UNVEILING THE TEMPORALLY CONTINGENT ROLE OF CODIFICATION IN ALLIANCE SUCCESS

KOEN H. HEIMERIKS
TIAS, Tilburg University
Warandelaan 2
NL-5037AB, Tilburg
Tel: +31 (13) 466-8660
Email: KHeimeriks@tiasnimbas.edu

CHRISTOPHER B. BINGHAM
Kenan-Flagler Business School
The University of North Carolina at Chapel Hill
4200 Suite, McColl Building
Chapel Hill, NC 27599
Tel: +1 (919) 923-8413
Email: cbingham@unc.edu

TOMI LAAMANEN
University of St. Gallen
Institute of Management
Dufourstrasse 40a
CH-9000 St. Gallen
Tel: +41(0)71 224-2360
Email: tomi.laamanen@unisg.ch

Keywords: Alliances, codification, capability, learning, knowledge.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/smj.02224

While prior research highlights the importance of codifying alliance experience to achieve alliance success, it is unclear whether codification is equally useful in the different phases of an alliance. Based on a sample of 192 technology firms that report on over 3,400 strategic alliances, we find that in the partner selection and termination phases, reliance on codified knowledge is useful. However, in the partner management phase reliance on codified knowledge is less beneficial and can be even negatively related to performance. Our findings have implications for the tension between flexibility and efficiency and the relationship between structure and performance.

Research suggests that a firm's alliance performance can improve through the use of codified knowledge captured in written documents, such as manuals and rule-books (Kale and Singh, 2007). Firms using codified policies and guidelines to shape alliance activity can avoid the loss of important insights (Zollo and Winter, 2002) and retain knowledge that allows them to replicate lessons learned from experience in subsequent deals. However, while codification may affect a firm's alliance performance (Harbison and Pekar, 1998), it is unclear when codification might be more or less beneficial for a firm since prior research does not separate the alliance process into its discrete phases (i.e., partner selection, management, and termination). Instead, it examines whether manuals and rule-books exist to help guide any aspect of the alliance process, irrespective of the alliance phase. To better understand the relationship between codification and alliance success, we examine the relative benefits of knowledge codification in the three key phases of the alliance process: (1) partner selection (Luo, 1997; Hitt, Dacin, Levitas, Arregle, and Borza, 2000; Shah and Swaminathan, 2008), (2) partner management (Geringer and Hebert, 1989; Barkema, Bell, and Pennings, 1996), and (3) partner termination (Pangarkar, 2009).

Based on a sample of 192 technology firms that participated in over 3,400 strategic alliances, we find that in both the partner selection and termination phases, reliance on codified knowledge improves alliance success. Intriguingly, however, we find that in the partner management phase

reliance on codified knowledge is not only less helpful – it is even negatively related to performance. Besides calling for more research on how firms can better convey the lessons learned from focal alliances to their subsequent alliances, we shed new light on the tension between flexibility and efficiency and the broader relationship between structure and performance in key strategic growth processes.

PHASES OF THE ALLIANCE PROCESS

Alliances often have three key phases: (1) partner selection, (2) partner management and (3) partner termination (Kale, Dyer, and Singh, 2002). Each phase has important distinguishing features that influence the relative importance of knowledge codification.

Partner Selection Phase

The first phase of the alliance process is partner selection. In this phase, firms typically use different partner screening tools (e.g., documents to help assess required capabilities, management style, commitment and cooperativeness) to generate partner shortlists and do candidate research (Dyer, Kale, and Singh, 2001). Although prior research has not examined the performance implications of codification in the partner selection phase, several benefits may accrue to firms relying on codified knowledge to guide partner selection. First, relying on codified guidelines for partner selection can lead to improved alliance performance by helping focus the attention of firm members on the most critical issues, based on past experience (Ocasio, 1997). For example, drawing on their accumulated history with alliances Yahoo executives relied on a few guidelines to help select partners in its early years. Some included (1) Select partners that do not jeopardize the user's experience; (2) Do not do any exclusive partnership deals; and (3) Ensure that the product from the partnership is free (Rindova and Kotha, 2001). Codified guidelines for partner selection can therefore act as selection heuristics (e.g. Gigerenzer, 2008; Gigerenzer and Gaissmaier, 2011; Bingham and Eisenhardt, 2011) or simple rules for picking opportunities (Bingham, Eisenhardt, and Furr, 2007).

Second, the use of codified guidelines for partner selection can reduce errors. For example, Thomas and Trevino (1993) examined the information processing requirements associated with partner selection and found that the way management chose to process information played a major

role in alliance performance by reducing behavioral biases. Codified guidelines for partner selection reduce the likelihood of overlooking hidden liabilities, miscalculating outcomes, or overestimating potential advantages of cooperating. By codifying how to select partners, firms reduce the likelihood of allying with unfit partners. Plus, as leaders collectively share the problems they had in partner selection and how they dealt with them, they are able to develop solutions that better address what needs to be done in the future so as to avoid the reoccurrence of those same problems (Zollo, Reuer and Singh, 2002).

Without codified guidelines for partner selection, firms may chase too many or too diverse alliance opportunities. This may not only diffuse energy and efficiency, but also lower alliance performance as a consequence of sub-additive alliances (Vassolo, Anand and Folta, 2004). It may also cause a lack of clarity about which alliances to pursue. Hence, the lack of codified guidelines for partner selection can reduce efficiency, promote confusion, and decrease alliance performance.

Partner Management Phase

The partner management phase begins after partner selection and involves working directly with the partner to achieve mutually desirable outcomes. In the partner management phase, firms typically use an implementation plan (including definition of tasks, roles, and milestones) to realize the goals set (Kale *et al*., 2002). Prior research suggests that use of codified guidelines for partner management can help clarify responsibilities for the different actors, give guidelines for interface management, and provide an outline for the overall execution of the alliance (e.g. Kale, Singh, and Perlmutter, 2000). However, when compared to the codified guidelines used in the partner selection phase, the codified guidelines used in the management phase are likely to be less helpful. This is because the partner management phase exhibits higher complexity and lower controllability relative to the partner selection phase (Doz, 1996; Reuer and Arino, 2002; Reuer, Zollo, and Singh, 2002).

Unforeseen coordination difficulties, communication hurdles, resource spillovers and information asymmetries may potentially threaten anticipated objectives (e.g., Dhanaraj, Lyles, Steensma, Tihanyi, 2004; Dussauge and Garrette, 1995). For example, set up in 2010 to make headway in the Asian low-cost car segment, the Volkswagen-Suzuki alliance was recently halted as

both parties experienced unanticipated trouble understanding each other. An executive that we interviewed in the pre-study stage commented, *'After the use of the partner selection protocols, so following the signing of the contract, you don't really know what you're up against. With the various tools we have it's possible to get a rough picture of the partner, but it's not before you start really working with them that you find out what the actual cultural and managerial challenges are.'* The use of codified tools for managing partners can hence reduce needed flexibility and prevent firms from exploring alternative actions that might allow for greater performance (Kogut and Zander, 1992). This is important as higher performing alliances often leave room for managers to make real-time adjustments in response to actual events (Lin, Yang and Demirkan, 2007; Lavie and Rosenkopf, 2006). Codification in the partner management phase may therefore provide fewer benefits as each partner is fundamentally distinct in its objectives, resource set, and prior history.

Moreover, due to the relative unpredictability and lower controllability of the partner management phase, the use of codified practices to manage partners can lead to overgeneralization of knowledge (Heimeriks, 2010; Zollo, 2009). With codified guidelines, there is an increased likelihood of "misplaced specialization" that induces repetition under dissimilar circumstances (March, 1981; Meyer and Shi, 1995). This can reduce the likelihood that professionals will challenge assumptions of codified practices for partner management and so fail to deliberately vary practices to handle agency or cultural issues that are partner specific (Park and Ungson, 2001). As another alliance executive we interviewed observed, *'When it comes to implementing the deal, the playing field in each deal is always different.*

In summary, codified knowledge may be less beneficial for the partner management phase relative to the partner selection phase since there is lower predictability and controllability and higher complexity in the management phase than in the selection phase. Even though research finds that reliance on codified knowledge is generally beneficial for alliances (Kale and Singh, 2007), we expect the benefits of codification to be harder to achieve in this phase than in the partner selection phase.

Partner Termination Phase

The partner termination phase is the last of the three alliance phases. In the termination phase,

firms typically use checklists to track and evaluate alliance success, which include roadmaps, score-card analysis, and termination templates (Dyer *et al*., 2001; Horn, Lovallo, and Vigueri, 2006). Similar to our argument in the partner selection phase, we contend that the use of codified guidelines in the partner termination phase is likely to result in more positive alliance outcomes than in the partner management phase. This is due to the higher predictability and controllability in the partner termination phase relative to the less predictable, less controllable partner management phase. First, since terminating an alliance can impose significant costs (Reuer and Zollo, 2005), codification is important as it helps firms to speed up decision-making in this phase. As alternative courses of action are given, i.e., dissolution, redefinition, or acquire (Das and Teng, 2000), firms that codify the decision criteria for each alternative benefit from greater efficiency. Indeed, such termination checklists have proven fruitful for companies like Hewlett-Packard and Lotus (Dyer *et al*., 2001).

Second, while termination is likely to be induced by factors in preceding alliance phases, reliance on codified tools for partner termination enables firms to more closely monitor the evolving conditions within which the alliance operates. For instance, prior work shows that industry volatility (Kogut, 1989) as well as deals between competitors (Park and Russo, 1996) increases chances of dissolution. Tracking progress through termination checklists thus enables the firm to succinctly map and decide on the appropriate time to end an alliance relationship.

Third, the partner termination phase involves greater predictability than the partner management phase. While some alliances will end unexpectedly in unilateral withdrawal, many others will end expectedly when common strategic objectives are met such as learning (Hamel, 1991), adaptation (Koza and Lewin, 1998) or opportunity exploitation (Kogut, 1991). The achievement of these objectives is relatively clear since alliances are often used for a specific value chain activity (Harrigan, 1985). Still other alliances can be predicted to end with the natural expiration of the collaborative agreement or when partners□ capabilities converge (Nakamura, Shaver, and Yeung, 1996). For example, Glover and Wasserman (1992) suggest that a joint venture could be dissolved if the termination date was reached or if the other party defaulted. In short, codified tools and methodologies guide alliance longevity and so enhance alliance performance by helping leaders avoid staying with particular partners past their prime (Horn *et al*., 2006).

Overall, we argue that when engaging in alliances, the benefits of codification are contingent on the controllability of the phase of the alliance. As activities associated with phases of an alliance process become less complex and more predictable, such as those related to partner selection or partner termination, codification becomes helpful and benefits exist from executing standardized action steps. In contrast, the benefits from codification are likely to be relatively lower in the partner management phase as it is characterized by higher complexity and lower controllability. Together, these arguments lead to our main hypothesis:

Hypothesis: The benefits of knowledge codification are higher in the partner selection and termination phases than in the partner management phase.

RESEARCH DESIGN AND METHODOLOGY

Sample

To uncover when codification is conducive to alliance success, we performed a multi-method study. First, we engaged in a series of in-depth interviews. The insights yielded during these interviews helped in the design of the detailed survey instrument sent out to a large number of alliance-active firms.

Expert interviews. A number of firms were contacted and invited to participate in a series of interviews and conversations over an extended period of time. We first selected executives in functions such as Vice-President of Alliances, Vice-President of Strategy, Director of Alliances, or Alliance Manager at world-renowned firms on basis of their established reputation, experience and knowledge of the field of alliance management. The interaction with executives from alliance departments in various firms, including Bayer, Cisco, DSM, GlaxoSmithKline, KLM-Air France, Philips Electronics, Microsoft, Oracle, SAP, Shell, and Unilever provided insights into the role that codification plays in developing a successful alliance portfolio. All executives interviewed had been directly involved in developing or deploying the firm's alliances. In total, 46 interviews were conducted and, for almost all firms involved, we interviewed at least two executives.

Survey. In order to test the insight emerging from the interviews, we sent out a survey on alliance capabilities to 650 alliance managers and Vice-Presidents who were responsible for managing and overseeing firms' alliance portfolios. Despite the fact we cannot test for causality due to the cross-

sectional nature of the survey data, our design enabled us to examine the effect of codification on the different phases of the alliance process. The primary data sources were the database of the Association of Strategic Alliance Professionals and the Dutch Internet Society. We surveyed Vice-Presidents of alliances and Alliance Directors or – in absence of this function – to top managers in charge of alliance management.

We received responses from 192 firms. This resulted in a response rate of 29.5 percent (Snow and Thomas, 1994), a rate comparable to prior studies on alliances (e.g. Kale *et al.,* 2002; Reuer, Park, and Zollo*,* 2002; Zollo *et al.,* 2002). The 192 firms reported on an estimated total of 3,477 strategic alliances. The average alliance portfolio of the respondents contained 18 alliances managed over the pre and post-bubble period of 1997–2001.

Of the respondents, 82 percent were active in information and communication technology (ICT) and service sectors. Firm size (yearly sales revenue) also showed divergence. The largest proportion of respondents, namely 35 percent, was in the category of $1 billion to $50 billion annual sales. The rest were grouped as follows: below $1m (24%), $1–100m (23%), $100m–$1b (13%), > $50b (4%), and missing data (1%). Most respondents were from European companies (61%), whereas the remaining respondents were North American (33%) and the rest of the world (6%). The sample diversity should not hamper the validity of the results, as codification should influence alliance performance regardless of the specific firm or alliance (Day, 1995).

We tested for non-response differences by comparing early and late response categories. Chi-square tests for three key measures (χ^2 of 2.386, $p>.05$ for number of employees; χ^2 of 1.947, $p>.05$ for sales revenues; and χ^2 of 3.133, $p>.05$ for alliance performance) suggested the absence of non-response bias (Armstrong and Overton, 1977).

Alliance portfolio as level of analysis

Consistent with prior work (e.g., Reuer and Ragozzino, 2006; Heimeriks and Duysters, 2007; Lavie, 2007), we focus on alliance portfolios as our level of analysis. This level helps us acknowledge existing interdependencies between the various alliances a firm may be managing (Gulati and Sytch, 2006). As the effects of codification are unlikely to remain limited to individual alliances, the alliance

portfolio level of analysis enables us to measure codification effects on all of the firm's alliances and is a viable level of analysis observed to shape alliance portfolio outcomes (Kale *et al.,* 2002).

Dependent variable

Our dependent variable in this study is *Strategic alliance portfolio performance.* We define strategic alliance portfolio performance as the percentage of alliances in which the firm's goals were realized. We measure this dependent variable at an ordinal level and the item is based on a 5-point scale (0–20%, 21–40%, … 81–100%). Respondents responsible for the firm's alliance portfolio answered the question "What is your company's overall success rate (i.e., percentage of strategic alliances where goals were realized) over the past five years?" Their assessment represents the overall satisfaction with alliance portfolio performance and the extent to which objectives were met. We chose this dependent variable measure for several reasons. First, given the emerging consensus on managerial assessments being a useful approach to evaluating strategic process outcomes (Kale *et al*., 2002), we use a subjective measure to assess portfolio outcomes (e.g., Heimeriks and Duysters, 2007; Kale and Singh, 2007; Zollo *et al*., 2002). Second, given our purpose to assess the temporally contingent effects of codification on broader portfolios rather than single events, we defined our outcome measure so as optimize the fit between process and performance measures (Miller, Washburn, and Glick, 2013). Possible alternatives, such as, cumulative abnormal stock return data correlate marginally with actual outcomes of strategic processes like alliances or acquisitions (Zollo and Meier, 2008). Therefore, we use a measure which directly relates the collective outcome of the firm's alliance activities to the underlying codified processes (Ray, Barney, and Muhanna, 2004). Overall, our measure seems appropriate as subjective and objective alliance performance measures tend to correlate highly (Geringer and Hebert, 1991).

Explanatory variables

Consistent with others (Kale and Singh, 2007; Zollo and Singh, 2004; Heimeriks, Schijven and Gates, 2012), we measure all codification variables as binary variables. Respondents were asked "Which of the following tools are used to support alliance management?" First, *codified guidelines for partner selection* measured whether the firm had and used defined steps, decision criteria and

checklists for partner selection (e.g., partner screening and fit analysis). Second, *codified guidelines for partner management*, measured whether the firm had and used codified guidelines to manage partners (e.g., use implementation plan to manage partner characteristics and realize goals set). Third, *codified guidelines for partner termination* measured whether the firm had and used codified metrics for partner termination (e.g., roadmaps, score-card analysis, and termination templates). For all explanatory variables, respondents indicated whether codified guidelines were available and used in the 5-year period reported on. While purposefully not collapsing all independent variables into one measure, we follow Zollo and Singh (2004) by defining single-item measures for specific phases of the alliance process (see also Bergkvist and Rossiter, 2007).

Control variables

Our models include various controls. We measure *strategic alliance experience* as the number of strategic alliances formed by the firm over the period 1997–2001 using a categorical variable (0–5, 6–15, 16–25, 25–40, >40). We measure *alliance department* as whether or not the firm had a dedicated alliance function or department (Kale *et al.,* 2002) and *alliance training* as whether the firm articulated specific knowledge through formal alliance training or not (Kale and Singh, 2007). We measure a*lliance value* as the importance of strategic alliances for the respondent firm (Reuer and Ariño, 2007) through the percentage of the respondent firm's market value (share price multiplied by the number of shares) coming from strategic alliances at the time of the survey. We measure *firm size* as as the log of the firm's annual sales revenues generated in 2000 (in US$). We measure *top management involvement* as whether the firm's alliance strategy was formed top-down (0 if organized bottom-up; 1 if top-down). We added dummy variables for *ICT industry* and *service industry* since certain high-technology industries such as the information and communication technology (ICT) industry are more actively engaged in alliances (Hagedoorn, 2002). Finally, *we measure nationality of headquarters* through a dummy capturing whether the respondent firm was headquartered in Europe (0) or in North America (1).

Econometric modeling and estimation technique

Given that our independent variables are categorical, we use ordinal logistic regression to test

our hypotheses (Long, 1997; Wooldridge, 2002). While our sample consists of 192 firms, our analyses are based on 156 due to missing observations for some of the key variables included. We also tested the robustness and validity of our models in several ways. First, we tested for multicollinearity by calculating the variance inflation factors (VIF) (see Kleinbaum, Kupper, Muller, and Nizam, 1998). Using an informal test with OLS regression, inflation was not an issue as for all variables VIF<10. Moreover, the stability of the coefficients over the various models suggests that multicollinearity is not an issue in the sample used. Second, we tested for overfitting, which may occur due to idiosyncrasies of a dataset, and selected a random subsample of 96 firms. Comparison of parameter estimates of the sub-sample to the holdout sample showed no difference in goodness-of-fit and pseudo *F*-value. Third, using alternative techniques, such as OLS regression and multinomial logit, yielded comparable outcomes. Overall, we believe that our models provide robust and valid results (see Appendix for detail on our many robustness tests).

RESULTS

Table 1 provides the descriptive statistics and correlations for all variables used. Table 2 shows the results of the regression analyses we used to test our hypotheses.

**** Insert Tables 1 and 2 about here ****

Model I shows the baseline model with only the effects of the control variables. Subsequently, we added the independent variables (Model II–IV). In the baseline model, only alliance value ($p<.001$) is a significant control variable. This suggests that firms whose market value generation hinges on alliances are more likely to succeed in their alliances. Interestingly, neither alliance experience nor an alliance department significantly influences strategic alliance portfolio performance. To test our hypothesis, we added variables corresponding to codification in each of the three alliance phases to Model II–IV. Our results provide support for our hypothesis that knowledge codification is more helpful in the partner selection and partner termination phases than in the partner management phase. Model II shows a positive relationship between the firm's rate of alliance success and the use of codified knowledge for partner selection ($p<.05$). Model III confirms further that knowledge codification is less useful in the partner management phase than in the partner selection

phase. To our surprise, the effect is not only less positive, but it is even negative. Finally, Model IV shows that codified guidelines for partner termination are again positively related to alliance performance. Models II, III, and IV are all significant. Also, upon adding the three key independent variables, the Nagelkerke R^2 increases for each of the models, confirming increasing explanatory power of our models. Due to the design of our study, these results represent associations rather than causalities. While our survey findings were in line with insights drawn from the fieldwork, it is possible that the relationship between codification and alliance success is also impacted by other factors. Overall, our results demonstrate strong support for our hypothesis underlining the contingent benefits of codification. Thus, while codification may be beneficial for alliance portfolio success, the effects are likely to be driven by the front (partner selection) and final (partner termination) phases.

DISCUSSION

Prior empirical work shows that firms benefit from codification in the context of alliances (Kale and Singh, 2007). Our empirical study adds to the literature by showing that such codification may be beneficial or detrimental depending on the alliance phase. We theorize about the temporally contingent benefits of codification in three critical phases of the alliance process: partner selection, partner management, and partner termination. Our core contribution is to demonstrate the different effect of codification across the different phases of the alliance process. Although beneficial in the selection and termination phases, codification appears detrimental in the management phase. Hence, by showcasing the benefits and detriments of codification during the lifecycle of an alliance, our study helps pinpoint the alliance phases where those effects are likely to occur. While the quality and differential availability of codified guidelines for the different alliance phases could also affect the observed results, our study points to a richer conception of codification and its relationship to alliance performance that extends beyond simply assessing whether codified documents exist. Instead, our study adds by suggesting a novel view where the temporal unfolding of the alliance process should start with more constraint (partner selection), move to less constraint (partner management), and then cycle back to more constraint once more (partner termination). Future research using qualitative or longitudinal data to explore the emergence and effectiveness of codification across the different alliance phases can extend these insights.

At a higher level, we contribute to an improved understanding of microfoundational processes firms can use to balance the fundamental tension between efficiency and flexibility (Eisenhardt, Furr, and Bingham, 2010; Felin, Foss, Heimeriks, and Madsen, 2012). Our study suggests that *phasing the use of codification* helps firms balance the competing tensions of efficiency and flexibility in key strategic processes such as alliances. Relying on codification for partner selection and partner termination increases efficiency and coherence by sharpening focus on attributes, milestones and evaluative criteria that largely remain stable over time. In contrast, eschewing use of codification in partner management enables flexibility to adjust to particular partner circumstances that generally vary over time. It allows for improvised action thereby enabling individuals to take greater advantage of unexpected events "on the fly" (Miner, Bassoff and Moorman, 2001; Furr, Cavaretta, and Garg, 2012). We thus sketch a boundary condition for codification. Concurrently, we emphasize a key implication: managers must learn to be effective at both coercing compliance and encouraging autonomy since they are threatened by internal breakdown (mistakes resulting from too little or too much flexibility or efficiency) and not just external competition (Davis, Eisenhardt, and Bingham, 2009).

We also contribute by adding insight into the relationship between structure and performance. Formalization, the degree to which firms rely on written guidelines, has long been one of the most extensively researched dimensions of organizational structure (Pugh and Hickson, 1976; Adler and Borys, 1999). In general, the strategy literature often relates moderate structure with high performance. Firms with too much structure cannot adapt and so under-perform because action is overly constrained. Yet firms with too little structure lack coherence in opportunity capture and so under-perform because action is under constrained. Moderate structure balances between the competing demands and so increases the probability of achieving higher performance (Brown and Eisenhardt 1997; Katila and Ahuja 2002; Rothaermel and Deeds, 2006; Siggelkow 2001).

Yet our findings suggest a different view where more *and* less structure is best. An important insight is the fundamental value of more structure for partner selection and termination but less structure for partner implementation. As the inputs and outputs associated with phases of an organizational process become more controllable and less complex, more structure becomes useful as

there are benefits from executing codified action steps. This is consistent with research indicating that in more predictable situations more structure is better since it allows firms to take advantage of consistent patterns in their situation that can be mirrored in structure (Davis *et al*, 2009). But when inputs and outputs associated with phases of an organizational process become less controllable and more complex, such as occurs with partner management, structure is less imperative. An implication of our study is the need for executives to vigilantly manage both the amount and timing of structure, and not just its content. Although the management and configuration of alliance portfolios have emerged as distinct research domains within the alliance literature (Wassmer, 2010), future research could examine whether more and less structure across alliance phases affects alliance portfolio configuration. Overall, we suggest that rather than maximize performance through single solutions that reflect a moderate amount of structure, high performing firms may require multiple solutions that support both more and less structure. This insight is important as it might help solve a central paradox in the field of strategy related to alliances: firms continue to invest in strategic alliances despite the fact that most fail to achieve their objectives.

ACKNOWLEDGEMENTS

We are grateful to Will Mitchell and two anonymous referees for their excellent guidance and feedback. We are indebted to Jeff Dyer, Kathy Eisenhardt, John Haleblian, Pursey Heugens, Carlo Salvato, and Mario Schijven. Stéphanie Basters and Janis Bargsten provided excellent research assistance.

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TABLE 1
Descriptive Statistics

	Mean[a]	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alliance portfolio performance (1)	3.2216	1.3057	1												
Codified guidelines for partner selection (2)	0.5260	0.5006	0.166*	1											
Codified guidelines for partner management (3)	0.2500	0.4689	-0.009	0.195**	1										
Codified guidelines for partner termination (4)	0.4505	0.3779	0.222*	0.415*	0.333*	1									
Alliance experience (5)	2.681	0.8947	0.054	0.075	0.061	0.101	1								
Alliance training (6)	0.2604	0.4400	0.028	0.278**	0.241**	0.393*	-0.095	1							
Alliance department (7)	0.4583	0.4996	0.101	0.413**	0.291**	0.301*	0.142	0.359**	1						
Alliance value (8)	1.4167	1.1084	0.248**	-0.048	-0.050	-0.007	-0.108	0.002	0.032	1					
Log firm size[b] (9)	2.2740	1.3072	0.130	0.351**	0.174*	0.258**	-0.060	0.337**	0.474**	-0.075	1				
Top management involvement (10)	1.3646	0.5988	0.064	0.003	0.028	0.045	-0.115	0.005	0.086	0.054	0.016	1			
ICT sector (11)	0.4271	0.4956	0.050	0.145*	0.169*	0.099	-0.026	0.015	0.136	0.031	0.046	0.037	1		
Service sector (12)	0.6458	0.4795	0.098	-0.049	-0.070	-0.083	-0.030	-0.057	-0.149*	-0.095	-0.057	-0.040	-0.087	1	
Nationality of HQ (13)	0.3536	0.4794	0.002	0.242**	0.110	0.099	0.117	0.053	0.310**	0.153*	0.121	-0.058	-0.012	-0.139	1

*** p< . ***p<. 1 **p< . 1 *p< . two-tailed .

[a] Mean and standard deviation are uncentered

[b] Firm size = log annual sales revenues

TABLE 2
Results of Regression Analyses

	Model I	Model II	Model III	Model IV
Explanatory variables				
Codified guidelines for partner selection		0.798* (0.341)	0.891** (0.346)	0.688* (0.360)
Codified guidelines for partner management			-0.597* (0.362)	-0.704* (0.371)
Codified guidelines for partner termination				0.439* (0.233)
Control variables				
Alliance experience	0.109 (0.119)	0.096 (0.120)	0.101 (0.120)	0.069 (0.121)
Alliance training	-0.472 (0.350)	-0.634 (0.360)	-0.579 (0.362)	-0.772* (0.377)
Alliance department	0.451 (0.369)	0.354 (0.372)	0.481 (0.379)	0.420 (0.379)
Alliance value	0.709*** (0.167)	0.734*** (0.169)	0.748*** (0.169)	0.726*** (0.169)
Log firm size	0.527* (0.311)	0.335 (0.319)	0.305 (0.320)	0.361 (0.320)
Top management involvement	0.467 (0.298)	0.435 (0.299)	0.478 (0.301)	0.466 (0.301)
ICT sector	-0.267 (0.310)	-0.379 (0.314)	-0.348 (0.316)	-0.364 (0.316)
Service sector	0.411 (0.315)	0.407 (0.316)	0.388 (0.316)	0.404 (0.317)
Nationality of HQ	-0.230 (0.322)	-0.373 (0.328)	-0.382 (0.329)	-0.328 (0.330)
Nagelkerke R^2	0.168	0.197	0.213	0.233
-2 Log Likelihood	426.108	423.075	422.891	430.004
Chi-square	27.049***	32.280***	35.236***	38.874***
N	156	156	156	156

****p< . 1 ** p< . 1 * p< . † p<.1 . SE in parentheses.*

ONLINE APPENDI
Robustness Chec s and Ad Hoc Analyses

Various tests were used to assess the robustness of our results. First, we analyzed whether different combinations of codification of the three alliance phases had distinct performance effects. We found that firms that do not codify perform low (43.5%, N=43); firms that codify one or a combination of the partner selection and termination phases perform better (59.8%, N=64); firms that only codify partner management or a combination with either partner selection or termination perform lower (45.1%, N=20); firms that codify all three phases perform best (62%, N=31).

Second, having noted that the main effect of partner management codification was not significant when entered by itself, we ran various two-stage models to assess the role of alliance experience in explaining why firms that codify all three phases perform best. The results revealed that, when using a dummy for firms that codify all three alliance phases (versus all others) in the first stage, the dependent variable is significantly correlated with alliance experience (B=.307; $p<.05$) (other combinations of the results were insignificant). Regressing the full model on our alliance portfolio performance measure in the second stage, the results were consistent with the models reported. This suggests that firms that codify all three phases have greater alliance experience relative to firms that do not (i.e., codify two phases or less). The results of this ad-hoc analysis suggests that experience plays an important role in explaining why the highest performing firms are the ones codifying all three stages. Also, alliance experience seems to explain why codifying the alliance management phase has beneficial effects for firms that also codify the partner selection and termination phases. That is, firms appear to have learned over time how to appropriately codify partner management. Although these analyses are subject to the inherent limitations of our cross-sectional design, e.g., simultaneity bias, these results are line with prior work that reported correlations between codification and task experience (Zollo and Singh, 2004).

Third, we used the Mergers, Acquisitions and Alliances' database of the Securities Data Corporation (SDC) and verified all announcement dates reported in SDC in other databases such as *Business Wire* and *Factiva* as well as annual reports. Having matched the survey to *Thomson Financial* SDC using firm unique CUSIP codes, we were able to gather stock return data on 855 alliances formed by 18 firms in our dataset. Daily data on stock market returns over a 100-day period were used to estimate the market model. The estimates were then used to predict returns for each of the 18 firms over a 3-day period surrounding the event date. We then calculated the average abnormal returns for the alliances formed per firm. When comparing high-performing firms (those where 61-100% of alliances met firm goals) to average and low-performing firms (<60%) on basis of the portfolio performance measure, the first category showed substantially higher average stock returns on alliance announcements (0.57%) than the second category (-0.03%). We also used the data to compare the performance effects of the main independent variables to the average stock returns of alliance announcements. The results of these additional analyses confirmed our findings: average abnormal stock returns of alliances by firms that did not codify were lower than those that codified the partner selection and termination phases. Average stock returns were highest for firms that used codified guidelines for all three phases. Similar to Kale, Dyer, and Singh (2002: 761), this additional analysis suggests our findings to be robust across different units of analyses.

Fourth, given that firms may be endogenously motivated to codify lessons learned, we sought to ascertain the absence of self-selection bias in different ways (Hamilton and Nickerson, 2003). In the survey design, we used different scale formats for dependent and independent variables, thereby separating our measures methodologically. The items were sequenced so as to ensure the measures were psychologically separated (Podsakoff, MacKenzie, Lee, and Podsakoff, 2003). All key independent variables were measured using objectives scales. To rule out any form

of single respondent variance or mono-method bias, a Harman one-factor test was performed and this demonstrated that the variables did not load on a single factor (Podsakoff *et al.,* 2003). Moreover, we used the three codification measures (i.e., partner selection, management, and termination) separately and in combination for the first stage model. The results of the first stage showed that codification of single phases was not significantly correlated to alliance experience. While the results for firms that codify two of three phases also showed insignificant results, significant results were found for codification of three phases. The Heckman correction factors, or inverse Mills ratios, for both separate and combinations of codified phases were insignificant in the second stage models. Also, the results of these models were virtually identical to those reported in the full model. Similar tests with alliance training and alliance department also yielded insignificant correction factors. As the Heckman correction factor captures unexplained variance inherent in the decision to codify, the absence of significant correction factors suggests there are no missing endogenous variables which explain performance differences among firms in the second stage model (Heckman, 1979).

We also conducted three additional analyses to assess whether our findings are affected by overfitting. We first re-ran the models excluding those observations for which the score on alliance portfolio performance equaled five (the maximum on the five-point Likert scale). This decreased our sample size to 126 and yielded highly similar findings, both in terms of effect sizes and their statistical significance. Subsequently, we re-ran the models excluding all control variables, thus decreasing the potential for overfitting. This led to qualitatively identical results as well. Finally, we re-estimated the models with each effect separately, also decreasing the number of parameters per model, and again the results were qualitatively identical to those reported.

Moreover, an unrotated principle components factor analysis was used to test whether a substantial amount of common method variance was present. Using the cut-off of eigenvalue above one, three factors emerged, none of which accounted for a majority of the covariance. We also ran an informal test to calculate the Cronbach's alpha of all the variables. This did not produce a single measure. We performed additional analyses to rule out systematic bias in our dependent variable caused by potential self-report bias. We verified whether respondents were biased in reporting portfolio performance by including dummies for case respondents who occupied a function as an alliance manager or another alliance-department-related function. However, neither of the two variables for respondent position, nor their interaction with alliance experience, proved to alter our findings. We tested for substitutional and supplemental interaction effects (e.g. Schwab, 2007), but did not find significant results for any of the learning effects for performance. Finally, we also tested whether any of the effects were moderated by the presence of an alliance department. However, neither of the models indicated there was any such effect.