SPILLOVERS ACROSS ORGANIZATIONAL ARCHITECTURES: THE ROLE OF PRIOR RESOURCE ALLOCATION AND COMMUNICATION IN POST-ACQUISITION COORDINATION OUTCOMES

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We integrate insights from organization design, economic game theory, and social psychology to examine the role of prior resource allocation and communication in alleviating behavioral uncertainty arising in interunit coordination settings. We use the context of post-acquisition coordination, focusing on the extent to which routines created under one organizational architecture (i.e., interorganizational alliances) may transfer to another organizational architecture (i.e., internal divisional structures via acquisition of alliance partners). Using a randomized experimental design, we find that prior resource allocation decisions in the absence of prior communication lowers post-acquisition performance due to the development and transference of pre-acquisition stage routines that may be inappropriate post-acquisition. Post-acquisition performance is aided, however, by the formation of noncompetitive routines in the pre-acquisition stage in the presence of communication. Copyright © 2012 John Wiley & Sons, Ltd.

INTRODUCTION

A central issue in organizational design is the development of optimal architectures that support the efforts of multiple actors in resource investment, knowledge sharing, and economic value creation. Organizations are faced with the general problem of coordinating tasks, in both intra- and interorganizational settings (Argyres, 1995;

Ghoshal and Bartlett, 1990; Puranam, Singh, and Chaudhuri, 2009). Tushman and Nadler (1978) note that interunit task interdependence increases the uncertainty managers face and, thus, increases information processing requirements. Information needed to support coordination among divisional managers can flow from resource allocation activities and direct communication (Galbraith, 1973; Noda and Bower, 1996). The information provided by these sources to a manager has two components—one that is objective and relates to the task requirements and incentives themselves and the other that is 'socialized' relating to trust and expectations regarding potential cooperative behavior by other managers (Gulati, 1995).

Against this background, the literature on classic organization design and congruence theory has examined how appropriate selection of internal structural elements may achieve higher coordination in the presence of task (and role) uncertainty (Burns and Stalker, 1961; Galbraith, 1973; Lawrence and Lorsch, 1967; Miller, 1986). This literature has extensively examined the role of task uncertainty (Burton and Obel, 2004; Donaldson, 1987, 1990; Lawrence and Lorsch, 1967) on organizational design choice and subsequent performance. Yet, the role of behavioral uncertainty, despite a long history (e.g., Barnard 1938; March and Simon, 1958; Simon, 1947) is not well understood. This is problematic as behavioral uncertainty stemming from lack of confidence that the other managers will make decisions that are congruent with their own cause the focal manager to have both coordination and appropriation concerns (Gulati and Singh, 1998), even if all managers have complete information on the task requirements. Specifically, we know little about the economic or social factors that enhance or mitigate behavioral uncertainty, particularly as organizational architectures evolve from one form to another.

Behavioral uncertainty is particularly salient in contexts where divisional managers have to interact with other managers in redefined structures. Routines created in prior organizational structures may be 'sticky' and transfer over to the new structural contexts (Gulati and Puranam, 2009). For example, when one firm acquires another, there are numerous challenges in achieving coordination of activities between the acquired and acquiring entities (Anand and Singh, 1997; Birkinshaw, Bresman, and Hakanson, 2000; Graebner, 2004; Karim and Mitchell, 2000; Puranam, Singh, and Zollo, 2006). Scholars have noted that a key source of heterogeneity in acquisitions relates to whether the acquired entity was a prior alliance partner (Benson and Ziedonis, 2010; Dyer, Kale, and Singh, 2004; Higgins and Rodriguez, 2006; Vassolo, Anand, and Folta, 2004; Zaheer, Hernandez, and Banerjee, 2010). Thus, post-acquisition settings provide a rich context within which we can examine the effects of behavioral uncertainty on coordination. If prior experience in an alliance setting permits divisional managers to have already developed trust, common understanding, and shared routines (Agarwal, Croson, and Mahoney, 2010; Gulati, 1995; Gulati and Nickerson, 2008; Sarkar, Aulakh, and Madhok, 2009; Zhao and

Anand, 2009), the reduction in behavioral or *partner-specific* uncertainty may result in greater value creation relative to outright acquisitions (Higgins and Rodriguez, 2006; Zaheer *et al.*, 2010). Anecdotally, this is exemplified by acquisitions undertaken by Cisco, where managers explicitly acknowledge the use of alliances to 'evaluate firms to determine if acquisitions will work' (Dyer *et al.*, 2004: 114), and Siemens, whose venture arm has stated that 'every investment is a potential acquisition' (Wieland, 2005: 1).

However, superior post-acquisition performance is not guaranteed when the acquisition is among prior alliance partners. For example, AOL's acquisition of prior alliance partner BEBO resulted in a subsequent divestiture at a loss of more than $1 billion (Helft, 2010). Consistent with this example, Benson and Ziedonis (2010) found that outright acquisitions may outperform acquisitions of alliance partners, and Zaheer *et al.* (2010) failed to find a positive main effect of acquisition of prior alliance partners relative to outright acquisitions. Therefore, it is important to understand how the information flow mechanisms highlighted in the organizational design literature, namely resource allocation decisions and direct communication (Galbraith, 1973; Noda and Bower, 1996), may address behavioral uncertainty and influence divisional managers' inferences regarding coordination and appropriation costs (Gulati and Singh, 1998).

We draw on a parallel literature stream based on both social psychology and economic game theoretic logic that has examined the role of behavioral uncertainty on successful coordination in interorganizational settings such as alliances (Khanna, Gulati, and Nohria, 1998, Gulati, Khanna, and Nohria, 2000; Agarwal *et al.*, 2010). Notably, these scholars have examined the role played by resource allocation and communication in providing managers with valuable information that shapes inferences regarding partner intent and impacts the success or failure of their cooperative endeavors.

Specifically, we examine two related research questions. First, how does the presence or absence of pre-acquisition resource allocation and communication in alliances impact post-acquisition performance? Second, do routines that are formed in the alliance stage impact post-acquisition performance? To do so, we identify the main and additive effects of information flows through *prior*

resource allocation and *prior communication*. Our use of experimental methods (Croson, Anand, and Agarwal, 2007; Agarwal *et al.*, 2010; Knez and Camerer, 1994; Song, Calantone, and Di Benedetto, 2002; Weber and Camerer, 2003) allows us to set aside the effects corresponding to non-random selection of alliances that are followed by acquisitions (as well as task uncertainty) and further isolate the effects of such mechanisms that often coexist in real-world settings through the creation of treatments that relate to each mechanism alone.

Our study finds that divisional managers make inferences about the likelihood that the other managers will cooperate based on whether positive or negative routines are formed during the interactions in alliance settings. Prior resource allocation alone makes it more likely that negative routines will be formed, but prior communication allows managers to create positive routines through more equitable sharing of the value created. Thus, our results underscore the importance of using 'rich' communication media among divisional managers (Lengel and Daft, 1984), not only for the resolution of task uncertainty, but also due to the beneficial effects on behavioral uncertainty.

Our study makes important contributions to the academic literature on organizational architectures and design and offers key managerial implications. We refine core concepts in organizational design and illuminate how post-acquisition organizational reconfiguration may interact with stickiness of routines established in prior organizational relationships to impact performance. By abstracting away from issues related to selection and endogeneity, we focus on the causal mechanisms that occur during the alliance to unpack some reasons for the contrary findings regarding value creation in acquisition of prior alliance partners relative to outright acquisitions. By highlighting issues of behavioral uncertainty and integrating perspectives from economic game theory with social psychology approaches, our research reveals the beneficial effects of informal mechanisms on managing the tensions between cooperation and competition that can arise in economic exchange. Of particular significance are intertemporal spillovers across organizational architectures; we show how antecedent interorganizational relationships have a dynamic and path dependent effect on the interactions within organizations and the ability

to manage ongoing tensions in an intraorganizational framework. From a managerial perspective, our results temper the conventional wisdom that pre-acquisition alliances always improve post-acquisition performance. Further, they highlight that alliances are not just opportunities for *selection,* but also for *creation* of potentially successful targets. Doing so requires managers to invest in 'rich' mediums of information exchange, such as direct communication and feedback (Daft and Lengel, 1986). Even though this may be expensive in terms of managerial time and attention (McCann and Galbraith, 1981), the returns may be worth it in the longer term when one takes into consideration the positive spillover effects across organizational architectures. Additionally, our study provides a cautionary note to those managers who seek to acquire partners in failing alliances to improve performance through the dissolution of firm boundaries—competitive and negative routines that are created in unsuccessful alliance experiences are also likely to hamper value creation post-acquisition.

THEORY

Theoretical backdrop

At the core, organization design grapples with two complementary problems: (1) how to best partition tasks across organizational players; and (2) how to reconnect these organizational elements to best realize the organization's strategic goals (Burton, DeSanctis, and Obel, 2006; Lawrence and Lorsch, 1967). In the context of the latter problem, organizational architectures have to enable effective gathering and processing of information to reduce uncertainty—due to an incomplete description of the world (Arrow, 1974) and ambiguity—arising from 'the existence of multiple and conflicting interpretations about an organizational situation' (Daft and Lengel, 1986: 556) Interunit task interdependence increases uncertainty facing divisional managers and, thus, increases information processing requirements (Tushman and Nadler, 1978).

Only by processing information can organizational decision makers observe the situation, analyze existing problems, make efficient choices about alternative actions, and convey these choices to others (Burton *et al.*, 2006). The information mechanisms are varied and range from routines

and codified information through direct communication (Burns and Stalker, 1961; Daft and Lengel, 1986; Galbraith 1973, 1977; Miller and Friesen, 1982). Further, there are two components to the requisite information—one that is objective and relates to the task requirements and the other that is 'socialized,' relating to trust and expectations regarding potential cooperative behavior by other managers (Gulati, 1995). The former involves the investment of effort and/or exchange of goods and services according to the agreed upon and specified rules and rewards (Macneil, 1978). The latter, conversely, is relationally based to address potentially conflicting interpretations or incentives across multiple actors and is associated with social processes that can generate norms of flexibility, solidarity, and information exchange (Macneil, 1980; Heide and John, 1992; Zaheer and Venkatraman, 1995) to help establish 'common ground' (Clark, 1996). Such common ground allows interacting parties to synchronize and adjust their actions to each other (Becker and Murphy, 1994; Schelling, 1960). Of course, both components are intertwined in reality and successful coordination occurs when the information mechanisms provide managers both the knowledge of the task requirements and the assurance that other managers will undertake their assigned actions.

While the former component of task uncertainty has been widely studied in the organization design literature (Burns and Stalker, 1961; Burton and Obel, 2004; Donaldson, 1987, 1990; Galbraith, 1973; Lawrence and Lorsch, 1967; Miller, 1986), relatively less attention has been paid to how managers approach the resolution of behavioral uncertainty (Grote, 2009; Leifer and Mills, 1996; Tushman and Nadler, 1978).[1] This is problematic because even if all managers have full information on what is required for successful completion of the task, uncertainty regarding whether other managers will behave to achieve the necessary

coordination along with value appropriation concerns (Gulati and Singh, 1998) may cause them to act in a manner contrary to achieving success.

In this context, it may be worthwhile to integrate insights from parallel literature in economic game theory and social psychology related to intra- and interorganizational coordination (Agarwal *et al*., 2010; Khanna *et al*., 1998; Zeng and Chen, 2003).[2] As Nadler and Tushman (1997: 14) note, 'the goal of organization design is to fashion a set of formal structures and processes that, together with an appropriate informal operating environment, will give people the skills, direction, and motivation to do the work necessary to achieve the strategic objectives.' Using economic game theoretic and social psychology logic, the critical organizational design issue can be thought of as configuring both structural and motivational solutions to the coordination problem within a 'social dilemma' or assurance game setting. As such, the coordination challenge is to assure the other partner of one's own cooperation so that they are more likely to cooperate themselves, thus enhancing the likelihood the partners will jointly invest in activities that create more value than each can create alone (Agarwal *et al*., 2010; Gulati *et al*. 1994).

Consider a hypothetical assurance game setting where two division managers in a firm have to coordinate for joint value creation. We illustrate the assurance game in Table 1, which provides information on the 'structural' or economic incentives for potential coordination in the form of 'payoffs' to each manager based on alternative outcomes. To create value, each manager needs to allocate resources to the joint activity. The opportunity cost

Table 1.   Assurance game

		Manager 2	
		Cooperate	Do not cooperate
Manager 1	Cooperate	**(10000, 10000)**	(3200, 6800)
	Do not cooperate	(6800, 3200)	**(8000, 8000)**

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[1] The potential importance of behavioral uncertainty is alluded to in the organization design literature, even though it has not been a subject of significant scholarly attention. For example, Tushman and Nadler (1978) highlight interunit task interdependence as a key source of work-related uncertainty with structural implications. They acknowledge the potential for diverse interests and miscommunications between units, but focus mainly on task-based joint problem solving issues. Similarly, Leifer and Mills (1996: 116) draw attention to the interpretation challenges given the numerous meanings that can be attributed to the information provided by various organizational players who approach problems with 'different experiences, cognitive perspectives, goals, values, and priorities.'

[2] For a discussion on why assurance games (with multiple Nash equilibria and no dominant strategy) are more representative of inter- and intraorganizational cooperation than prisoner's dilemma games (typically characterized by a single Nash equilibrium given symmetric dominant strategies), please refer to Gulati *et al*. (1994) and Agarwal *et al*. (2010).

of contributing to the joint activity is the foregone ability to invest in division-specific activities whose payoffs are not dependent on the other division's cooperation. The rewards of the investments are contingent on whether the other division manager also contributes the requisite resources to the joint activity. The assurance game, thus, represents what Thompson (1967) would classify as reciprocal task interdependence. Given the payoff matrix in Table 1, the optimal decision for each manager is dependent on the other manager's decision (Agarwal *et al.*, 2010; Harsanyi and Selten, 1988).

There are two potential Nash equilibria in this game. The first equilibrium outcome—payoff dominant/cooperative—occurs when both managers invest resources in the joint activity to align actual and potential value creation and earn $10,000 each as payoffs. This equilibrium is called payoff dominant because it maximizes individual and collective payoff. Since each manager expects the other to cooperate, cooperation is the best strategy. This outcome is a Nash equilibrium since no manager is better off deviating from their strategy, given the other manager's strategy. The second equilibrium outcome—risk dominant/noncooperative—occurs when neither manager invests in the joint activity, resulting in each earning a payoff of $8,000. This equilibrium is called risk dominant because it minimizes the exposure of the managers to the risk that the other may not contribute; however, each manager earns less than they would in the payoff-dominant equilibria. The risk-dominant outcome is also a Nash equilibrium: not cooperating is the best strategy under the expectation that the other manager will not cooperate, and there is no incentive for either manager to deviate from their strategy given the other's strategy.

We note that this task interdependency problem has no task-related uncertainty, in the sense that the outcomes are completely determined contingent on each manager's actions. Yet, there is behavioral uncertainty stemming from the fact that each manager is unsure of whether the other manager will act cooperatively. While economic incentive alignment predisposes toward greater value creation through joint activity, the lack of a dominant strategy and unique equilibrium implies that higher potential payoffs from the joint activity may not be sufficient for ensuring actual value creation (Agarwal *et al.*, 2010; Zeng and Chen, 2003). The

information conveyed via structural interaction elements (i.e., resource allocation) alone may be inadequate to catalyze cooperation, as it arrives absent supporting explanatory data (Daft and Lengel, 1986). In such circumstances, motivational solutions that facilitate coordination (such as communication, articulation of common goals, and development of shared trust) may enhance actual value creation. These 'richer' modes of interaction can aid interpretation and subsequently increase understanding of, and congruence in, partner actions (Russ, Daft, and Lengel, 1990). Consistent with this argument, Agarwal *et al.* (2010) found that enabling communication among alliance partners doubled the probability of achieving successful outcomes relative to economic incentive alignment alone.

Though the assurance game settings have been used largely to examine interorganizational coordination (Agarwal *et al.*, 2010; Gulati *et al.*, 1994; Zeng and Chen, 2003), they are equally applicable to intraorganizational coordination settings. Thus, against this theoretical backdrop, we begin our formal theorizing regarding coordination outcomes that occur after a merger or an acquisition, which is the specific phenomenon through which we highlight the role of information mechanisms in addressing behavioral uncertainty.

Post-acquisition performance

Post-acquisition performance is determined by many factors: the underlying reasons for the acquisition, firms' capabilities and their synergies, the price paid for the target firm, and the post-acquisition coordination of the firms (Haspeslagh and Jemison, 1991). In this study, we focus on post-acquisition coordination for two important reasons.[3] First, surveys of Fortune 500 CEOs

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[3] Given variation in acquirers' value creation models, there can be significant variance in the extent and nature of the post-acquisition coordination desired. As Haspeslagh and Jemison (1991), Puranam *et al.* (2006), and Puranam *et al.* (2009) have argued, under certain conditions, too much coordination can be unnecessary and even harmful. However, there needs to be at least some degree of interdependence established among the acquired and existing organizational subunits. At a minimum, such interdependence can come from participating in an internal capital market, though often there is also an internal labor market or other forms of resource exchanges even under 'holding' or 'preservation' models (Haspeslagh and Jemison, 1991). The simple act of bringing a transaction internal to an existing firm has ramifications for both incentives and administrative controls.

find that missteps in post-acquisition coordination consistently rank among the top reasons for merger failure (Schmidt, 1999). This has been corroborated by extant academic research (Haspeslagh and Jemison, 1991; Marks and Mirvis, 1998; Nahavandi and Malekzadeh, 1988; Lubatkin *et al.*, 1998; Puranam *et al.*, 2006; Schweiger and Goulet, 2000; Ranft and Lord, 2002; Weber and Camerer, 2003). Second, the degree of organizational design changes required when two firms merge depends, in part, on the preexisting organizational relationships between the firms.[4]

We highlight the nature of pre-acquisition interactions between the target and the acquiring firm and explore the effects of these interactions on post-acquisition performance. We investigate how both pre-existing resource allocation decisions and the ability to communicate provide information that shapes the routines developed and the consequences of such routines on post-acquisition performance.

Pre-acquisition organizational architectures

The prior relationships between targets and acquiring firms vary greatly. At one extreme, an acquisition may occur in the absence of any prior relationships. For example, in seeking strategic renewal, an organization may enter a new product or service area by acquiring a previously unassociated firm (Agarwal and Helfat, 2009; Anand and Singh, 1997; Karim and Mitchell, 2000; Capron and Mitchell, 2009; Anand, Oriani, and Vassolo, 2010). Facing competitive pressures to rapidly gain a position in a new emerging opportunity, management may decide to acquire a firm with which it has had no economic resource allocation-based interactions and also little opportunity to communicate via an extended evaluation process. In the case of *outright acquisition*, the two firms start from

a 'clean slate.'[5] For examples, Cisco's numerous outright acquisitions include those of Pure Digital Technologies and Starent Networks (Vance, 2009).

Alternatively, the acquisition may follow a *complete alliance,* where acquiring and target firms had fully developed joint resource allocation and communication-based interactions that provide information and guide partner behavior in the pre-acquisition period. The task-based incentives drive resource allocation choices by the partners. However, these choices may be further influenced by (or interpreted in light of) the informal organizational norms that incorporate contextual information gained from communications between, and learning about, partners. For example, IBM acquired Cognos, Inc., in 2007 after several years of a successful alliance partnership where the two firms collaborated in a service-oriented architecture (Austen, 2007). During the alliance stage, the two firms met corporate customers' needs by allocating their complementary resources so that Cognos provided business intelligence and consulting services, while IBM provided integrated hardware and software solutions. These resource allocation decisions were also accompanied by significant communications where both parties developed a common understanding and trust regarding partner abilities and intentions. The presence of these structures in a *complete alliance* setting, thus, implies that the post-acquisition coordination challenge would be vastly different than in the *outright acquisition* setting, as depicted in Table 2.

Table 2. Pre-acquisition organizational interaction

		Prior communication	
		Yes	No
Prior resource allocation	Yes	Complete alliance	Allocation only
	No	Communication only	Outright acquisition

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[4] Post-acquisition coordination between acquired and existing divisions is an important issue, with theoretical and practical significance. Conceptually, this phenomenon represents a natural experiment in dissolution of firm boundaries. When coordination is 'complete,' it implies that two previously autonomous firms now behave as a single economic and social entity, thus, having removed their interfirm boundary. It is a good context to provide insights into the theory of the firm. In terms of practical significance, poor coordination has been identified as a frequent culprit behind poor acquisition performance (e.g., Schweiger and DeNisi, 1991). While firms with successful coordination can reap benefits from acquisitions, other firms suffer from managerial turnover, poor decision making, and internal feuds, all leading to financial losses.

[5] We note that such outright acquisitions may occur due to differences in the extent to which managers at different hierarchies have been involved in prior negotiations. For our purposes, even if there may have been extensive communication between the top management team of the two firms, relative absence of interaction between the mid- and lower-level managers of the relevant divisions may still result in the 'clean slate' outcome.

Table 2 also highlights the possibility of the non-diagonal cells of *allocation only* and *communication only*. While not plausible in the real world,[6] these cells are theoretically important since they allow us to isolate the informational effects of resource allocation and communication-based linkages, where one occurs in the absence of the other. It should be noted that these linkages vary in the 'richness' of information they carry. As compared to communication, resource allocation activities are more circumscribed and provide limited emotional cues and fewer opportunities for rapid feedback. (Daft and Lengel, 1986; Lengel and Daft, 1984). Direct communication is a richer medium that enables the transfer and assimilation of nuanced messages and offers the means to confirm understandings and correct misinterpretations (Russ *et al.*, 1990). Yet, as highlighted by McCann and Galbraith (1981), direct feedback mechanisms are the most expensive in terms of managerial time and attention. Identifying the main and additive effects of these linkages permits a better understanding of the relative importance of these two critical dimensions of organizational design to achieving post-acquisition coordination. Importantly, it also enables a better understanding of what types of prior interactions are more likely to transfer from one organizational structure (alliance) to the other (acquisition). Thus, the four types of pre-acquisition relationships depicted in Table 2 flow from the potential combinations of organizational architectural elements: an organizational structure associated with the ability to communicate and an organizational structure associated with resource allocation. We now turn to the hypothesized effects of each of the organizational components on post-acquisition performance.

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[6] In the context of *allocation only*, there is a possibility that firms may engage in an 'arms-length' alliance; where the tasks and economic incentives are set and the partners then engage in resource allocation, with only limited communication or one-on-one interaction. Thus, partners rely on their independent and individual cost-benefit calculus while making their decisions, forming impressions of their partners based solely on the revealed resource allocation decisions in the alliance. In these *allocation only* interactions, the resource allocation experience may create routines that influence later interactions. The real-world plausibility of *communication only* is far lower, though one may envision a case where communication enables the two firms to learn about each other and the tasks required for synergistic outcomes, prior to any 'economic' transactions or combined operational tasks. Such dialogue and observation may enable managers to gain an awareness of the dominant operational culture as well as catalyze social ties formation (Smith-Doerr and Powell, 2005).

PRE-ACQUISITION ORGANIZATIONAL ARCHITECTURE AND POST-ACQUISITION PERFORMANCE

Prior resource allocation experience

We begin by a comparison of Rows 1 and 2 in Table 2: both complete alliance and allocation only scenarios provide prior resource allocation experience to the managers of the two firms that will ultimately be integrated in a single organization. In contrast, the managers of the two firms in Row 2 do not gain comparable experience through joint allocation of resources. For these managers, efforts to coordinate value-creation activities occur only within the integrated entity. Compared to Row 1, the decision makers in Row 2 face a delay in gaining hands-on knowledge of the task and developing partner-specific absorptive capacity (Zaheer *et al.*, 2010), which translates into a corresponding lag in efforts to move down the learning curve. Though the timing and, thus, the organizational context will differ, both sets of players will face similar operational challenges—inducing sufficient contributions across partners to achieve greater mutual benefit.

The challenge of coordinating to support value-creation is not trivial. Even with no task uncertainty, managers face the problem of multiple equilibria, as depicted in the previously discussed assurance game setting (Agarwal *et al.*, 2010; Harsanyi and Selten, 1988). If the acquired and acquiring firms have no prior resource allocation experience, they have not had the opportunity to either learn about the task or develop proclivity toward either cooperation (the payoff-dominant equilibrium) or noncooperation (the risk-dominant equilibrium). However, if the two firms have engaged in prior resource allocation in the pre-acquisition setting, the knowledge gained from this experience will likely spill over with implications for post-acquisition coordination.

Importantly, an interorganizational context is different from coordination within organizations, since the former are more likely to experience greater tensions between cooperation and competition (Hamel, 1991). While competition may exist in intraorganizational settings as well, the tensions are more salient in an interorganizational setting (Khanna *et al.*, 1998; Williamson, 1991). Thus, prior resource allocation experience among alliance partners may set them on one of two

divergent paths. If the prior resource allocation experience results in cooperative action being chosen, there may be positive spillovers between the pre-acquisition activities and post-acquisition performance. Alternatively, if the prior resource allocation experience results in noncooperative action, there may be negative spillovers for the new organizational design choice. Since each path is viable, in lieu of offering competing hypotheses, we leave the performance ramifications of prior resource allocation as an empirical question.

Prior communication experience

In contrast, the comparison between Columns 1 and 2 of Table 2 illuminate the effect of communication between the acquiring and acquired firm and the potential for development of some shared culture and social norms. Prior communication can provide information that alleviates both operational and behavioral challenges to value creation. First, through communication, the firms can provide information about their respective positions, gain insight into their potential struggles in managing the interdependent task and improve economic returns post-acquisition (Bastien, 1987; Shanley, 1988; Napier, 1989; Bohl, 1989; Schweiger and DeNisi, 1991).

Communication facilitates a flow of information that can clarify expectations and causal connections between individual actions and group outcomes (Kogut, 2000). Communication can also reduce behavioral uncertainty in the presence of bounded rationality (Simon, 1947; Zeng and Chen, 2003). Direct communication supports the transfer of 'rich information' enhancing the capacity of managers to process complex subjective messages and resolve ambiguity in a timely manner (Lengel and Daft, 1984). Insights from the social psychology 'contact hypothesis' illuminate how contact and communication may reduce tension between groups (Allport, 1954; Pettigrew, 1971; Brewer and Brown, 1998). Thus, prior communication can help the acquiring and acquired firms alleviate problems that may arise post-acquisition. By reducing the possibility of surprises, communication can provide convergent expectations that enhance the coordination and cohesion of the group (Malmgren, 1961; Williamson, 1975). Even in the absence of resource allocation interactions that may occur when the target is a former alliance partner, communication plays a vital role; the evaluation process is not only important in ensuring that the right partner is selected, but also critical to ensuring common ground between the two firms is established (Jemison and Sitkin, 1986; Bastien, 1987; Haspeslagh and Jemison, 1991). Further, when the prospective target is an alliance partner, research on strategic alliances has underscored the role of communication among decision makers for increasing performance (Agarwal *et al*., 2010; Rodan and Galunic, 2004; Zaheer and Venkatraman, 1995). Communication may engender trust between the transacting parties, increase familiarity with one another, strengthen personal ties, and confirm the goodwill of both organizations (Gulati, 1998, 1999; Dyer and Chu, 2000). With communication, the potential gains to cooperative action are perceived as more certain as such interactions enable the parties to come to a shared understanding on ambiguous issues (Russ *et al*., 1990). Relatedly, prior communication provides opportunities for moral suasion, aiding in the development of group identity and raising the salience of group interests, which may increase the likelihood of cooperation (Dawes, van de Kragt, and Orbell, 1988; Komorita and Parks, 1994; Zeng and Chen, 2003).

In sum, when acquired and acquiring firms have engaged in prior communication, the increased flow of information and creation of social norms enable a smoother transition to activities performed within the integrated organizational design. In the language of social dilemma and assurance games, communication enhances the probability of the payoff-dominant relative to the risk-dominant equilibrium (Agarwal *et al*., 2010; Gulati *et al*., 1994; Harsanyi and Selten, 1988). So:

> *Hypothesis 1 (H1): Prior communication experience will result in higher post acquisition performance than no prior communication experience.*

Joint effects of prior resource allocation and prior communication

The previous two sections relate to the 'main effects' of prior resource allocation and communication; we now examine the impact of one in the presence/absence of the other. Understanding these results, we argue, will help us understand how the two experiences combine to affect performance in the post-acquisition organizational framework.

While prior resource allocation creates the structural framework for economic exchange, prior communication provides additional motivational solutions to the social dilemma problem (Agarwal *et al.*, 2010; Zeng and Chen, 2003). Purely structural linkages may be incapable of providing the necessary breadth of information and, thus, may result in poor coordination (Nadler and Tushman, 1997). Some of the gaps in the former type of structure can be filled as the parties communicate and develop a shared set of norms that further direct partner behavior.[7] With future decisions guided by a more comprehensive base of shared knowledge (which includes not only the outcomes of one's partner's decisions but information about the reasons for these decisions), successful outcomes are more likely. Both Gulati *et al.* (1994) and Orbell, Dawes, and van de Kragt (1990) highlight the need for multilateral promises to augment formal decision rules that may flow from the underlying incentive structure. These communication efforts may exert influence on decision makers that reinforces identification with the cooperative system (Barnard, 1938; Simon, 1947) and increases the likelihood of a payoff-dominant equilibrium.[8]

Similarly, prior communication can be augmented by prior resource allocation experience. First, communication is more effective when it is concomitant with knowledge of the critical issues that need to be resolved. Challenges encountered during the prior resource allocation process may provide insights on what issues are most salient for discussion. Second, communication without resource allocation may result in 'cheap talk,' since

it may not carry significant payoff-relevant information, or worse, may be strategically misleading as partners assert intentions that are not backed by actions (Crawford, 1998; Ledyard, 1995; Farrell and Rabin, 1996).

In sum, by capturing economic incentives, the structure of an alliance can establish a foundation for value creation. However, value may not be realized due to partner miscalculation or misbehavior, which is where the shared culture and social norms enabled by communication may facilitate cooperative outcomes. Thus, the concatenation of both these mechanisms can jointly enhance task-related learning and, equally importantly, alleviate opportunism concerns that may arise post-acquisition, as well as increase performance. Simply put, having both prior resource allocation and prior communication opportunities increases the likelihood of getting the payoff-dominant Nash equilibria, rather than defaulting to the risk-dominant Nash equilibria.[9]

Hypothesis 2 (H2): The acquisition of a complete alliance partner (presence of prior resource allocation and communication) will result in higher performance than the acquisition of an allocation only partner (presence of prior resource allocation alone).

Hypothesis 3 (H3): The acquisition of a complete alliance partner (presence of prior resource allocation and communication) will result in higher performance than the acquisition of a communication only partner (presence of prior communication alone).

Formation and transfer of routines from alliance to post-acquisition

Formation of routines for value appropriation

Implicit in our hypotheses relating interorganizational designs during the pre-acquisition stage to the post-acquisition performance is the assumption that routines created during the alliance-setting

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[7] Classical organization theory argues that effective coordination is a product of both monetary incentives and nonmonetary awards and highlights the role of both formal and informal managerial communication can play in increasing performance (Barnard, 1938).

[8] In a landmark study using a field experiment, Schweiger and DeNisi (1991) showed that communication can ameliorate the negative effects of an acquisition. They showed that there is a heightened sense of uncertainty and greater perceived risk following an acquisition, which tend to increase with time, leading to reduced trust and commitment to firm goals. However, realistic communications during and after the acquisition significantly reduced such outcomes. Further, research in procedural justice (e.g., Greenberg, 1987) shows that even when people are unhappy with an outcome, they experience fewer dysfunctions when they understand the process through open communication. Besides the useful informational content in such communications, there is also a useful symbolic component to such communication.

[9] We note that H2 is closely related (but not identical to) H1. Both H2 and H1 suggest that communication will lead to higher performance. However, these hypotheses are not logically equivalent. For example, we might see a main effect of communication when comparing all four treatments (supporting H1), but no effect of communication in the presence of prior resource allocation (rejecting H2). Alternately, we might see an effect of communication in the presence of prior resource allocation (supporting H2), but not overall (rejecting H1).

transfer to the post-acquisition stage. We now turn to the subset of acquisitions that involve prior alliance partners, treatments where managers from both Firm A and Firm B make resource allocation decisions in the pre-acquisition periods, to examine this issue in-depth.

As noted earlier, while strategic alliances are formed with the intent that both partners will reap benefits accruing to combinational activity, there is nonetheless a competitive element as partners make decisions with an eye to their own private economic benefits. These two elements correspond to value creation and value appropriation, respectively. Simply put, exchange partners can pursue their own interest at the expense of their partner's by engaging in economic holdup and/or learning races in a manner that affects both value creation and value appropriation (Doz, 1996; Khanna *et al.*, 1998; Das and Teng, 2000). Even in the absence of opportunistic behavior, miscalculations and misunderstanding can result in alliances falling short of their potential in value creation (Kale, Dyer, and Singh, 2002). Thus, the alliance stage can be fraught with situations where there is coordination failure and lack of contribution.

Agarwal *et al.* (2010) provide evidence that communication enhances the likelihood of payoff-dominant equilibria being chosen over risk-dominant equilibria in alliance settings, thus increasing the likelihood of value creation. We argue that in addition to enhancing value creation (creation of the pie), communication may also facilitate more cooperative value appropriation (sharing of the pie) among the decision makers.

In Table 1, we provided a simple example of an assurance game setting, where the decision is a simple binary variable regarding the choice of cooperation. In more realistic assurance game settings, partners have to additionally choose their *level of effort* or amount of resource allocation. Accordingly, there are many payoff-dominant Nash equilibria that represent different levels of costs and, thus, share of the value, appropriated by each alliance partner. Economic/game theoretic logic would argue that rational partners (should) consider both issues simultaneously, determining their level of contribution to insure that sufficient resources are committed to create value in the joint alliance activity while optimizing private payoffs. Thus, each partner prefers a payoff-dominant equilibrium in which he or she

contributes relatively little while his/her partners contribute relatively more. For acquisitions that achieve payoff-dominant outcomes, an examination of the relative contributions of the various parties helps determine whether the value is being appropriated equally or unequally.

We argue that interorganizational architectures that rely solely on economic incentive alignment and resource allocation as the primary form of interaction among alliance partners are more likely to result in unequal value appropriation. In contrast, interorganizational architectures that combine communication with economic incentives and resource allocation engender social norms and social identity that support more 'equitable' contributions of resources and sharing of the value creation (Deutsch and Gerard, 1955; Zeng and Chen, 2003). Accordingly, we posit:

> *Hypothesis 4 (H4): In alliances, communication will result in more equal value appropriation than will no communication.*

Transfer of routines post-acquisition

Previous research suggests that post-acquisition performance may be enhanced by the existence of pre-acquisition alliance activity (Reich and Mankin, 1984; Doz, Hamel, and Prahalad, 1986; Haspeslagh and Jemison, 1991; Bleeke and Ernst, 1995; Hagedoorn and Sadowski, 1999). Pre-acquisition alliances may serve as an important screening mechanism for potential targets, as is argued in the real options and related literatures (Kogut, 1991; Arend, 2004). If only a 'selected' group of alliances are followed by acquisitions, one may observe a positive relationship between sequential strategies and performance without the existence of a causal link between them.

Aside from selection, distinct processes formed during the alliance stage may enhance or exacerbate post-acquisition performance. Moving from an alliance to an acquisition entails a governance structure transition. Though, post-acquisition, the partners continue to contribute and combine resources, they do so under a lower-powered incentives regime (Williamson, 1991). The potential spillovers from the alliance stage to the post-acquisition stage stem from learning *from/with* partners about the task or learning *about* partners and their level of opportunism (Ring and van

de Ven, 1994; Anand and Khanna, 2000). Thus, the creation of partner-specific absorptive capacity (Zaheer *et al.*, 2010) can result in higher post-acquisition performance. Organizational architecture design choices of the alliance, as it contributes to this learning, may have significant consequences in setting routines that partners carry into the post-acquisition stage. This is particularly salient given inertness of organizational contractual commitments, which may result in governance inseparability and constrain future organizational design choices (Argyres and Liebeskind, 1999).

In some instances, the routines established through alliance experience are expected to have positive performance effects post-acquisition. Through successful alliance activity, partners gain resource exchange know-how and resource integration experience (Porrini, 2004). Consistent with what Pisano (1994) refers to as 'learning before doing,' post-acquisition performance can be facilitated by the opportunity that the two firms have had to learn about how best to use each other's resources and obtain potential value-creating combinations in the alliance phase. Broadly, success in value creation creates common ground—an understood set of shared knowledge that supports coordination (Clark, 1996; Puranam *et al.*, 2009). If task requirements remain similar, partners with a history of success are likely to rely on established routines, continuing to cooperate in the new post-acquisition organizational context.

Players that adopted cooperative norms in the alliance phase will find themselves more suitably positioned to operate within the lower-powered incentive environment. Argyres (1995), for example, provides detailed case studies of how successful alliance experience translated to superior post-acquisition performance, as with IBM's acquisition of Lotus Notes. However, the opposite outcome is also possible—when prior experience is fraught with competitive rather than cooperative routines, there can be a negative effect due to the transfer of competitive routines from the alliance stage to the acquisition stage (Haleblian and Finkelstein, 1999; Barkema and Schijven, 2008). Due to competitive pressures and opportunism concerns that exist in alliances (Khanna *et al.*, 1998), some partners will struggle to create value in the alliance stage. Particularly because alliances and acquisitions represent different governance modes, elements of competition and opportunism in the routinized interactions of the alliance stage should be

muted post-acquisition, since acquisitions result in intrafirm settings that represent joint maximization problems (Williamson, 1975). But once these routines are set up between alliance partners, they may persist (owing to their stickiness) even after the acquisition has dissolved the interfirm boundaries and the alliance partner has been internalized (Argyres, 1995; Argyres and Liebeskind, 1999). If the competitive routines developed in the alliance stage persist post-acquisition, they may result in lower performance.

Thus, the transference of inappropriate routines implies that alliance partners may experience negative effects. Routines created under incentive structures where the resource allocation is based on competition among independent organizations may remain sticky, thus causing frictions post-acquisition when divisional members need to reconfigure their relationships in the context of a more hierarchical governance structure.

Hypothesis 5 (H5): Post-acquisition performance will increase with the level of pre-acquisition alliance performance.

Hypothesis 6 (H6): Resource allocation routines (value allocation) established in a pre-acquisition alliance will be retained post-acquisition.

EMPIRICAL METHODOLOGY

Experiments as a research method

We test our hypotheses using experimental methodology (Kahneman, Knetsch, and Thaler, 1990; Smith, 2000). The earlier theoretical section identified prior resource allocation and prior communication as separate drivers of post-acquisition performance. In addition to cleanly isolating these individual effects, our empirical methodology avoids selection issues, given random assignment of subjects to treatments, and permits the development of clear dependent measures of post-acquisition performance. Experiments have been used for many generations in psychology, sociology, and economics to distinguish between competing theories, testbed possible policies, and explore anomalies in the field (see Falk and Heckman, 2009, for a review and methodological discussion). In management, experiments have been

used to investigate issues as diverse as agency contracts (e.g., Tosi, Katz, and Gomez-Mejia, 1997; Parks and Conlon, 1995; Conlon and Parks, 1990), compensation and allocation decisions (e.g., Freedman 1978; London and Oldham, 1977; Fossum, 1979) and negotiating behavior (e.g., Tenbrunsel, 1998; Neale and Bazerman, 1985; Bhappu, Griffith, and Northcraft, 1997; Thomas-Hunt, Ogden, and Neale, 2003). More specific to corporate strategies related to acquisitions and alliances, experimental design has been implemented by Weber and Camerer (2003) to examine the effect of cultural differences in merger failures and by Agarwal *et al.* (2010) to study the relative effects of incentive alignment and communication on success of alliances. Also, Croson *et al.* (2007) provide a review of the methodology for specific applications to corporate strategy.

The use of the experimental methodology is particularly valuable in situations where competing theories offer alternative explanations for an observed effect. For example, in our setting, improved post-acquisition performance might be caused by selection issues (firms acquire only their highest-value alliance partners) or by the formation of positive routines. Our experiment sidesteps selection issues and allows us to focus on the developmental processes as potential causes of the observed relationship between pre-acquisition activity and post-acquisition performance. The use of an experiment controls for endogeneity in which alliances become acquisitions—endogeneity that is not easy to control with the use of field data (Hamilton and Nickerson, 2003). In our experimental setting, partners are randomly assigned to each other and, importantly, there is no choice about the acquisition. This enables us to focus on the decisions in the pre-acquisition stage as a causal driver of post-acquisition performance. In a laboratory experiment like this one, the theory can be tested directly by controlling for extraneous factors, much as a physics experiment might control air pressure in measuring an atomic reaction. A second advantage of the experimental methodology is that it allows us to separate alternate theories and predictions that might not otherwise be separable (or even observed) with naturally occurring data. In our setting, this enables us to untangle the confound between prior resource allocation and ability to communicate that is present in the field and tease apart the competing causal explanations for post-acquisition performance. Thus, we

can obtain clean measures of our independent variables in a way that would not be possible using observational data.

Similarly, the use of experiments permits a clear measure of our dependent variable of interest, post-acquisition performance, without relying on noisy or possibly biased data like stock market returns. Finally, since experiments are replicable, other researchers can reproduce the experiment and verify the findings independently.

While experiments provide some advantages, they have limitations as well.[10] These primarily include an abstraction from reality and the reliance on subjects whose incentives may not reflect those of real-world actors. We accommodate these limitations by ensuring that the relevant factors from the field are captured in the experimental design. In particular, we ensure that the experimental participants' incentives match as closely as possible the incentives of the real-world actors. Similarly, the task assigned to the participants captures important aspects of post-acquisition coordination, while retaining the simplicity needed to provide a clean outcome measure for analysis. Finally, we rely on subjects who have managerial experience to proxy for real-world decision makers.

Experimental design and procedure

The experiment was designed so participants could replicate the role of managers in firms engaging in pre-acquisition/post-acquisition activities. In our

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[10] Critics of experiments argue that since the laboratory situation is necessarily abstract and unrealistic (in that it contains fewer considerations, dimensions, and confounds than the real-world situation), no results from the lab can be used to predict behavior in the field. We disagree. Zelditch (1969) discusses this issue in-depth in his amusingly titled article *Can you really study an army in the laboratory?* His argument acknowledges that the laboratory setting is different from any naturally occurring, real-world setting one is likely to find. However, he argues, the bridge between the lab and the field is the theory being developed to explain observed behavior and being tested in the laboratory design. Theories are developed to predict and explain real-world observations. These theories should also predict and explain behavior in laboratory settings. If they do not, it is not the fault of the experiment, but a flaw in the theory. This argument is also made by Plott (1991) in the context of market experiments. He argues that the theory of market equilibrium, if true, should predict behavior in a laboratory market just as it should predict behavior on the London Stock Exchange. In fact, it should perform *better* in the lab, since confounding factors not incorporated in the theory are absent in that setting. If the theory doesn't predict in the clean, uncomplicated environment of the lab, how likely is it to predict in the cluttered, confounded environment of the field?

experimental setting, we simulated two firms, Firm A and Firm B. Firm A is represented by two divisional managers who interact with each other. The two divisions share profits. Firm B is represented by a single manager. When the experiment begins, Firm B is involved (or not involved) in an alliance with the two divisions of Firm A. After a few initial periods, Firm A acquires Firm B and the manager of Firm B becomes the third divisional manager in the now 'merged' firm. As a result, all three divisions now share profits.

The managers choose how many resources to allocate toward their own division/firm's production and toward joint production (combined activities) with the other divisions/firm (which could be conceptualized as joint production, R&D, technology transfer, or marketing). Resources allocated toward production in their own division/firm generate a profit stream commensurate with the investment. Resources allocated toward combined activities, described as firm (or alliance) production, generate returns only if a minimum threshold is met, to capture synergistic gains from these combined activities. If this threshold of resources allocated toward combined activities is met, the project is successful, value is created, and each firm earns additional profit. Each manager has different monetary benefits from the joint production's success, which affects their decisions concerning how much of their resources to contribute. If the resources allocated toward combined activities fail to meet the threshold level, the project fails, no value is created, and contributed resources are lost. The experimental design ensures that the threshold requires more resources than are controlled by any one manager, thus ensuring task interdependency and adhering to the principle that successful combined activities requires participation of multiple divisions and/or firms.

While the implemented experimental design mirrors the simple threshold social dilemma/assurance game example in our theoretical backdrop, several features that increase complexity and correspondence to the real world are worth noting. First, the particular parameters are chosen to induce a set of efficient and stable outcomes (payoff-dominant equilibria) in which combined activities are successful. Second, the resource allocation is efficient; the sum of the profits that result from successful combined activities is larger than the cost of foregone profits from private production. Third, each manager's bonus is sufficiently large so as to induce allocation of resources toward the combined activities, *given that they believe others will do so as well.* Finally, there is an asymmetry of costs of resource allocation across the multiple pay-off dominant equilibria, which results in differences in the extent of value appropriated by each manager. Each payoff-dominant equilibrium requires that managers not only have to agree on whether the threshold will be met, but also on the amount of resources that each will allocate to achieve the threshold level. This is important since each manager would prefer the payoff-dominant equilibrium in which he or she contributes relatively little while his/her partners contribute relatively more.

Appendix 1 describes the parameters used for the treatments, both pre- and post-acquisition. Managers engage in multiple rounds of interaction (described as financial quarters). To avoid endgame effects and simulate the unknown endpoint feature of the real-world setting, we implement a finite game with an unknown end. The participants do not know when the game will end; instead they are informed that after each quarter there is an 80 percent chance that the game will progress to the next quarter (and a 20 percent chance that it will end). The continuation probabilities are indeed as described; no deception is used in any feature of this experiment.

Treatments

Our experimental design manipulates pre-acquisition interaction to test if post-acquisition performance is enhanced by the existence of pre-acquisition interactions of different types. Accordingly, there are two stages in the experiment. Stage 1 (the pre-acquisition stage) consists of three quarters. At the end of the third quarter, an announcement of the acquisition is made and Stage 2 (the post-acquisition stage) commences. Mirroring Table 2 in the earlier theoretical section, we distinguish between the competing causes of hypothesized differences: prior resource allocation and prior communication. We implement a 2x2 design that manipulates the pre-acquisition relationship between the two divisions of Firm A and Firm B. The two dimensions of the design are *prior resource allocation* (yes, no) and *prior communication* (yes, no).

The first manipulation focuses on prior resource allocation (Row 1 versus Row 2 in Table 2) and

is implemented based on whether the manager of Firm B is able to make resource allocations in the pre-acquisition quarters. In the *communication only* and *outright acquisition* treatments, during the first three quarters only the two divisional managers of Firm A make resource allocations. In the *complete alliance* and *allocation only* treatments, all three managers make resource allocation decisions. The second manipulation focuses on prior communication (Column 1 versus Column 2 in Table 2) and is implemented via a chat box. In the treatments without prior communication with Firm B (*allocation only* and *outright acquisition*), only the two divisions within Firm A can discuss the situation and their decisions. In the treatments with prior communication (*communication only* and *complete alliance*), the manager of Firm B can observe and participate in the discussions.

In the post-acquisition stage, the experience is the same for all participants in all four treatments. New parameters values are introduced (as described in Appendix 1) to represent payoffs consistent with the post-acquisition setting; in particular, Firm B now represents a division that engages in profit sharing with the other two divisions. However, the task of resource allocation remains the same. The three divisions have the opportunity to allocate resources toward (and reap benefits from) combined activities. We gauge performance by measuring coordination success and relative contributions achieved in this post-acquisition phase. Note that all groups experience an acquisition, even those who have had unsuccessful pre-acquisition alliances. This eliminates the selection endogeneity present in field data.

Participants

Our experiment involved 213 participants, all of whom were MBA students at a major business school and had prior work experience. Additionally, some of the experiments were conducted using participants from the Executive MBA classes—these participants represent people with current managerial experience in a variety of corporate settings. There was no significant difference in the results across the regular MBA and executive MBA pool.

To induce participants to take tasks seriously, we used the *induced valuation* methodology of experimental economics (Smith, 1982, 2000). This involves paying participants in cash based on the profits earned in the experiments. The important dimension of this payment is that it is responsive to the decisions that participants (and their counterparts) make. We designed the incentives to reflect realistic pre- and post-acquisition earnings of managers in the field, and participants were (privately) paid those incentives in cash at the end of the experiment. When the experiment ended, participants were debriefed and dismissed. The experiment involved no deception, thus contamination effects are not a major concern. Nonetheless, participants were asked to not discuss the experiment with others. The data was collected in three sessions scheduled across three days.

Procedure

Participants were randomly assigned to treatment and role within the treatment. Consistent with our theoretical focus and the likelihood that some treatments are more likely to occur in the real world than others, we oversampled the diagonal cells of *complete alliance* and *outright acquisitions*. Specifically, we ran 25 games of *complete alliance*, 20 games of *outright acquisition*, 14 games of *allocation only*, and 12 games of *communication only*. When participants arrived at the lab, they were shown to a computer terminal, read and signed a consent form, and were given a copy of role-specific instructions to read. Once everyone had arrived, a composite version of the instructions was read aloud (see Appendix 2 for the composite version). After the instructions, but before the experiment began, participants completed a quiz to ensure understanding of the decisions required and the resulting payoffs. The entire experiment was computerized, run via the Web using a Java application; participants input their allocation decisions when appropriate, engaged in electronic chat, and were given feedback entirely electronically. After the experiment ended, participants completed an exit survey describing their experiences.

Variable definitions

Dependent variables

Post-acquisition performance is measured using post-acquisition success as the dependent variable for H1-H3 and H5. *Success* in coded as '1' if the total resource allocations by all divisions meets or exceeds the threshold amount required for synergistic profits from combined activities and '0'

otherwise. Whereas H1-H3 and H5 explore value-creation outcomes, the remaining two hypotheses (H4 and H6) explore value appropriation when there is successful value creation. As noted earlier, there are many payoff-dominant Nash equilibria for which the value creation threshold is met (i.e., *success* = 1), but which differ in the relative contribution levels (and, hence, value appropriation levels) adopted by the partners. H4 focuses on the link between communication and pre-acquisition value appropriation. The dependent variable used to test H4 is the pre-acquisition *value appropriation ratio*, calculated based on the benefits received by Firm B relative to Firm A in the successful pre-acquisition rounds. The higher this ratio is, the less equitable the division of value. H6 investigates the influence of pre-acquisition contribution routines on contribution choices post-acquisition. The dependent variable for H6 is the *post-acquisition contribution ratio* of the manager of erstwhile Firm B relative to managers in Firm A, calculated based on the contributions of each manager during successful post-acquisition rounds.

Explanatory variables

For H1 and H4, the main explanatory variable of interest is *prior communication*, which takes the value of '1' if the treatment allows for Firm B to engage in communication in the pre-acquisition stage. In the model investigating H2 and H3, indicator variables for the organizational architecture treatments are used (e.g., *complete alliance* = 1 for observations drawn from that treatment and 0 otherwise). The *outright acquisition* treatment is the omitted category. To explore the effect of routines established via pre-acquisition alliance activity on post-acquisition performance, we use two independent variables. The first is *prior success*, which takes the value of '1' if the threshold value was met during the pre-acquisition stage. The second is the *pre-acquisition contribution ratio*, which is constructed similarly to the *post-acquisition contribution ratio*.

In all models, *quarter*— denoting the period in which the decision is being made—is used as a control for task-related learning with repetition. To control for unobserved heterogeneity between the different groups of managers, we use random effects logistic regression analysis in models where the dependent variable is *success* and random effects regression analysis for models where the

value appropriation ratio or the *contribution ratio* is the dependent variable.

RESULTS

The tests for Hypothesis 1, and for Hypotheses 2 and 3, are reported in Tables 3 and 4, respectively. We note that repeated interactions in the post-acquisition stage have a beneficial effect on coordination, given that the effect of *quarter* is positive and significant in both tables. Controlling for this learning over time, we find that prior resource allocation has a significant adverse effect on post-acquisition success. This result suggests that alliance partners may have a proclivity to choose risk-dominant equilibria over payoff-dominant equilibria when making resource allocation decisions in an interorganizational context. On the other hand, prior communication has a significant beneficial impact on post-acquisition success. The probability of success is higher in contexts where managers have the ability to communicate prior to the acquisition to mitigate operational and/or behavioral challenges to value creation. Thus, H1 is supported.

The analysis reported in Table 4 allows comparison across the alternative pre-acquisition organizational architectures. To facilitate comparison with Table 3, we retain *outright acquisition* as a baseline. While not hypothesized, we note that the coefficient of *complete alliance* is not different from the baseline in either statistical or economic significance, which is consistent with the assurance game logic mentioned earlier and the findings of Zaheer *et al.* (2010). In support of H2, the negative and

Table 3. Effects of prior resource allocation and prior communication on post-acquisition coordination

	Success (logistic)	
	Coeff	s.e.
Intercept	−0.52	0.48
Prior resource allocation	−0.73	0.37**
Prior communication	0.76	0.38**
Quarter	0.33	0.06***
Number of observations		568
chi-sq		36.07***

** $p < 0.05$; *** $p < 0.01$, two-tailed test.
Random effects panel regression by group.
Observations consist of the eight post-acquisition quarters across all 71 sets.

Table 4. Organizational architecture and post-acquisition success

| | Success (logistic) | |
	Coeff	s.e.
Intercept	−0.41	0.48
Allocation only	−0.97	0.48**
Communication only	0.43	0.56
Complete alliance	−0.01	0.46
Quarter	0.33	0.06***
Number of observations		568
chi-sq		36.46***

** p < 0.05; *** p < 0.01, two-tailed test.
Random effects panel regression by group.
Observations consist of the eight post-acquisition quarters across all 71 sets.

significant coefficient of *allocation only* implies that post-acquisition success is less likely following the acquisition of an *allocation only* partner relative to a *complete alliance* partner (test for differences in coefficients $\chi^2 = 6.42$, $p < 0.05$). This suggests that there are performance benefits to adding communication to resource allocation in the pre-acquisition stage. It appears that the negative routines that develop in mixed-motive, prior resource allocation situations can be mitigated through the use of communication to help increase the likelihood of a payoff-dominant equilibrium. Interestingly, we find no support for H3—the coefficients of *complete alliance* and *communication only* are not significantly different from each other (test for differences in coefficients $\chi^2 = 0.71$, p = 0.70). The lack of support for H3, in conjunction with the support for H2, is interesting—it implies that while prior resource allocation in the absence of prior communication is detrimental to success, the converse is not true. Allowing managers to have prior resource allocation experience, when they already have communication channels established, does not increase the likelihood of success over and above *communication only*. A potential explanation for this result might be that absent task uncertainty (since all managers have full information regarding the rules, incentives, and outcomes), there is no additional benefit from having prior resource allocation experience; and that communication alone is sufficient to resolve behavioral uncertainty and to assure divisional managers that the everyone will cooperate. Taken together, the results in Table 4 also highlight the fact that competitive routines are most likely created when

managers have to make resource allocations in the absence of communication. Communication permits cooperative routines to be formed, whether in the absence or presence of resource allocation. Importantly, the findings indicate that outright acquisitions, where managers are starting with a clean slate, outperform settings where managers make resource allocation decisions without communication, thus showing that no prior routines are better than competitive routines.

We delve further into this issue in the remaining analyses, presented in Table 5 and Table 6, which explore the development of routines in pre-acquisition alliances (when managers from both Firm A and Firm B make resource allocation decisions) and the subsequent impact of these routines on post-acquisition performance. Though not explicitly hypothesized, the data shows that the probability of success in the pre-acquisition period is greater when the partners communicate. This is consistent with the findings of Agarwal *et al.* (2010) and supports the contention that communication reduces behavioral uncertainty and moves partners toward achieving payoff-dominant equilibria over risk-dominant equilibria. Consistent with H4, we find that communication also facilitates the adoption of more equitable value appropriation routines by the decision makers. As can be seen in Table 5 (Column 2), communication in the alliance stage results in a more equitable distribution of benefits (i.e., lower ratio of Firm

Table 5. Organizational architecture and development of pre-acquisition routines

| | Success (logistic) | | Successful quarter firmB/ firmA benefits ratio (OLS) | |
	Coeff	s.e.		
Intercept	−3.43	0.93***	0.39	0.04***
Communication	0.98	0.62**	−0.07	0.04**
Quarter	1.02	0.32***	0.02	0.01**
Number of observations		117		43
chi-sq/f-stat		11.62***		8.38**
r-sq				0.16

** p < 0.05; *** p < 0.01, one-tailed test.
Random effects panel regression by group.
Observations consist of: (a) the pre-acquisition quarters for the complete alliance and allocation treatments (39 sets) for the logistic regressions on success; and (b) the subset of these treatments that achieved success for the OLS regressions on benefits ratio.

Table 6.   Stickiness of routines: effect of alliance activity on post-acquisition performance

| | Success (logistic) | | FirmB/firmA contribution ratio (OLS) | |
	Coeff	s.e.	Coeff	s.e.
Intercept	−2.08	0.68**	0.39	0.03***
Success in alliance stage	1.530	0.49**		
Contribution ratio in alliance stage			0.27	0.07***
Communication	0.66	0.48*	−0.10	0.04***
Quarter	0.36	0.070***	−0.002	0.002
Number of observations		312		287
chi-sq/f-stat		47.1***		17.92***
r-sq				0.21

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; one-tailed test.
Random effects panel regression by group.
Observations consist of the eight post-acquisition quarters for the complete alliance and allocation only treatments (39 sets).

B's benefits relative to Firm A's benefits), which is significant at the 5 percent level. Finally, in Table 6, we find strong support for the contention that routines established in the alliance period are carried over into the post-acquisition stage.[11] As hypothesized in H5, pre-acquisition value-creation success begets post-acquisition value-creation success. Similarly, and providing support for H6, the resource allocation routines (contribution ratio of the managers) set in the alliance context is positively and significantly related to the resource allocation routines adopted in the new, integrated organizational context.

DISCUSSION AND CONCLUSIONS

Successful organization design requires selection among multiple media for effective information processing during task execution (Galbraith, 1973; Daft and Lengel, 1986; Russ *et al*., 1990). Initial design choices, however, influence the interaction among decision makers and thus may subsequently impact the ability to achieve coordination as organizational structures are redesigned. This research relates these critical issues to behavioral uncertainty by examining a specific context and asking a deceptively simple question: what are the consequences of pre-acquisition architectural choices on post-acquisition performance? More specifically, how does the presence or absence of pre-acquisition information flows via resource allocation and/or communication-based interactions shape both value-creation and value-appropriation routines? And further, are these routines sustained with a move from one organizational form (interorganizational alliance) to another (integrated firm)? Thus, our fundamental research question relates to identifying and teasing apart the creation and transfer of routines from one organizational architecture to another, particularly as it relates to behavioral uncertainty and the need for assurance that the other managers will act consistent to expectations for successful coordination.

Existing research provides important clues, yet does not answer these questions completely. Theoretically, many alternative mechanisms have been proposed (Reich and Mankin, 1984; Doz *et al*., 1986; Haspeslagh and Jemison, 1991; Kogut, 1991; Balakrishnan and Koza, 1993; Bleeke and Ernst, 1995; Hagedoorn and Sadowski, 1999; Chang and Rosenzweig, 2001) linking pre-acquisition alliance activity with subsequent performance. Similarly, the empirical evidence is unable to provide a uniform answer to this question or to distinguish among competing causes of performance differences that are proposed or observed. For example, Higgins and Rodriguez (2006) study 160 pharmaceutical acquisitions, of which 28 percent had prior alliances, and report a positive effect of prior alliances on market reaction to acquisition announcements. However, Benson and Ziedonis (2010) study 530 acquisitions by 61 top investors and report a negative effect of prior corporate

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[11] This is consistent with anecdotal field observations. For example, managers report that it takes about 12–18 months to build trust with partners and assess their collaborative potential (Dyer *et al*., 2004). For example, Cisco worked with NETSYS Technologies for 20 months before acquiring the firm for its network infrastructure and software technologies in 1996.

venture capital investments on market returns at the time of announcement. Zaheer *et al.* (2010) find no main effects of prior alliances on post-acquisition performance, but do find that international alliances or alliances with strong ties result in superior post-acquisition performance.

In this study, we integrate insights from organization design, economic game theory, and social psychology to illuminate the role of prior resource allocation and communication in alleviating behavioral uncertainty that arises in interunit coordination settings within and across organizations. Both mechanisms are related to learning (task specific and partner specific) and development of social processes and norms. However, as highlighted in organization design literature, both mechanisms vary in their 'richness' and concomitant costs in terms of managerial time and effort (Daft and Lengel, 1986; Russ *et al.*, 1990). By examining the main and additive effects, we are able to shed light on which one is more important in the creation of positive routines. Using a randomized experimental design, we find that prior resource allocation reduces, rather than enhances, post-acquisition performance. This finding builds on and complements previous work in organizational design that highlights the differential ability of resource allocation activities and communication interactions to convey subjective/socialized information. Simply, we find that richer information flows are needed to promote cooperation in the presence of behavioral uncertainty (H1 and H2). Sans such flows, it is likely that competitive, rather than cooperative, routines will develop between managers in the mixed-motive interorganizational environment. In this context, we note that the lack of support for H3 is interesting in its own right. It indicates that in situations where there is no task uncertainty (as in our framework), resource allocation does not add any additional information beyond communication—thus, communication is relatively more important in the resolution of behavioral uncertainty than is resource allocation and prior experience with resource allocation.

Once an acquisition has occurred, these competitive routines, though no longer appropriate in the combined entity, appear to be retained (H4-H6). Our results indicate, however, that such competitive routines are less likely to be established in the presence of communication. When managers communicate before the acquisition, they have the opportunity to share individual positions and can

develop a mechanism for understanding each others' positions. Such interactions support both success in value creation and equity in value appropriation. The effect of prior communication is unambiguously positive, as predicted by existing theory (Gulati, 1995). Further, and as expected, performance also improves with experience. In sum, our research shows that competitive and confrontational routines that develop in an alliance setting may have adverse transfer effects when the alliance partners merge and dissolve the interorganizational boundaries.

We note several limitations—which also represent future research opportunities—of our study. First, our use of experiments permits us to disentangle the effects of underlying mechanisms, but at some cost of realism. In particular, we abstracted from the effect of task uncertainty (either technological or market driven) on the post-acquisition performance outcomes, while focusing on the behavioral uncertainty resulting from managers interacting with each other. Future research examining the main and interaction effects of task and behavioral uncertainty on the transition of organizations from interorganizational to intraorganizational settings would be very fruitful. Also, while we identify and isolate the effects of resource allocation and communication as aggregate-level information processing mechanisms, research that further disaggregates the effect of task-oriented and partner-specific learning and creations of norms and culture is warranted. Further, research that examines how firm capabilities may affect the relationship between pre-acquisition resource allocation or communication on post-acquisition performance would enhance our understanding of how organizational capabilities and organizational economics influence organizational design outcomes. For example, it would be interesting to examine not only whether the specific alliance designs help or hurt future acquisition performance, but also the processes that are used by the allying firms to initiate and negotiate their alliance arrangement. Given the path dependence that is revealed in such setup procedures, it would be nice to identify early markers of future success or failure in corporate development activities.

Another limitation of our study relates to the use of students rather than professionals. We undertook several steps to minimize the effect of this limitation. First, all participants in our experiments were pursuing professional graduate-level degrees

and had at least four years of work experience. Further, there was no significant difference in the results obtained for groups in which the managers were enrolled in the executive MBA program who were older, had more experience, and had participated in alliances and post-acquisition coordination activity as part of their job description. Finally, we rely on the rich tradition of the use of experiments in related areas of experimental economics, social psychology, and organizational behavior, where researchers have consistently documented the equivalence of results of experiments using students versus 'real-world' decision makers (Dyer, Kagel, and Levin, 1989; Croson and Donohue, 2006). However, additional research where nonstudent samples are used would clearly provide additional value to the field.

Since field studies confound multiple causal mechanisms, our study provides an important complementary methodology that isolates the mechanisms that are at play in the alliance stage and abstracts away from exogenous uncertainty, or selection effects, about partner quality. As we argued earlier in the section on empirical methodology, endogeneity and sample selection have become recognized as important issues in strategy research (Hamilton and Nickerson, 2003). Experiments provide a powerful alternative to two-stage type models using field data. Such a methodology can generate data pertaining to cases that do not naturally exist in the field.

Importantly, this study contributes to the existing organizational design literature by moving beyond the traditional focus on environmental and task uncertainty to explicitly consider the role of behavioral uncertainty in the selection and subsequent performance of alternative organizational architectures. As divisional managers process information regarding interdependent tasks and create codified routines that guide future actions, a critical determinant of these routines is whether they embody expectations of cooperative or competitive behavior from the other managers. Classic organization design theory and congruence theory pay little attention to how managers coordinate when task interdependence is complicated by internal competition and significant behavioral uncertainty. In such situations, design of appropriate structural and informal mechanisms must take into consideration the 'history' of the interdependent units, as it may be necessary to adapt designs

to overcome previously established counterproductive routines. This issue is of particular salience for integration events involving the dissolution of firm boundaries where managers who were formerly 'outsiders' are now are part of the firm. Our study employs an under-researched route of examining inter- and intraorganizational design using the social dilemma paradigm (Khanna *et al.*, 1998; Agarwal *et al.*, 2010) and advances understanding of how resource allocation and communication may result in persistence of positive or negative organizational outcomes.

Since post-acquisition coordination may be seen as a natural experiment in the dissolution of firm boundaries, the context we examine also relates to issues related to the theory of the firm. For example, what kinds of decisions are made differently by divisions within a firm versus autonomous divisions? What kinds of factors cause the interfirm boundaries to dissolve effectively? Our results reveal the complementary role of 'soft' issues like communication (Schweiger and Goulet, 2000) and the 'hard' issues like resource allocation (Ghosh and Ruland, 1998). By examining the effect of variance in these factors, we can identify the contribution of each set and, more importantly, the additive effect among them. As per previous research (Kogut and Zander, 1996; Conner and Prahalad, 1996), our research shows the complementary roles of these factors.

In terms of implications for practice, this research enhances our understanding of post-acquisition coordination and the actual mechanisms that may drive successful post-acquisition performance. Our study illustrates that competitive routines develop even in simple settings—rather than the complex settings of the field, the only change in our experimental task between pre- and post-acquisition was in the incentive structure or the profit-sharing rule (representing a shift from an alliance to acquisition setting). Also, our study underscores the fact that alliances are not just opportunities for *selection,* but also for *creation* of potentially successful targets. Creation of cooperative resource allocation routines helps in the long run creation of value when alliance partners are subsequently acquired. Our research suggests that the early cooperative engagement with the potential partner can have long-term effects, even lasting beyond an eventual acquisition, so firms should take into account such effects even at early stage. Firms may consider starting this process

keeping in mind how it might end. Finally, the study is a cautionary note to managers who seek to overcome failure in alliances by acquiring partners with the intent to use the dissolution of firm boundaries to achieve cooperation. Negative routines, once formed, are hard to overcome. Thus, it behooves managers to weigh the positive and negative effects of sequential strategies when they design their corporate development efforts. Specifically, it points out that in pre-acquisition alliances, managers should mitigate the formation of competitive routines and that managers should engage in wide and open communication for the development of appropriate norms and culture, both before and after the acquisition. Finally, it provides implications for a better understanding of the concepts of acquisition and alliance capabilities.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

APPENDIX 1: Parameters and resulting equilibria

APPENDIX 2: Composite instructions

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