizing alliance management capability, we build on this research that addresses the routines that underlie dynamic capabilities, and we apply these ideas to the context of alliance management. This approach enables us to develop a theory-based, multidimensional model of our focal construct alliance management capability.

Based on this conceptualization, we derive a comprehensive measurement instrument for alliance management capability and integrate the construct into a broader nomological network. We not only investigate its link to alliance portfolio performance but also examine relationships to alliance experience and dedicated alliance structures. To test our alliance management capability model, we use survey data from 204 companies.

In this article, we intend to make an empirical contribution to the literature by addressing the conceptualization and measurement of alliance management capability. At present, no

comprehensive construct exists in the literature that encompasses a broad set of organizational routines associated with alliance management. In our study, therefore, we identify and operationalize different dimensions of a comprehensive second-order construct, capturing a theoretically derived set of key organizational routines reflecting alliance management capability. As such, our study is the first to explicitly measure alliance management capability and test the validity of the measure based on structural equation modeling (SEM) techniques and using large-scale key informant data. Thus, we add to current knowledge about what specifically constitutes alliance management capability and how it can be measured.

Conceptual Background

Strategic alliances pose a significant managerial challenge given the complexities and uncertainties associated with managing projects across organizational boundaries (Rothaermel & Deeds, 2006). Consequently, it is not surprising that many alliances do not live up to expectations (e.g., Koza & Lewin, 2000). Interestingly, it has been found that alliance performance differs substantially among firms (Anand & Khanna, 2000), suggesting that organizations possess certain characteristics determining how effectively they manage their alliances and that these characteristics vary across firms (Kale et al., 2002; Reuer & Ragozzino, 2006). As a consequence, a stream of research has emerged designed to explain what these characteristics are and why some organizations have greater alliance success than others.

In particular, two factors have been identified empirically as key organizational-level determinants of alliance success: *alliance experience* (Anand & Khanna, 2000; Hoang & Rothaermel, 2005; Sampson, 2005; Zollo, Reuer, & Singh, 2002), defined as the extent to which a company has previously been involved in strategic alliances, and *alliance structures* (Draulans, de Man, & Volberda, 2003; Hoffmann, 2005; Kale et al., 2002), which are specialized organizational units and personnel dedicated to the management of strategic alliances. While experience and specialized organizational structures certainly characterize important firm differences relevant to alliance success, researchers have emphasized that much of the variance in firms' alliance performance remains unexplained; therefore, these researchers have called for the examination of additional organizational-level factors affecting alliance outcomes (Kale et al., 2002; Rothaermel & Deeds, 2006).

The resource-based view of the firm suggests that organizational capabilities—socially complex practices aimed at performing a certain task—may represent such an additional source of alliance success (Dyer & Singh, 1998; Eisenhardt & Martin, 2000). Recently, Heimeriks and Duysters (2007), as well as Kale and Singh (2007), empirically analyzed the role of learning capabilities, and both studies investigated learning practices that enable a firm to improve its alliance management capability, in turn improving its alliance performance. Neither of these studies, however, has actually conceptualized or measured the construct of alliance management capability, as the authors themselves have acknowledged in their suggestions for future research (Heimeriks & Duysters, 2007, p. 43; Kale & Singh, 2007, p. 996). Thus, important questions still remain as to what aspects of alliance management are relevant to such a capability, how they can be measured, and how alliance management capability is related to other constructs, as we discuss in the following section.

Conceptualization and Hypotheses

Conceptual Development of Alliance Management Capability

Alliances can be seen as a possible alternative to obtain required resources that are outside the boundaries of the firm (Das & Teng, 2000). As such, alliance management is a critical strategic domain that allows the organization to alter its resource base. Therefore, consistent with the work of previous authors (e.g., Eisenhardt & Martin, 2000; Rothaermel & Deeds, 2006; Zollo & Winter, 2002), we argue that alliance management capability is a distinct dynamic capability. Analogous to Eisenhardt and Martin's (2000) definition of dynamic capabilities and consistent with Helfat et al.'s (2007) discussion of relational capabilities, alliance management capability can be considered a "type of dynamic capability with the capacity to purposefully create, extend, or modify the firm's resource base, augmented to include the resources of its alliance partners" (p. 66). In conceptualizing our focal construct of alliance management capability, we thus build on concepts obtained from the dynamic capabilities framework.

Dynamic capabilities are based on collections of organizational routines and need to be understood as multidimensional constructs (Winter, 2003), reflected by a set of specific routines that represent their dimensions. The term *routines* refers to rule-based behavioral patterns for interdependent corporate actions (Nelson & Winter, 1982). In their influential work, Teece, Pisano, and Shuen (1997) elaborate on distinct types of routines that constitute dynamic capability. Specifically, they emphasize the importance of coordination, learning, and reconfiguration routines. Coordination routines aim at allocating resources, assigning tasks, and synchronizing activities. Learning routines pertain to the process of generating new knowledge and building new thinking. While Teece et al. do not formally define reconfiguration, the respective paragraph begins with the following two sentences:

> In rapidly changing environments, there is obviously value in the ability to sense the need to reconfigure the firm's asset structure, and to accomplish the necessary internal and external transformation. This requires constant surveillance of markets and technologies and the willingness to adopt best practice. (p. 520)

Here, it becomes obvious that reconfiguration is actually a heterogeneous concept, consisting of two elements: sensing and transformation. Sensing routines involve scanning, searching, and exploring new opportunities. Transformation routines aim to revamp the existing business logic to effectuate necessary adjustments. Several researchers (e.g., Helfat et al., 2007; O'Reilly & Tushman, 2007; Zahra et al., 2006) have built on Teece et al.'s ideas, highlighting the importance of coordination, learning, sensing, and transformation in their discussions of dynamic capabilities.

Collectively, these four types of organizational routines are proposed to be the key mechanisms by which organizations accomplish an effective change in their resource bases. Focusing on the routines of coordination, learning, sensing, and transformation is in line with recent work that discusses the three generic capabilities of seizing, sensing, and transformation (Teece, 2007) and with work asserting that coordination and learning routines constitute key aspects of the

generic capability of seizing (Helfat et al., 2007; Teece, 2007). Viewing alliance management capability as a distinct dynamic capability, we thus conceptualize the construct by building on the four generic types of routines mentioned previously (i.e., coordination, learning, sensing, and transformation) and applying them to the alliance management context. In the following sections, we elaborate on each of the resultant dimensions of alliance management capability.

Coordination

The literature on strategic alliances differentiates between two central coordination tasks of alliance management: interorganizational coordination and alliance portfolio coordination. While *interorganizational coordination* refers to the governance of individual alliances, *alliance portfolio management* deals with the integration of all of an organization's strategic alliances (Goerzen, 2005). Interorganizational coordination ensures that single alliances are governed efficiently and that the legitimacy of transaction between the partners is enhanced (R. Kumar & Nti, 1998). Three arguments support the need for interorganizational coordination routines. First, in the context of interorganizational cooperation, the existence of dependencies between partners produces a need for coordination. For instance, interdependent resources dispersed over various individuals in different organizations need to be harmonized through interorganizational coordination. Second, alliance partners rarely pursue a common alliance objective autonomously, thus creating the need to reconcile the interests of all parties through coordination mechanisms. Third, the need for interorganizational coordination can also be ascribed to the fact that alliance partners do not automatically have all of the necessary information to align their own actions with the activities of their counterparts and to harmonize them to achieve mutual alliance objectives. Consequently, interorganizational coordination is an important task of alliance management (Goerzen & Beamish, 2005). Supported by these considerations, we suggest that interorganizational coordination is a key dimension of alliance management capability. Interorganizational coordination is formally defined as the extent of routines to coordinate activities and resources with the alliance partner (Gulati, Lawrence, & Puranam, 2005).

In addition, researchers have recently begun to consider alliance management from a portfolio perspective (Goerzen, 2007; Koka & Prescott, 2002). This view suggests not only that coordination within single alliances is essential but that comprehensive governance of a business's entire alliance portfolio is also important (Goerzen, 2005). The need for coordinating the alliance portfolio is primarily a result of the interdependences between the individual alliances. Alliance portfolio coordination aims to identify these interdependences, avoid duplicate actions, and produce synergies among the individual alliances (Bamford & Ernst, 2002; Hoffmann, 2005). By identifying and creating synergies between single alliances, alliance portfolio coordination has the potential to make an alliance portfolio more than the sum of its parts (Bamford & Ernst, 2002; Dyer & Nobeoka, 2000). Further, alliance portfolio coordination aims to allocate limited resources to alliance projects that allow maximal gain at bearable levels of risk. Hoffmann (2005) discusses the high extent of synergies that may be realized between various alliances. Apart from the synergy potential, Parise and

Casher (2003) regard conflict reduction as a key advantage of alliance portfolio coordination. Thus, the routines for coordinating a portfolio of strategic alliances are regarded here as a further dimension of alliance management capability.

Learning

The potential for interorganizational learning, that is, knowledge transfer across organizational boundaries (Dyer & Nobeoka, 2000), is considered to be a key advantage of strategic alliances (Goerzen & Beamish, 2005). Simultaneously, the capability to effectively transfer knowledge from the alliance partner plays a central role for success (Mowery, Oxley, & Silverman, 2002; Teece, 2007). Companies differ considerably in their routines for interorganizational learning (Martin & Salomon, 2003). Some companies may learn more than others when they interact through strategic alliances—that is, differential learning may occur. Analyzing the relevance of learning in alliances, Steensma (1996) provides empirical evidence that the interorganizational learning ability of an organization has a positive impact on the extent of resources gained through strategic alliances. Accordingly, interorganizational learning is conceptualized as a dimension of alliance management capability.

Sensing

Sensing routines are reflected in a high alertness to environmental information (Zaheer & Zaheer, 1997). They enable the organization to understand the environment and to identify market requirements and new opportunities for gaining resources. Hence, there is reason to assume that sensing routines serve an important role as a part of alliance management capability. Sensing routines for the identification of opportunities to enter into strategic alliances are considered particularly critical for alliance success (S. H. Park, Chen, & Gallagher, 2002). It is essential to identify adequate alliance partners that possess the resources and competences needed by the firm. Firms that are able to sense alliance opportunities early enjoy first-mover advantages on the market for strategic partners, which, in turn, may translate into superior alliance success. Karol, Loeser, and Tait (2002), for instance, find that higher performance may be ascribed to routine processes of identifying and evaluating partners.

Sarkar, Echambadi, and Harrison (2001) subsume organizational sensing routines for the alliance context under the concept of *alliance proactiveness*. They denote alliance proactiveness as "efforts to identify potentially valuable partnering opportunities" (p. 702) and find empirical support for the influence of alliance proactiveness on market performance. Based on the close relation to the dynamic capabilities view and empirical evidence for its performance impact, alliance proactiveness is conceptualized as a dimension of alliance management capability. It is defined as the extent of routines to identify potentially valuable partnering opportunities.

Transformation

While some past research has interpreted structural changes within strategic alliances as a sign of failure, these transformations are now considered to be a natural phenomenon;

changed market conditions, for example, are thought to make the reorganization of alliances desirable (Reuer & Zollo, 2000). Consequently, it is unrealistic to expect that a perfect fit between partners can be established from the very beginning. Rather, interaction and adaptation between partners are required to establish such a fit (Doz, 1996). Moreover, the flexibility of the organizational form of alliance is frequently mentioned as one of its biggest advantages so it is not surprising that this flexibility is utilized. Reuer and Zollo determine that transformations, such as contract amendments, fluctuations in alliance-related personnel, or changes in alliance-related governance mechanisms, occur in approximately 40% of all strategic alliances. Organizational routines for alliance transformation, however, often do not exist. While some companies, such as GE and SNECMA, have successfully and repeatedly implemented changes to their alliances (Doz, 1996), others still do not have routinized actions of alliance transformation in place, suggesting that firms differ in these capabilities. Building on this argument, we conceptualize alliance transformation (i.e., the extent of routines to modify alliances over the course of the alliance process; Niederkofler, 1991) as a further dimension of alliance management capability.

These routines of coordination, learning, sensing, and transformation discussed above must be understood as individual facets of an alliance management capability. As suggested by Winter (2003), "Capabilities are complex, structured and multidimensional" (p. 992). It is their "package nature" that makes capabilities difficult to buy, imitate, assemble, substitute, or replace (Hunt, 1999). Since these routines display a high level of coherence (Teece et al., 1997), we suggest they are elements of a higher order construct, as shown graphically in Figure 1.

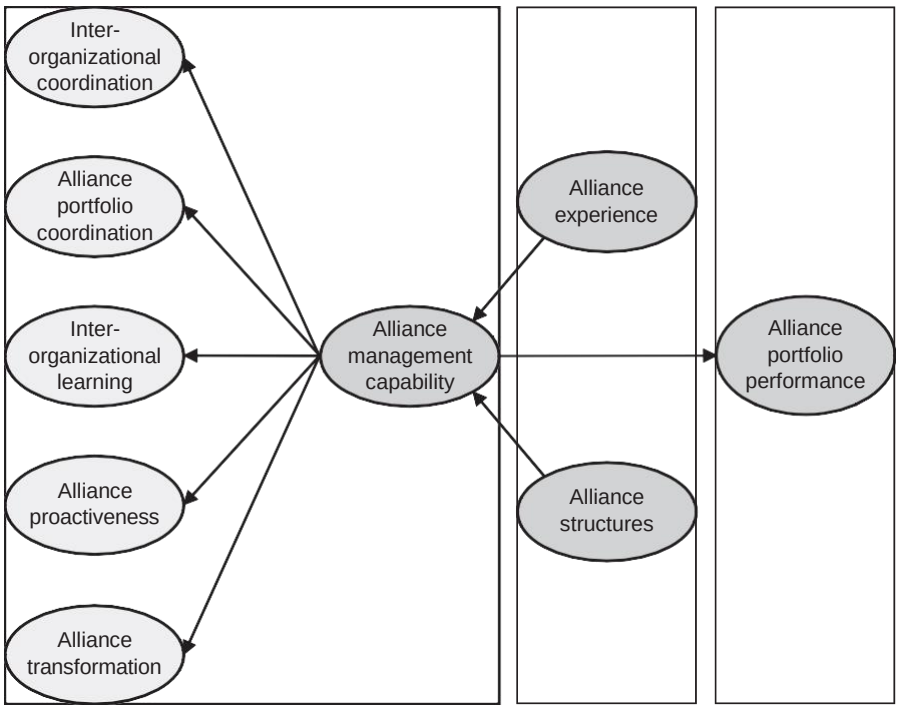
Alliance Management Capability and Alliance Portfolio Performance

According to the dynamic capabilities literature, management routines enable the firm to generate continuous improvement in the effectiveness of its performance of product market activities (Collis, 1996). A firm's collective tacit knowledge of how to engage in resource renewal—built into the organization's routines and embedded in modes of behavior—allows the firm to achieve competitive advantage (Teece, 1998).

Organizations with a strong alliance management capability possess routines that allow for an efficient and effective alliance management. The more the firm possesses alliance-related knowledge and the skills necessary to apply it, the more its alliances are expected to benefit. Therefore, we suggest that there is a direct positive relationship between alliance management capability and the performance of the firm's portfolio of alliances. We use the construct of alliance portfolio performance as the dependent variable, since we expect alliance management capability to have a positive influence not only on individual alliances but on the entirety of an organizational entity's alliances (Heimeriks & Duysters, 2007). Using alliance portfolio performance as the unit of analysis is also consistent with Ray, Barney, and Muhanna's (2004) general recommendations for selecting appropriate dependent variables in empirical studies drawing from resource-based perspectives.

Hypothesis 1: There is a positive relationship between alliance management capability and alliance portfolio performance.

Figure 1
Conceptual Framework



Our foregoing discussion of alliance management capability suggests that organizational alliance management routines are an important source of alliance advantage. Implicit in our discussion is the idea that organizations differ in these routines (Kor & Mahoney, 2005). While alliance portfolio performance may be directly affected by alliance management capability (as argued above), an interesting question of what affects the institutionalization of such routines arises. Previous research has indicated that alliance experience and dedicated organizational structures may be relevant. As fundamental elements of the organizational learning system, experience and structures are important means for making effective changes to management routines (Bontis, Crossan, & Hulland, 2002). We suggest, therefore, that alliance management capability is influenced by these factors and mediates their effect on alliance portfolio performance, as we argue below.

Alliance Experience, Alliance Management Capability, and Alliance Portfolio Performance

Prior research on strategic alliances suggests that a central factor influencing the creation of alliance routines is previous alliance experience (Anand & Khanna, 2000; Gulati, 1999).

Referring to the literature on learning curves (Dutton & Thomas, 1984; Lieberman, 1989), it is argued that firms with greater experience have an advantage over the competition. For example, as firms increase their production experience, they are better able to link changes in outcomes to changes in inputs and routines (Lieberman, 1989). As a consequence of "learning from direct experience" (Levitt & March, 1988, p. 321), an improvement of the firm's existing routines should follow. While learning rates may differ immensely between firms and industries, it is virtually undeniable that firms can increase their routines' effectiveness through experience (Sorenson, 2003). Pisano (2002) remarks, "The seeds of today's capabilities are sown in yesterday's experience" (p. 150).

The same arguments can be applied to understand the role of experience in the management of strategic alliances. Repeated participation in those hybrid organizational forms exposes organizations to variation in alliance management practices and outcomes (Sampson, 2005). The company builds a "broad repertoire of experiences" (Anand & Khanna, 2000, p. 298), allowing the firm to draw conclusions on the effectiveness of its alliance management processes. Each alliance experience allows organizations to assess effective routines for exchanging information with their partners as well as routines to manage complex activities with uncertain outcomes. Experience may also result in the development of organizational routines to facilitate interorganizational coordination and to select appropriate future alliance partners (Hoang & Rothaermel, 2005).

In summary, previous alliance experience will aid companies in developing adequate alliance management routines, thereby avoiding mistakes when establishing and managing further alliances. Consequently, companies experienced with alliances are likely to manage future partnerships more effectively and thus to be more alliance capable, which in turn should lead to higher performance. This leads to the following hypothesis:

Hypothesis 2: Alliance management capability mediates the effect of alliance experience on alliance portfolio performance.

Alliance Structures, Alliance Management Capability, and Alliance Portfolio Performance

Winter (2003) argues that capabilities not only require frequent exercise to be economically sound but also "generally involve a lot of specialized personnel who are committed full time to their change roles" (p. 993). This is in line with Crossan, Lane, and White's (1999) argument that institutionalization, that is, the process of ensuring that effective organizational routines are established, is fostered by specialized organizational structures. These structures help ensure that procedures producing favorable outcomes are discovered and continue to be carried out. Clark and Fujimoto (1990) illustrate the positive effect of specialized structures for the case of product development capability. They find that organizational structures, such as coordination committees, speed problem-solving processes and improve the quality of solutions. In a similar vein, Henderson and Cockburn (1994) stress that organizations investing in structures focused explicitly on improving the firm's competences will significantly outperform competitors that do not do so.

We extend this general logic to understand the role of specialized organizational structures for the management of strategic alliances. These alliance structures may include single alliance specialists or entire alliance units. Lufthansa, for example, has its own alliance coordinator for each business unit (e.g., for passage, freight, etc.), as well as a vice president of strategic alliances at the corporate level to manage company-wide alliance activities. Other firms, such as Hewlett-Packard, Eli Lilly, and Oracle, also operate their own alliance departments.

Dedicated alliance structures have the potential to improve alliance management capability by supporting the alliance management routines of coordination, learning, sensing, and transformation (Hoffmann, 2005; Kale, Dyer, & Singh, 2001). One of the major advantages of formal alliance structures is that these structures help to oversee the entire organization (Sampson, 2005). Consequently, they can aid knowledge codification and facilitate communication over functional areas within the firm (Hoang & Rothaermel, 2005). These are important mechanisms, making individuals' knowledge stocks available to the entire organization. Furthermore, alliance structures enable an overview about what kind of alliances and partners would be particularly valuable and can provide the required resources for scanning the market for appropriate new alliance opportunities (Gulati, 1999). In conclusion, alliance structures can facilitate a more systematic alliance management and thus are an important determinant of effective alliance management routines, as stated in Hypothesis 3.

Hypothesis 3: Alliance management capability mediates the effect of alliance structures on alliance portfolio performance.

Method

Sample Selection and Data Collection

To test our hypotheses, we required primary data, so we conducted a survey of key informants. To ensure a sufficient homogeneity of the research domain, we followed the approach by Eisenhardt and Schoonhoven (1996) by focusing our empirical analysis on companies' R&D alliances. The number of R&D alliances has grown immensely (Hagedoorn, 2002), making it a significant phenomenon worthy of study. Moreover, choosing R&D alliance activities is consistent with our aim of conceptualizing alliance management capability as a specific dynamic capability designed to modify the organization's resource base, because R&D alliances (i.e., as opposed to production or marketing alliances) are more clearly directed toward accessing and obtaining new resources (Eisenhardt & Schoonhoven, 1996).

The unit of analysis is a business unit within a firm or the entire firm if there were no specialized business units.[2] The focus on the business unit level of analysis helped us to assure that key informants were well informed and highly qualified to respond to the study's questionnaire. On the other hand, items measuring the alliance structure construct pertained to the entire firm since we expected key informants to be aware of such firm-level units and that firm-level alliance structures usually support all business units of a given firm.

Since the main level of analysis of our research is the business unit's R&D alliance portfolio, our ideal choice of a sample would be the entirety of companies involved in R&D alliances.

Since in practice, however, there is no such comprehensive database, we followed Parkhe's (1993) method of employing specific selection criteria designed to capture firms that are most likely to be involved in R&D alliances by focusing specifically on certain industries and firm sizes. The first criterion is based on the recognition that certain industry groups, including chemicals, machinery, and motor vehicles, are among the most prolific in alliance activity (Grant & Baden-Fuller, 2004; Hagedoorn, 1993). Simultaneously, these three sectors are among the most R&D-intensive manufacturing industries (ZEW, 2004), making them an ideal focus for our study. The second criterion is based on the fact that larger companies show significantly greater alliance activity than do small companies (Hagedoorn & Schakenraad, 1994). As such, we focus our study on businesses with at least 100 employees.

The data collection was carried out using a list of companies derived from the Hoppenstedt database Firmendatenbank, a source well known in Germany. The Hoppenstedt Group, founded in 1926, is part of the Swedish Bisnode Group, which is one of the largest business data providers in Europe. Information obtained from Hoppenstedt included the name of the firm, industry segment, number of employees, and telephone number. Based on this information, we identified 2,226 firms that satisfied our selection criteria. We contacted each firm by telephone to inquire whether it currently participated in an R&D alliance. Based on these responses, a sample of 1,386 firms remained to which we sent questionnaires.[3] In order to place special emphasis on the identification of appropriate key informants (N. Kumar, Stern, & Anderson, 1993), all firms were telephoned to establish contact with those individuals who were most knowledgeable about the company's management procedures regarding R&D alliances, and this person was asked to participate in our study. After a three-wave mailing approach (Dillman, 1978) via e-mail, a total of 302 usable responses were returned, representing a response rate of 21.8%. This response rate is in line with comparable studies using top managers as key informants (e.g., Draulans et al., 2003; Mohr & Spekman, 1994).

To overcome problems associated with the key informant approach, we developed the survey instrument in several stages, which included six explorative expert interviews, an extensive literature screening to identify relevant scale items for measuring the factors in this research, 21 partially structured expert interviews, an item-sorting pretest based on Anderson and Gerbing's (1991) among 15 scholars familiar with alliance research, and a pretest of the questionnaire.

With regards to the dependent variable, we used a 3-year time lag to collect performance data. We chose a 3-year lag for the business unit's alliance management routines to manifest themselves fully and lead to observable performance outcomes. The incorporation of a temporal lag into the research design provides at least two benefits. First, the temporal separation in measurement between the independent and the dependent variables can reduce a potential method bias that stems from measuring both sets of variables at the same time within the same survey instrument (Podsakoff & Organ, 1986). Second, as Rindfleisch, Malter, Ganesan, and Moorman (2008) describe, longitudinal research possesses superior causal inference ability by assessing the influence of a predictor at a time subsequent to its cause. We contacted the same key informants who participated in the first data collection. At this stage, a number of key informants either could not be reached due to informant turnover or were unavailable in the second round. Thus, our final sample consisted of 204 matched questionnaires across Times 1 and 2.

Table 1
Sample Composition

Respondent and Company Characteristics	%
A. Industry	
Machinery	52.9
Motor vehicles	23.5
Chemicals	23.5
B. Company size (number of employees)	
Fewer than 100	2.9
100-249	36.3
250-499	25.0
500-999	14.2
1,000-4,999	12.3
More than 5,000	9.3
C. Position of respondents	
Head of R&D	58.3
R&D project leader	15.7
Member of the executive board	7.4
Others (e.g., head of construction, chief technical officer)	18.6
D. Number of the company's R&D alliances the respondent has directly been involved in	
Fewer than 2	5.4
2-4	41.7
5-10	34.3
More than 10	18.6

Data Characteristics and Evaluation

Respondent and company characteristics of the final sample are presented in Table 1. It is important to note that the questionnaire included an item that assessed the respondent's self-reported knowledge of the company's R&D alliances on a 5-point scale, ranging from 1 (*poor*) to 5 (*excellent*). The mean score for this item was 4.06 (s = 0.83), suggesting that the respondents were very well informed. We also assessed nonresponse bias by comparing early respondents with late respondents (Armstrong & Overton, 1977). Moreover, we examined whether the firms we initially addressed and the responding firms differed by size (number of employees) or industry. Following the guidelines recommended by Mentzer, Flint, and Hult (2001), we also contacted a random sample of nonrespondents and asked them to answer one item for each construct of our research model. Based on information from 30 nonrespondents, the t tests of group means revealed no significant differences between respondents and nonrespondents on any of the questions. The findings provide evidence that nonresponse bias is not a problem with the data. In addition, there was no evidence of either a Web survey bias (Dickson & Maclachlan, 1996) or a bias based on the participants' positions (Groves, 1989).[4] Finally, we compared our final sample (that participated in both waves) with the firms that participated only in the first wave with respect to size and industry and found no significant differences.

To further validate our data, 100 randomly chosen participating companies were sent a second questionnaire, and a second manager was requested to complete the questionnaire.

We received a second response from 18 companies. Inter-rater agreement was computed following the procedure described by Kotha and Vadlamani (1995). Of 468 possible responses on a 7-point scale of the second questionnaire (18 × 26), 333 were within one interval of the responses of the first questionnaire. Thus, 71.2% of responses from two different managers in a company were within one interval or less, showing satisfactory inter-rater agreement. In addition, a Pearson product–moment correlation was calculated across all Likert-type questionnaire items for each pair of respondents. The mean correlation across all pairs of respondents was .58 ($p < .01$). This high degree of agreement between multiple respondents strengthened confidence in the survey's validity.

Finally, we conducted a supplementary analysis aimed at diagnosing the robustness of the information on alliance portfolio performance provided by the respondents by triangulating reported data with secondary data (Boyer, 1999). Since explicit information on alliance portfolio performance was not available from published sources, we used secondary data on business performance for this procedure. This is in line with prior research showing that successful alliances contribute significantly to the overall performance of the organization (e.g., Baum, Calabrese, & Silverman, 2000), suggesting a positive link between business performance and alliance portfolio performance if validly measured. To test this relationship and gain further insights about the validity of our own alliance portfolio performance measure, we identified businesses in our sample for which objective performance information is publicly available; this was the case for 50 companies in our sample. Using two financial databases and annual reports from the companies' Web sites, we obtained data to determine the return on investment (ROI) over the past 2 years. For each company, we computed the average ROI over those years and standardized it by industry. We then correlated this objective information on business performance with the average of the alliance portfolio performance items reported by the managers. Both measures are highly correlated ($\rho = .42$, $p < .01$), indicating that the managerial alliance portfolio performance evaluations are robust. Finally, as a supplementary procedure testing for the validity of the alliance portfolio performance measure, we ran two regression analyses for the subset of companies for which objective business performance data were obtained (Vorhies & Morgan, 2005). We regressed the alliance management capability score for each company onto the perceptual alliance portfolio performance measure and the objective ROI performance data. The coefficient ($\beta = .38$, $p < .01$) in the ROI regression is very much in line with the value we observed when using the perceptual measure of alliance portfolio performance as the dependent variable ($\beta = .58$, $p < .01$). This consistency in the sign and significance of the regression coefficient further enhanced the confidence in our measurement of the dependent variable.

Construct Measurement

All measurement items, except for alliance experience and company size, were formulated as Likert-type statements anchored by a 7-point scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Alliance management capability. Alliance management capability was modeled as a five-dimensional reflective second-order construct.[5] We developed scales to measure the

first-order dimensions of alliance management capability building on prior literature. To account for the routine-based nature of the construct, we phrased the majority of items as discrete practices that together reflect the capability dimension (Knott, 2003).

The dimension of *interorganizational coordination* is defined as the extent of routines to coordinate activities and resources with the alliance partner (Gulati et al., 2005; Shi, Zou, White, McNally, & Cavusgil, 2005). The scales by Mohr and Spekman (1994) and Pavlou and El Sawy (2006) served as the starting point for the measurement of this dimension. More specifically, the coordination scale by Mohr and Spekman was transferred from the context of vertical partnerships between manufacturers and dealers to the context of R&D alliances and complemented with items that were constructed based on items developed by Pavlou and El Sawy, who measured intraorganizational coordination capability.

The second dimension, *alliance portfolio coordination*, pertains to the routines related to the integration of all of a business unit's R&D alliances. For this construct, new items were developed on the basis of the conceptual work of Hoffmann (2005) and Parise and Casher (2003). *Interorganizational learning*, the third alliance management capability dimension, denotes the extent of routines designed to facilitate knowledge transfer from R&D alliance partners (Dyer & Nobeoka, 2000). The absorptive capacity scales of Matusik and Heeley (2005) and Pavlou and El Sawy (2006) served as a basis for measuring this dimension.

Alliance proactiveness is considered the fourth dimension of alliance management capability; it can be defined as the extent of routines to identify potentially valuable partnering opportunities. Our measures of the alliance proactiveness dimension followed those of Sarkar, Echambadi, and Harrison (2001). Finally, *alliance transformation* refers to the extent of routines to modify alliances over the course of the alliance process (Niederkofler, 1991). Measures for the dimension of alliance transformation were developed on the basis of those of Johnson (1999) and Young-Ybarra and Wiersema (1999), who measured the concept of flexibility in buyer–seller relationships. In total, we used 18 alliance management capability items that were either newly developed, adapted from related measures, or taken from previous research.

Alliance experience. The alliance experience construct refers to the extent to which a company has previously been involved in strategic alliances. Based on the work of Reuer, Zollo, and Singh (2002), alliance experience was measured by a single item: Respondents were asked to indicate the number of prior agreements of their business units with R&D alliance partners within the past 5 years.[6] Since this variable was positively skewed, we redefined it for the hypothesis tests using a logarithmic transformation that has been shown to remedy such a problem (Tabachnick & Fidell, 2000).

Alliance structures. We refer to alliance structures as organizational units dedicated primarily to the management of strategic alliances. We developed a new scale for the construct of alliance structures on the basis of Hoffmann (2005) and Kale et al. (2002). The items were designed to gauge the degree to which the firm has specialized alliance personnel or departments.

Alliance portfolio performance. Despite the publication of numerous studies on alliance performance, no consensus on measuring this phenomenon has yet emerged (Ariño, 2003). The hybrid structures and transitory nature of strategic alliances present unique challenges for assessing their success (Krishnan, Martin, & Noorderhaven, 2006). Survival is an imperfect

indicator of performance because an alliance can be successful and still be discontinued, and for most alliances, adequate information on financial performance is not available from a secondary source (Reuer, 2001). Accordingly, much of the alliance performance research relies on managers' evaluations of alliance performance (e.g., Judge & Dooley, 2005; Zollo et al., 2002). This approach is particularly appropriate if the respondents represent top-level management (Olk, 2002). Given that the respondents in our study were very well informed about their business units' R&D alliances, we were confident of managerial evaluations of alliance success. Thus, we measured our dependent variable, alliance portfolio performance, in terms of performance satisfaction and perceived goal fulfillment of the business unit's R&D alliances. We used a four-item scale that was developed based on Judge and Dooley (2005), Saxton (1997), and Zollo et al. (2002).

Control variables. Several control variables were used in the analysis. First, we controlled for industry effects, because strategic alliances in certain industries may systematically perform better than those in other industries owing to differences in industry structure (Krishnan et al., 2006). To control for industry effects, we used dummy variables that have been coded so that the machinery sector serves as the base relative to which the effects of the other dummies (chemicals and motor vehicles) are measured. We also controlled for company size since it has been argued that smaller firms may benefit more from strategic alliances than larger firms do (Koh & Venkatraman, 1991). At the same time, size may influence the organizational capability to manage alliances (N. K. Park & Mezias, 2005), with larger companies being able to assign more resources to alliance management routines (Kale et al., 2002). Moreover, larger companies are more likely to engage in strategic alliances than are smaller ones (Hagedoorn & Schakenraad, 1994), suggesting a link between size and alliance experience. Finally, since alliance structures require certain investments, companies may need to be large enough to justify these costs (Kale et al., 2001), suggesting a possible relationship between company size and alliance structures. We measured company size by number of employees. Our third control was the organization's degree of R&D orientation. This variable was measured using a single item to which the respondents indicated agreement with the assertion, "In our company, we emphasize Research & Development activities." A high R&D orientation not only may be related to performance outcomes (Gatignon & Xuereb, 1997) but also may encourage organizations to build capabilities particularly relevant to R&D (Dosi & Marengo, 1993), such as alliance management capability. Likewise, it seems plausible that R&D-oriented companies will be engaged in a greater number of R&D alliances and that it is worthwhile for those businesses to invest in specialized alliance structures. Finally, we controlled for the relationship between alliance experience and alliance structures because it has been argued that organizations are more likely to establish dedicated alliance structures as the company's cumulative number of alliances becomes greater (Kale et al., 2002).

Estimation Approach

To examine the latent variables within their causal structure, we applied SEM using AMOS 7.0 software (Arbuckle, 2006) and applied the maximum likelihood procedure. We chose an SEM approach because it is a powerful generalization of earlier statistical approaches

with the key benefit being that each explanatory and dependent variable is associated with measurement error, in contrast to ordinary least squares regression, for example, which is based on the assumption that variables are measured perfectly (Bollen, 1989). In addition, SEM allows for multiple indicators of latent variables, which oftentimes are a more realistic representation of the variables under study.

Results

Validity and Reliability

We first conducted analyses separately for each first-order construct. Coefficient alphas, composite reliabilities (CR), and average variances extracted (AVE) are indicative of a reliable and valid measurement of the individual factors and are illustrated in Table 2. We subsequently tested the postulated structure of the alliance management capability construct by means of second-order confirmatory factor analysis (Bagozzi, 1994). In the model, alliance management capability is the second-order factor of five first-order dimensions. The loadings of the second-order construct on its five respective dimensions are .76, .62, .90, .77, and .63 ($p < .01$). The global fit criteria indicate a good overall model fit: $\chi^2/df = 1.04$, comparative fit index (CFI) = 0.99, goodness-of-fit index (GFI) = 0.94, Tucker-Lewis index (TLI) = 0.99, root mean square error of approximation (RMSEA) = 0.01. The target coefficient index (T) clearly exceeds the required minimum value of 90% and demonstrates that a large portion of the variance within the first-order factors can be explained through the second-order construct (Marsh & Hocevar, 1985). In addition, we conducted a series of analyses in which we compared our five-factor model with all possible constellations of one-, two-, three-, and four-factor structures. Using chi-square difference tests, the fit of the hypothesized five-factor model was significantly better compared with all other models. In summary, the results underline the reliability and validity of the measurement of alliance management capability as a five-dimensional construct.

In an analysis based on Fornell and Larcker (1981), we assessed the discriminant validity of the factors included in our overall research model. We found that the average variance extracted by the measure of each factor is larger than the squared correlation of that factor's measure with all measures of other factors (see Table 3). Furthermore, we ran a series of nested confirmatory factor analyses in which we constrained the correlation between each pair of constructs to one (Anderson & Gerbing, 1988). For all pairs, when we compared the constrained model with a free model, the difference was significant. On the basis of these findings, we conclude that all factors possess strong discriminant validity.

Hypothesis Tests

To test the hypotheses, we merged the measurement models of alliance management capability, alliance experience, alliance structures, alliance portfolio performance, and the control variables into a structural model. While the results presented in Figure 2 account for

Table 2
Measurement Scales

	α	Composite Reliability	Average Variances Extracted	*M*	*SD*
Alliance management capability					
Interorganizational coordination	.83	0.84	0.63		
1a. Our activities with R&D alliance partners are well coordinated.				5.17	1.57
1b. We ensure that our work is synchronized with the work of our R&D alliance partners.				4.58	1.64
1c. There is a great deal of interaction with our R&D alliance partners on most decisions.				4.99	1.52
Alliance portfolio coordination	.91	0.91	0.72		
2a. We ensure an appropriate coordination among the activities of our different R&D alliances.				4.15	1.71
2b. We determine areas of synergy in our R&D alliance portfolio.				4.25	1.76
2c. We ensure that interdependencies between our R&D alliances are identified.				3.97	1.70
2d. We determine if there are overlaps between our different R&D alliances.				4.50	1.70
Interorganizational learning	.87	0.87	0.63		
3a. We have the capability to learn from our R&D alliance partners.				5.13	1.37
3b. We have the managerial competence to absorb new knowledge from our R&D alliance partners.				4.65	1.44
3c. We have adequate routines to analyze the information obtained from our R&D alliance partners.				4.91	1.48
3d. We can successfully integrate our existing knowledge with new information acquired from our R&D alliance partners.				4.85	1.46
Alliance proactiveness	.87	0.87	0.63		
4a. We strive to preempt our competition by entering into R&D alliance opportunities.				4.44	1.78
4b. We often take the initiative in approaching firms with R&D alliance proposals.				4.04	1.71
4c. Compared to our competitors, we are far more proactive and responsive in finding and “going after” R&D partnerships.				3.79	1.59
4d. We actively monitor our environment to identify R&D partnership opportunities.				4.46	1.52

(continued)

Table 2 (continued)

	α	Composite Reliability	Average Variances Extracted	*M*	*SD*
Alliance transformation	.82	0.82	0.60		
5a. We are willing to put aside contractual terms to improve the outcome of our R&D alliances.				4.27	1.61
5b. When an unexpected situation arises, we would rather modify an R&D alliance agreement than insist on the original terms.				4.96	1.46
5c. Flexibility, in response to a request for change, is characteristic of our R&D alliance management process.				4.93	1.45
Alliance experience					
6a. Please indicate the number of R&D alliances your company has had within the last 5 years.				17.97	40.70
Alliance structures	.83	0.83	0.63		
7a. In our firm, there is a great deal of support for the management of R&D alliances through a central unit.				2.88	2.10
7b. In our firm, there are departments primarily dedicated to the management of R&D alliances.				2.05	1.73
7c. In our firm, there are various employees primarily dedicated to the management of R&D alliances.				2.10	1.69
Alliance portfolio performance	.88	0.89	0.66		
8a. Overall we are satisfied with the performance of our R&D alliances.				4.39	1.28
8b. Generally our R&D alliances satisfy our initial objectives.				4.65	1.18
8c. We are satisfied with the knowledge accumulated from participating in R&D alliances.				4.80	1.19
8d. Our R&D alliances have been profitable investments.				4.23	1.34
R&D orientation					
9a. In our company, we emphasize Research & Development activities.				5.32	1.44

control variables, the specific effects of control variables are reported separately in Table 4 in order to streamline Figure 2.

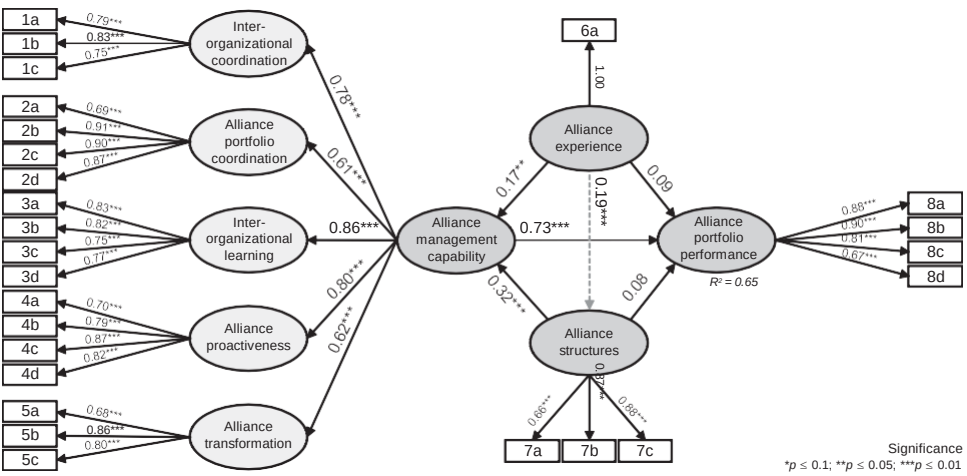
The fit measures for the structural model show satisfactory values (χ^2/df = 1.31, CFI = 0.96, GFI = 0.87, TLI = 0.96, RMSEA = 0.04). The coefficient of the path from alliance management capability to alliance portfolio performance shows that alliance portfolio performance is influenced positively and significantly by alliance management capability ($\beta = .73$, $p < .01$). Thus, Hypothesis 1 is supported. Moreover, the path coefficient of 0.17,

Table 3
Discriminant Validity of Constructs

Factor	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
Interorganizational coordination	4.91	1.36	**.63**									
Alliance portfolio coordination	4.22	1.52	.24	**.72**								
Interorganizational learning	4.88	1.22	.47	.32	**.63**							
Alliance proactiveness	4.18	1.40	.29	.24	.47	**.63**						
Alliance transformation	4.72	1.29	.26	.10	.31	.28	**.60**					
Alliance experience	2.09	1.09	.04	.01	.07	.14	.03	**1.00**				
Alliance structures	2.34	1.60	.12	.15	.10	.17	.05	.08	**.63**			
Alliance portfolio performance	4.58	1.07	.44	.22	.41	.41	.22	.11	.17	**.66**		
R&D orientation	5.32	1.44	.13	.07	.19	.21	.07	.03	.06	.17	**1.00**	
Company size	3.25	1.38	.03	.00	.02	.03	.00	.06	.11	.01	.03	**1.00**

Note: Bold numbers on the diagonal show the average variances extracted; numbers below the diagonal are the squared correlations.

Figure 2
Results of Model Estimation



significant at a 5% level, points to a strong positive relationship between alliance experience and alliance management capability. Therefore, alliance experience is an appropriate construct to explain why some organizations have a higher alliance management capability than others. Further, the structural link from alliance structures to alliance management capability is positive and significant ($\beta = .32$, $p < .01$).

To test whether alliance management capability fully mediates the relationships between alliance experience and alliance portfolio performance, as well as between alliance structures

Table 4
Effect of Control Variables

	Alliance Management Capability	Alliance Experience	Alliance Structures	Alliance Portfolio Performance
Chemicals				.02
Motor vehicles				–.10*
Company size	–.04	.22***	.27***	–.06
R&D orientation	.40***	.14**	.16**	.02

*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$.

and alliance portfolio performance, we conducted two types of analyses. First, we applied Baron and Kenny's (1986) approach to test for mediation, which requires that both alliance experience and alliance structures affect alliance management capability while neither variable affects alliance portfolio performance directly. Looking at the results of the model estimation, the path from alliance experience to alliance management capability was significant, as was the path from alliance structures to alliance management capability (see Figure 2). However, the direct path from alliance experience to alliance portfolio performance was not significant when the alliance management capability construct was included ($\beta = .09$, $p > .1$). Equally, the direct path from alliance structures to alliance portfolio performance was insignificant when alliance management capability was introduced ($\beta = .08$, $p > .1$). However, the indirect effects of both alliance experience and alliance structures on alliance portfolio performance via alliance management capability are significant (indirect effect of alliance experience = 0.12, $p < .05$; indirect effect of alliance structures = 0.23, $p < .01$). Finally, Sobel (1982) tests confirmed the mediating role of alliance management capability for both effects (alliance experience: $z = 2.61$, $p < .01$; alliance structures: $z = 3.34$, $p < .01$).

The second analysis used to test the mediation models was a chi-square difference test between pairs of nested models (e.g., Schneider, Ehrhart, Mayer, Saltz, & Niles-Jolly, 2005). Each baseline model included a link between the antecedent construct (Baseline Model 1: alliance experience; Baseline Model 2: alliance structures) and alliance management capability as well as between alliance management capability and alliance portfolio performance. The alternative models added a direct link from the antecedent construct to alliance portfolio performance. The addition of this link did not significantly improve model fit for the alliance experience model ($\Delta\chi^2 = 2.55$, $\Delta df = 1$, $p > .1$) or for the alliance structures model ($\Delta\chi^2 = 1.15$, $\Delta df = 1$, $p > .1$), indicating that the baseline models are superior. Thus, alliance management capability fully mediates the relations between alliance experience and alliance portfolio performance as well as between alliance structures and alliance portfolio performance, supporting Hypotheses 2 and 3.

Post Hoc Analysis

Underlying our multidimensional conceptualization of alliance management capability is the assumption that its individual dimensions are closely intertwined and act as a coherent

package (Teece et al., 1997). To empirically explore the consequences of simultaneously analyzing multiple versus single alliance management routines, we estimated five additional structural equation models, one for each dimension separately. We maintained the model outline depicted in Figure 2 while excluding four dimensions respectively.

The results showed that, in each of the five models, alliance experience and alliance structures had a significant effect on the single alliance management dimension, which, in turn, had a significant impact on alliance portfolio performance. However, we found support in none of the five models for full mediation (as was the case in the original model including the multidimensional construct). Rather, we only obtained partial mediation for each single dimension (i.e., at least one the direct effects of alliance experience and alliance structures on alliance portfolio performance remained significant). Thus, we find evidence for the notion that it is its "package nature" that makes alliance management capability particularly relevant to performance.

Discussion

Why are some organizations more successful with their alliances than others? This research question is still relatively new to alliance research, as most of the prior work has focused on the alliance (and not the organization) as the unit of analysis. However, starting with Anand and Khanna's (2000) observation that persistent differences exist across organizations in their ability to create value from alliances, researchers have become interested in the organizational antecedents to alliance performance.

In this article, we pick up the notion that organizational management routines are a major determinant of performance. Building on the dynamic capabilities and alliance management literature, we developed the construct of alliance management capability, which encompasses the organization's coordination, learning, sensing, and transformation routines relevant to alliance management. More specifically, we conceptualized alliance management capability as a second-order construct, reflected by the organizational routines of interorganizational coordination, alliance portfolio coordination, interorganizational learning, alliance proactiveness, and alliance transformation. We then developed items to assess the extent to which the dimensions are implemented.

Our empirical results not only support the proposed five-dimensional structure of the construct but also provide evidence that alliance management capability is a crucial driver of alliance portfolio performance. In support of our first hypothesis, we find a significant positive link between alliance management capability and alliance portfolio performance. Further, in support of Hypotheses 2 and 3, we establish that alliance management capability is positively related to alliance experience and dedicated alliance structures and fully mediates the performance effects of those two factors.

A particularly significant contribution to future alliance research is the conceptualization and operationalization of the alliance management capability construct presented in this article. Based on dynamic capabilities theory, we derived a set of five dimensions representing important alliance management routines. Building on field interviews and existing measures from various contexts, we operationalized these dimensions and assessed the validity of the measurement instrument. Using several statistical analyses, we found evidence that our

multidimensional measure possesses high reliability and validity. Importantly, our post hoc analysis emphasized the relevance of considering multiple dimensions of alliance management capability simultaneously when analyzing the construct in its nomological network. Since a good metric is crucial to establish a common ground so that the results of alliance management can be compared across companies and research studies, future alliance researchers may find it valuable to use the measurement instrument developed in this article.

Although our main objective was to add to current knowledge about alliance management, this study also contributes to the strategy literature by providing empirical evidence that capabilities can be understood as a set of management routines. While prior research has argued conceptually that capabilities are inextricably linked to organizational routines (Winter, 2003; Zollo & Winter, 2002), there have been very few studies that empirically analyze this assertion. Addressing this gap, this study conceptualizes and validates a routine-based dynamic capability for the context of strategic alliances. The results particularly support the notion of multidimensional capabilities that are reflected by a set of first-order routines. Previous research has tended to identify capabilities only post hoc, inferring their existence from successful organizational outcomes, which makes it difficult to separate capabilities from their effects (Zahra et al., 2006). We believe our approach to operationalizing alliance management capability—that is, to derive general construct dimensions from dynamic capabilities theory and specify them to the context of alliance management—may also be useful for future research measuring dynamic capabilities in different contexts (such as product development or mergers and acquisitions).

Limitations and Future Research

The study's limitations result in a number of promising avenues for future research. The empirical test of our research model is clearly limited to the context of R&D alliances. Given that R&D alliances may contribute to resource configurations in a different way than do other types of alliances (Eisenhardt & Schoonhoven, 1996), future studies should apply our model to marketing or manufacturing alliances as well. Moreover, this study focuses on the evaluation of main effects among the constructs. Future research may also consider potential moderators such as the environmental context and alliance portfolio characteristics. In particular, it might be worthwhile to examine the proportion of scale and link alliance in the portfolio since the latter have been suggested to be more difficult to manage than the former (Dussauge, Garrette, & Mitchell, 2004).

A further limitation is the study's focus on the business unit level as the unit of analysis. All constructs analyzed in this study pertain to the business unit, except for alliance structures, which are captured at the firm level. Embracing a multilevel perspective, future research could also consider individual-level constructs (such as characteristics of the managers involved in strategic alliances) and dyadic-level constructs (such as partner complementarities) as additional antecedent to alliance management capability and performance. In addition, corporate-level phenomena (such as alliance activities in other business units of the firm) may also play an important role in the development of alliance management capability. In particular, the analysis of substitutional and complementary effects among different levels may yield to interesting findings. As extant resource-based studies addressing the level issue

are very scarce (for an exception, see Rothaermel & Hess, 2007), future research is needed to clarify where the key locus of alliance management capability lies, what the roles of different levels are, and whether these levels substitute or complement each other.

Managerial Implications

From a managerial perspective, our analysis of the nature, antecedents, and performance relevance of alliance management capability provides insights into how companies should go about in improving their alliance portfolio performance. This study identifies specific management routines that can be influenced and are fundamental to the success of companies engaged in strategic alliances. In addition, we identify two important determinants of those routines, namely, alliance experience and alliance structures.

In particular, two applications emerge from the identification of those success factors of alliance management. First, the quality of the existing alliance management of one's own company can be analyzed, which, for one, helps in deciding if alliances are a success-promising strategic option for the business in the first place. On the other hand, specific weak points that require future improvements through targeted measures may be detected. Second, it seems to be beneficial to align with partners who are highly alliance capable themselves. Thus, the dimensions and antecedents of alliance management capability may serve as evaluation criteria for selecting among potential alliance partners.

Overall, our study implies the need to rethink common approaches to strategic alliance management. Alliances are no longer an unusual occurrence but have become part of daily business (Bamford & Ernst, 2002). Thus, ad hoc decisions no longer suffice to manage alliances effectively. Rather, it takes systematic management routines to generate the maximum value in strategic alliances. Employees working in strategic alliances must not be left alone; on the contrary, they must be provided with support through specialized alliance structures, such as dedicated alliance personnel or alliance departments. Moreover, to capitalize on previous alliances, we suggest codifying knowledge on alliance management in databases and in manuals. Companies need to evaluate if they are providing sufficient support for leveraging alliance experience and converting their alliance experience into organization-wide know-how. In conclusion, the findings of this study can serve as a useful basis for making decisions as to which variables management should focus its attention on to improve the performance of its company's alliances.

Notes

1. Researchers have used variant terminology when referring to capabilities that facilitate repeated alliance success. For example, Helfat et al. (2007) used the term *relational capabilities*, and Kale et al. (Kale, Dyer, & Singh, 2002; Kale & Singh, 2007) discussed *alliance capability*. In this article, we follow Rothaermel and Deeds (2006) and consistently use the term *alliance management capability*. While *relational capabilities* and *alliance capability* are umbrella terms including multiple organizational level constructs affecting alliance portfolio performance, the *alliance management capability* term is clearly focused on the management routines associated with alliance activities.

2. The questionnaire included the following instruction: "If you are employed at a diversified firm with several business units, please respond to the questions with reference to the business unit you are working for."

3. We followed the relationship criterion approach adopted by Koka and Prescott (2002) in that we only included companies in our study that were involved in at least one R&D alliance.

4. Respondents had the choice to participate in the study either offline (via mail) or online (via a Web survey). To test for a Web survey bias, the sample was divided into two groups according to the respective reply option (offline or online), and Mann-Whitney *U* tests were performed. The results indicate that no significant difference exists between the replies from the online and offline respondents. Finally, it was established, through Kruskal-Wallis *H* tests that by and large there are no significant differences between the four groups of participants described in Table 1 (heads of R&D, R&D project leaders, members of executive board, and others).

5. Alliance management capability is understood as a holistic concept with highly correlated, reinforcing dimensions. The reflective second-order construct captures the complementarities among the five first-order dimensions by accounting for their interactions and covariations. For further details about reflective and formative second-order constructs, see Jarvis, MacKenzie, and Podsakoff (2003).

6. Since we did not expect R&D managers (who make up 74% of our informants) to be well informed about other types of collaborative agreements, we restricted our experience measure to R&D alliances in order to ensure a valid measurement.

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