

Organizing New Product Development Projects in Strategic Alliances

Donald Gerwin

Eric Sprott School of Business, Carleton University, Ottawa, Ontario, Canada K1S 5B6, and 29 rue Jasmin, 75016 Paris, France (for correspondence), dgerwin@carleton.ca

J. Stephen Ferris

Department of Economics, Carleton University, Ottawa, Ontario, Canada K1S 5B6, sferris@ces.carleton.ca

We utilize research on alliance governance structures and on new product development to study how partners working under an existing alliance governance structure will organize a new product development project. Initially, we consider a contractual alliance doing multiple projects and argue that the critical organization decisions for any project are whether one or both partners should be involved, whether the partners should work with little or considerable interaction, and whether decision-making authority should reside in a project manager or be consensual. Based on the answers to these questions, we identify at least four viable project organization options. We next examine the option that would be selected under conditions involving the alliance's newness, whether a cooperative history exists, and the distribution of skills for the project. Under each condition, we compare the costs and benefits of the options with respect to the underlying transaction costs, potential for learning, and the ability to contribute to developing a social relations network. By allowing variations in time-to-market pressures, the tacit knowledge that a partner can obtain from the project, and the partners' need to work closely together on future projects, we can determine the points at which costs and benefits indicate a switch from one organization option to another. Finally, we indicate how to adjust the theory for it to apply to a contractual alliance doing only one project and to an institutional alliance such as a joint venture.

Key words: new product development; strategic alliance; project management; transaction costs; learning; social relations network; time-to-market; tacit knowledge

Introduction

Our concern in this paper is with how partners operating within an established alliance governance structure choose to organize the specific new product development project(s) they intend to carry out. It is now common for companies to work together on new product development (Doz and Hamel 1998, Yoshino and Rangan 1995). Accordingly, it is not surprising to find that in the strategic alliance literature, issues related to the global governance structure for new product development have received considerable attention (e.g., Kogut 1988, Pisano and Teece 1989, Pisano 1990, Williamson 1991, Bonaccorsi and Lipparini 1994, Folta 1998, Gulati and Singh 1998). Such research, on the other hand, has much less to say about the lower-level project organization issues of jointly conducted new product development. At the same time, new product development research has typically focused on managing projects, but only when one firm has the responsibility, even if that firm may work with component suppliers (e.g., Clark and Fujimoto 1991, Brown and Eisenhardt 1995, Griffin 1997, Shenhar 2001, Gerwin and Barrowman 2002). Much less work exists in this literature on jointly managed new product development.

These project organization issues of new product development within an alliance cannot be handled by appealing only to strategic alliance research. First, a project's structure does not necessarily mirror its alliance's governance structure. For example, we will show that an alliance may not have an ultimate individual authority, but a project may be organized through a single project manager. Second, because a project exists within an already functioning alliance, its organization cannot come simply from considering the project as an independent alliance in miniature. A firm, for example, can unilaterally decide not to enter a partnership, but once the partnership exists, it cannot unilaterally choose to do by itself a project within the alliance's agreed on range of products. As another example, we shall also demonstrate that an alliance's governance structure influences the number of organization options available at the project level.

Likewise, due to its focus on a single company, one cannot determine a joint project's organization by turning only to new product development research. Certain significant project organization issues between allied companies add a layer of complexity not typically examined in that literature. As examples, consider whether

one or both partners should do a specific project, and whether the joint project team should make consensus decisions or have a project manager selected from one of the partners.

At the same time, how alliances organize new product development projects should be of interest to academics and decision makers. First, pursuing new product development within an alliance has risen in popularity despite the difficulties encountered when trying to implement such an approach. In part, these difficulties arise because managing new product development within an alliance is inherently complex. Partners typically have considerable difficulty in valuing resource contributions, protecting confidential technical information, creating a social relations network among new product development participants, maintaining a balance of power, and preventing cannibalization of their firms' products by the jointly developed products (Doz and Hamel 1998, Mowery 1992).

Second, if we extrapolate from research findings on new product development done within a single firm, we are likely to find that the organization chosen for a project will influence final project performance in terms of such dimensions as cost and time (Lawrence and Lorsch 1967, Clark and Fujimoto 1991, Cooper and Kleinschmidt 1994, Brown and Eisenhardt 1995). This, in turn, should influence the probability that the alliance will succeed. Third, as we shall see, the type of project organization also influences employee learning and socialization, positive spin-offs that have broader significance for the alliance (Doz 1996, Larson 1992, Ring and Van de Ven 1994).

Our investigation then has two objectives. First, we wish to set out the options available to partners for organizing a new product development project within a strategic alliance. We identify these options as the answers to certain critical questions that can be asked of every new project. Second, we provide guidance on the circumstances under which each option would be selected. Here, we examine the set of project organization options under various conditions. For each of these conditions, we then identify variables that permit us to determine the point at which costs and benefits indicate a switch from one option to another. This allows us to speculate on the basic factors that underlie the selection decision.

Attaining our objectives requires the use of concepts from both strategic alliance and new product development research. We utilize these concepts to establish a framework that embraces a broad array of alliance types. Our procedure is to first develop a theory appropriate for one specific context, and then demonstrate that the theory relevant for other contexts is either equivalent or a special case. Hence, we initially develop a theory for a contractual alliance in which first-time partners undertake multiple new product development projects (and

possibly other types of activities as well). We examine the alliance when it commences, and if it has evolved into a cooperative relationship. A particular strength of our approach is that once this relatively complex situation is handled, the extension to other situations is straightforward. Thus, we show that the same theory also applies if partners cooperated on new product development in prior alliances. We then indicate the adjustments needed for the theory to apply to a contractual alliance involving a single project and also an institutional alliance.¹

In the rest of this section, we discuss the boundaries of our theoretical investigation. Section 2 identifies the set of project organization options in a contractual alliance among first-time partners doing multiple new product development. Section 3 sets out propositions for choosing among these options, assuming that the allying companies have just initiated such an alliance. We then examine in §4, the effect on our propositions if the same alliance evolves into a cooperative relationship. This section also extends the theory to the situation in which the partners have had prior new product development cooperation, and to other situations as well. Section 5 discusses implications and future research opportunities. Section 6 presents some concluding remarks.

Boundaries for the Theoretical Investigation

To define the boundaries of our inquiry, we begin by noting that an alliance's governance structure can be broadly categorized as either contractual or institutional (Doz and Hamel 1998). A contractual alliance is a nonequity relationship among otherwise independent alliance members, based on written agreements and verbal understandings. An institutional alliance involves, as well as contracts, an operating entity such as a joint venture, with equity control by the partners (Harrigan 1988, Zollo et al. 2002). For reasons already given, we concentrate on project management once companies are executing an alliance within an existing overall governance structure, and our initial focus is on contractual alliances.

Second, the organizational issues with which we will deal arise when firms in a contractual alliance share new product development decision making at least for some of their projects. The situation in which one of the companies has the final say on decisions is more in the province of existing new product development research. We also exclude licensing arrangements for technology transfer and contracts that simply exchange design information on previously developed products, because in these arrangements, coordinating the development of new knowledge is not the major concern.

Third, our focus is not at the alliance level, but on the project level. These levels, we believe, have distinct organizational issues because they involve different tasks performed by different types of people. At the alliance

level, top executives provide strategic direction by defining the current and future scope of the alliance's activities, assessing values obtained from and contributions made to the alliance, examining the partners' strategic compatibility, and handling shifts in the relative value of partners' contributions over time (Doz and Hamel 1998). At the project level, mid- and low-level managerial and technical people implement activities by actually developing new products. Product development includes, for example, establishing product requirements, creating a product architecture, doing detailed design, and testing (Ulrich and Eppinger 2000). With these distinct tasks, contingency theory would predict that the alliance and project levels have different organizational solutions (e.g., Mintzberg 1983).

Fourth, our initial interest is in contractual alliances designed to conduct multiple projects. One possibility might be joint development of products aimed at different markets within a broad industry. Another possibility is joint development of a product family through product variations directed at different segments of a market. Still, another possibility would be joint development of a set of products that form complementary parts of a larger-scale system, such as a telecommunications switching network (Langlois and Robertson 1992). Consider the contractual alliance of a North American and a European telecommunications equipment manufacturer for the development, manufacture, and marketing of an asynchronous transfer mode switching network. Their new product development projects included switches, routers, and network management software.

Finally, managers at the alliance level will attempt to forge an umbrella agreement to resolve issues that, predictably, arise when jointly implementing new product development projects. As a general rule, it will often be efficient to handle significant, recurring issues under an umbrella agreement, because resolving them once and for all rather than redoing them over and over again will typically reduce cost. However, given bounded rationality and project uncertainty, the best that can be hoped for at the level of the alliance is that a set of guidelines can be established for handling general cases (Williamson 1985). For each project, the details need to be worked out separately and then embodied in a contract sometimes referred to as a development project agreement. In the telecommunications equipment manufacturers' alliance previously mentioned, each joint project had to be conducted under a separately executed agreement.

The development project agreement may contain aspects, such as a mission statement and a work plan, that often appear in a firm doing its own new product development (see, e.g., Wheelwright and Clark 1992). For our purposes, the agreement is important because it also deals with issues that are not present in a company doing its own new product development. For example,

there is a set of alliance-specific new product development issues relating to the valuation, allocation, and protection of each partner's property. How the partners will value in-kind resource contributions, divide joint sales revenue, allocate resource contributions across companies, and develop and protect intellectual property rights are nontrivial issues. Another example is the set of project organization issues studied in this paper.

Identifying Project Organization Options

Our first objective is to identify the project organization options available for a new product development project. In this section, we focus on the beginning of a contractual alliance among first-time partners doing multiple new product development.

Strategic alliance research identifies at least the following questions for determining an alliance's overall governance structure:

(1) Should a firm work alone or with partners (Folta 1998, Pisano 1990, Pisano and Teece 1989)?

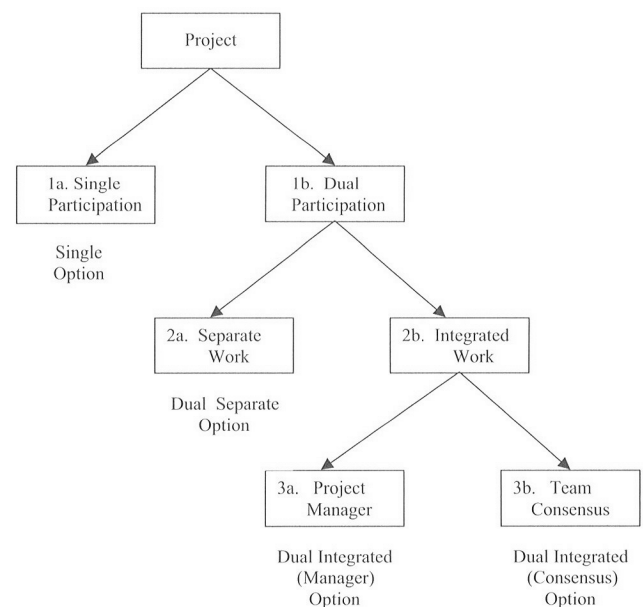
(2) Should an alliance be divided into more or less independent spheres, such as by assigning design to one company and manufacturing and marketing to another, or should the partners fully integrate each aspect of their activities (Doz and Hamel 1998)?

(3) Should an institutional alliance be established or should the relationship be contractual (Gulati and Singh 1998, Kogut 1988, Williamson 1991)?

Suitably rephrased, these questions also define critical project organization issues. As indicated in Figure 1, these project organization issues (rephrased questions) are:

(1) Should there be single (1a in Figure 1) or dual (1b) partner participation in the project? Implicit in 1a is

Figure 1 Project Organization Options



the subsidiary project organization issue of which company will work alone.

(2) If both participate, should they work separately (2a) or should their activities be integrated (2b)? This corresponds to a high-level choice between a modular and an integral product architecture (Ulrich 1995, Baldwin and Clark 2000, Schilling 2000). An example of joint new product development undertaken separately would be one firm designing the core of an aircraft engine and the other designing the fan.

(3) If they integrate their work, should decision-making authority rest in a project manager (3a) or in a team consensus (3b)? Implicit in 3a is the subsidiary project organization issue of which company will furnish the project manager.²

From Figure 1 we can identify four project organization options for an alliance's new product development projects. They correspond to the four paths in the figure that begin from the initial position at the top of the chart labeled "Project" and go to the four different endnodes (1a, 2a, 3a, and 3b). The following four options can be given simple acronyms to describe their essential characteristics:

(1) "Single" refers to the situation in which only one of the alliance companies does the entire project, with a project manager heading up a team of its employees. In the telecommunications equipment manufacturers' alliance, in addition to doing joint projects, each partner also agreed to contribute a different-sized switch.

(2) "Dual Separate" is used to indicate participation by both partners, but with most of the work done separately. Each company has its own roughly independent sphere of specialization, and there is typically little coordination with each other. To conduct its sphere of the project, each company will have a project manager heading up a team. These individuals will interact when integration is needed, as at the beginning and end of a project. Consider the domestic North American contractual alliance between a financial institution and a telecommunications access provider to develop wireless financial services. The financial institution, under a project manager, did the software, service operations, and marketing, while the access provider, using its own project manager, did the network hardware.

(3) "Dual Integrated (Manager)" means that the partners work together on all aspects of the project. A single project manager leads a team composed of representatives from each firm.

(4) In "Dual Integrated (Consensus)," the firms work together on all aspects of the project and authority rests not in a project manager, but in the accords reached by the project team made up of representatives from each company.³ In one of the joint projects undertaken by the telecommunications equipment manufacturers' alliance, there was no individual project manager, and dual representation from each of the key business functions.

Figure 1 also suggests how certain project management issues, defined here as problems normally resolved at the team level, will be dealt with under each option. Project management includes the determination of the project's schedule, the choice of business processes, and the allocation of the assigned budget. It also involves resolving certain technical issues that the project will encounter. For example, a difference of opinion among team members may exist on the significant, but highly uncertain, issue of the nature of market requirements.

With the Single option, the project manager of the company doing the work is ultimately responsible for all of these issues. In the Dual Separate option, the two company project managers have the final say within their spheres of independence. With the Dual Integrated (Manager) option, a single project manager is again responsible. In the Dual Integrated (Consensus) option, the team, composed of individuals from both firms, handles these issues. In this last situation, anything that cannot be resolved under consensus will be passed to the alliance level, but even then there is no guarantee of an agreement.

Selecting a Project Organization when the Alliance Starts

Our second objective is to identify the considerations entering into the selection of the appropriate project organization option for a new product development project. This section deals with the choices at the start of a contractual alliance among first-time partners doing multiple new product development.

Contingencies and Cost/Benefit Factors

The distribution between the partners of the technical knowledge required to do a given project should influence the project organization (Hennart 1988, Pisano and Teece 1989, Ring 1996). Here, we consider two distinctly different skill distributions, recognizing that the first may fit some projects and the second may fit the other projects. In the first instance, the allying firms may have similar technical skills for a project, such that each partner has the knowledge necessary to do it alone. The partners' motivation for working together may be to substantially limit the inherent risks in development or to establish a new industrywide standard ahead of competing technologies. Alternatively, partners, especially in the same industry, may discover that among the projects they need to do, some could be done by both. One of the joint projects in the telecommunications equipment manufacturers' alliance was the development of a router that either company could have done itself. A second skill distribution arises when the firms have cospecialized (complementary) skills for the project (Dyer and Singh 1998, Doz and Hamel 1998, Ring 1996). This will tend to imply that no one company can do the project alone with its existing skill set.⁴

The alternatives of either similar skills (Condition I) or cospecialized skills (Condition II) provide two different contexts under which to investigate the selection of a project organization option. The most important costs and benefits to be considered are (1) transaction costs, (2) the potential for learning from a partner (an amount that may differ from actual learning), and (3) the ability to contribute to the formation of a productive social relations network. We shall also examine the costs of acquiring skills needed to do a project.⁵ As each project organization option represents a different way of coordinating interaction, it will create different behavioral incentives for the partners and result in different benefits and costs.

According to Williamson (1985) and Milgrom and Roberts (1990), transaction costs are the direct and indirect expenses of negotiating, monitoring, and enforcing both explicit contracts (documented agreements on valuation, allocation, and protection and project organization issues) and implicit contracts (verbal agreements on the project management issues). Because we have assumed that an alliance among first-time partners was just initiated, relatively little practical experience exists between the firms that can be put into the umbrella agreement governing conflict resolution.⁶ Most potential disputes must be resolved at the project level. One critical concern in new product development is the lost sales revenue that can arise from negotiating delays on explicit and implicit contractual issues lying on the project's critical path. The costs of achieving agreement to avoid losses stemming from missing the project's market window form a significant part of our transaction costs.

Learning from the partner, as opposed to merely gaining access to its skills, is generally considered one of the most important benefits of an alliance (Doz 1996, Hamel 1991, Khanna et al. 1998). Through such learning, a company acquires new knowledge and fills any gaps in its existing knowledge base. This knowledge gives a firm a new potential to increase the alliance's future profits, but it also creates the ability to appropriate profit within and outside of the alliance (Khanna et al. 1998). Profit appropriation within an alliance occurs when learning eliminates a dependency, and thereby increases bargaining power (Hamel 1991, Inkpen and Beamish 1997). Profit appropriation outside the alliance occurs as a company applies knowledge gained through the alliance to unrelated activities.

Finally, the projects that initiate the alliance represent the first step in the consolidation of a social relations network among new product development participants. A social network represents a set of persons (or organizations) linked by a set of social relationships (Gulati 1998). In our context, we can think of a set of individuals in the partner firms linked by their communications concerning new product development within and between projects. This network, by building norms of trust and

reciprocity, creates the shared expectations and mutual personal obligations that provide benefits in the future as the alliance becomes more established. In this sense, it lowers transaction costs by transferring issues previously settled by formal negotiation and binding written accords to verbal handshake agreements (Lorenzoni and Lipparini 1999, Ring and Van de Ven 1994). In particular, by reducing negotiating delays, a social network lowers the cost of achieving agreement and, thus, facilitates hitting a project's market window. It also allows for learning benefits over and above those discussed earlier. For example, a network of project engineers facilitates the trading of nonvital proprietary new product development data, perhaps on a tit-for-tat basis (von Hippel 1987).

Condition I: Similar Skills for a Project

Table 1 displays the cost and benefit categories for Condition I and indicates an ordinal ranking across the project organization options for each category. The relevant categories are transaction costs and the contribution to developing a social relations network. With similar skills, learning from the partner should be small enough to disregard (Dussauge et al. 2000).⁷ In addition, no important skill acquisition costs exist because each company can do the project alone.

To help explain the ranking of transaction costs, in Table 1, details on the components of these costs are provided in Table 2. Perhaps surprisingly, the Single option will tend to generate the highest transaction costs. The partners do not have significant valuation, allocation, and protection issues to handle because only one of them does the project, and project management issues are not salient because a project manager exists to resolve them.

There is, however, a major project organization issue present. Because each partner is similarly equipped to undertake the project, there is no natural way for them to agree upon which one will do it, and until this issue is resolved, the selected company cannot get started. This is, then, an early critical path issue with significant potential for reducing sales revenues. One reason for the difficulty in agreeing is that the company doing the project, and thus controlling the new product, creates a dependency that will affect the future balance of power in the alliance and, hence, the distribution of alliance profits. Another reason is that the chosen firm may develop a new product in a way that suits its needs more than that of its partner's. As the dispute over who does the project can quickly lead to paralysis, we assign in Table 2 the value of extremely high to project organization costs for this option.

The transaction costs for the Dual Separate option, rated as fourth highest, are based mainly on valuation, allocation, and protection issues. Because these are typical issues that must be resolved for any project, we assigned them a medium value in Table 2. There are no

Table 1 Costs and Benefits for Condition I

Costs and Benefits	Single	Dual Separate	Dual Integrated (Manager)	Dual Integrated (Consensus)
Transaction costs	Highest	Fourth highest	Second highest	Third highest
Network contribution	None	Second highest	Highest	Highest

significant project organization issues, and each firm uses its own project manager to resolve project management concerns.

In the Dual Integrated (Manager) option, transaction costs are rated as second highest. This option presents valuation, allocation, and protection issues similar to those in the previous option. However, one critical project organization item is added. Integrating through a common project manager means that it will be very difficult to decide from which company the project manager will come. Because both firms can contribute a project manager, the one that does will have much more control over the project. Hence, transaction costs must be incurred to ensure that the project manager does not opportunistically use her authority to resolve project management issues in her own firm's interests. One example of these higher costs would be the costs of reviewing and adjudicating company favoritism in specifying market requirements. Because having to decide on a project manager can lead to a more limited form of paralysis than deciding on which company does the project, project organization costs receive a high rating. Once mechanisms are in place to ensure that the project manager does not behave opportunistically, no serious project management issues should arise.

The transaction costs in the Dual Integrated (Consensus) option are rated as third highest. That is, in addition to having valuation, allocation, and protection issues similar to those in the previous two situations, there are the project management issues that arise due to having to achieve consensus. Because the latter costs are typical issues that must be resolved for any project, we rate them as medium in Table 2. There are no project organization issues to be considered.

The entries in Table 1 for each option's contribution to forming a network are straightforward to interpret. Because no joint contact is maintained under the Sin-

gle option, there is no contribution made toward networking. The second-highest level of contribution arises in the Dual Separate option as some work must be accomplished together. Finally, the highest contribution to the network arises in the two Dual Integrated options, because the companies work together throughout the project.

Before selecting an appropriate project organization option for this condition, we first define a dominated option as one that has each cost equal to or higher than, and each benefit equal to or lower than, at least one other option. Using this criterion, Table 1 shows that the Single and Dual Integrated (Manager) options are dominated by the Dual Integrated (Consensus) option, and so can be eliminated from further consideration. Certain more intangible factors also dictate against these alternatives. First, at the start of an alliance, neither firm will want to jeopardize the alliance's stability by insisting upon a potentially divisive argument over control of the project. Second, a status equality norm is likely to exist when both firms have similar skills and have not previously worked together. Neither firm will be willing to signal their acceptance of inferiority by letting the other do the project.

The viability of the Dual Separate option depends on whether technical factors allow the partitioning of the project into fairly independent spheres of activity. In other words, sufficient standardization must exist so that the technical interfaces between the two spheres can be decoupled (Ulrich 1995, Baldwin and Clark 2000, Schilling 2000). To avoid problems of opportunism, each firm's sphere must contain some aspect essential to the new product's functioning. Otherwise, the disadvantaged partner may regret its potential dependence on the other. When no project partition meets these two criteria, Dual Integrated (Consensus) becomes the only viable option.

PROPOSITION 1. *In a recently initiated contractual alliance among first-time partners doing multiple projects, if the partners bring similar skills to a project and can-*

Table 2 Transaction Costs for Condition I

Transaction Costs	Single	Dual Separate	Dual Integrated (Manager)	Dual Integrated (Consensus)
Valuation, allocation, and protection	Low	Medium	Medium	Medium
Project organization	Extremely high	None	High	None
Project management	Low	Low	Low	Medium
Total	Highest	Fourth highest	Second highest	Third highest

not achieve a suitable partition, then Dual Integrated (Consensus) will be the project organization.

When the Dual Separate and the Dual Integrated (Consensus) options are both viable, they offer differing amounts of benefits and costs. Dual Separate has lower transaction costs but makes a smaller contribution to network formation than does Dual Integrated (Consensus). Under these circumstances, conflict over the choice of an option can be avoided by forging a solution that contains elements of both options. Referred to here as the Dual Separate (Joint Teams) option, this composite involves representatives from both companies forming two teams, each having their own roughly independent sphere of specialization. A project manager from each company can then head one of the teams, and so avoid conferring differential advantage to one of the partnering companies. Note that it is only because the firms have similar skills that people from each firm can participate in both teams.

In this hybrid solution, the transaction costs would be about the same as in the Dual Separate option. Any temptation by one project manager to behave opportunistically is countered because the other project manager can retaliate in kind. In addition to providing this mutual safeguard, joint teams contribute about the same amount to network formation as the Dual Integrated (Consensus) option. As a result, this option dominates the other two.

PROPOSITION 2. *In a recently initiated contractual alliance among first-time partners doing multiple projects, if the partners bring similar skills to a project and can achieve a suitable partition, then Dual Separate (Joint Teams) will be the project organization.*

Condition II: Cospecialized Skills for a Project

Table 3 shows that the relevant costs and benefits in Condition II are transaction costs, skill acquisition costs, the ability to learn from the partner, and the network contribution. Because having different skill sets creates a form of information asymmetry, the transaction costs for each of the options will be higher than in the previous condition. However, these increases should be proportional across conditions and, hence, not change the options' ordinal ranking.

Once again, the Single option presents the greatest occasion for opportunism, and so generates the highest level of transaction costs. Transaction costs for Dual

Separate are the fourth highest because they include only the valuation, allocation, and protection issues. Dual Integrated (Manager) has higher transaction costs because the partners face, in addition to the valuation, allocation, and protection issues, the difficult problem of which company will provide the project manager. Transaction costs for the Dual Integrated (Consensus) option are in-between, because they avoid the problems of monitoring the manager, but add the project management issues to the valuation, allocation, and protection issues.

Skill acquisition costs become highest in the Single option. With differing skills, the company doing the project must itself acquire the missing technical knowledge in sufficient time to hit the market window. These costs are second highest in the Dual Integrated (Manager) option. To properly lead the project, the project manager must acquire his missing technical knowledge, once again in sufficient time to attain the market window. While the amounts of these costs in Table 3 may differ between the partners, a company's ordinal ranking conforms to the indicated entries.

There is no learning from the partner in the Single option. Because in the Dual Separate option each partner mainly works independently, not much learning occurs, and the rating is below that of the integrated options. In Dual Integrated (Manager) and Dual Integrated (Consensus), the partners work together throughout the project so that in both instances, the highest learning occurs.

It is possible that learning asymmetries exist that would give one company an advantage over the other in all the Dual options. These differences could arise because a firm's learning depends not only on how much time it spends working with its partner, but on other factors such as its intent to learn, its absorptive capacity, and its ability to access the partner's information (Cohen and Levinthal 1990, Hamel 1991). For the moment, we assume that these factors are symmetric across partners. In this situation, both firms receive roughly the same amount of benefit in a Dual option, and Table 3 provides the ordinal ranking among options. An alternative assumption in which learning disparities occur will be examined later.

In terms of the last category of benefits and costs in Table 3, the ordinal ranking of each option's contribution to the formation of a social relations network remains the same as in Condition I. The contribution either increases or stays the same as we move from left to right in the

Table 3 Costs and Benefits for Condition II

Costs and Benefits	Single	Dual Separate	Dual Integrated (Manager)	Dual Integrated (Consensus)
Transaction costs	Highest	Fourth highest	Second highest	Third highest
Skill acquisition costs	Highest	None	Second highest	None
Learning from partner	None	Second highest	Highest	Highest
Network contribution	None	Second highest	Highest	Highest

table, because each successive option offers either more or equal opportunity than the previous for the companies to work together.

Table 3 demonstrates that the Single and Dual Integrated (Manager) options are dominated by Dual Integrated (Consensus). Intangible factors, such as wishing to avoid a potentially divisive argument and trying to maintain status equality, may provide additional support for eliminating the two options.

In considering the remaining options, the viability of Dual Separate depends on whether technical factors allow dividing the project into the two roughly independent spheres of activity that coincide with each of the partner's skills. Any other partition would require at least one firm to engage in activities for which it does not currently have the skill base.⁸ A division based on the partners' skills also has the advantage of automatically creating mutual dependency as opposed to one-way dependency. Without such a partition, we have:

PROPOSITION 3. *In a recently initiated contractual alliance among first-time partners doing multiple projects, if the partners bring cospecialized skills to a project, cannot achieve a suitable partition, and expect symmetric learning benefits, then Dual Integrated (Consensus) will be the project organization.*

When Dual Separate and Dual Integrated (Consensus) are both viable, the differences in benefits and costs, must be considered. Dual Separate has lower transaction costs, but allows for less learning and makes less of a contribution to network formation than does Dual Integrated (Consensus). Moreover, the partners cannot appeal to the Dual Separate (Joint Teams) solution because their cospecialized skills prevent a company from participating in both teams. The choice between the two options, then, depends upon certain key factors that will determine the priority both partners would give to transaction costs relative to learning from the partner and a network contribution.

We examined three characteristic features of new product development including time-to-market pressures, the amount of tacit learning obtainable through the project, and the integration needs of future projects. Each factor was allowed to take high and low values for purposes of comparison. Given that the partners obtain roughly the same learning benefits, and given the significance of tacit learning for those benefits (Amit and Schoemaker 1993 and Wernerfelt 1984 indicate that tacit knowledge is an important source of competitive advantage), we note that both partners will simultaneously obtain either high or low amounts of tacit learning.

Time-to-market pressures refer to the time until the project must reach the market versus the time it will

take to do the project. For both options, high versus low time-to-market pressures mean that higher transaction costs must be incurred to avoid losing sales revenue from missing the market window (although the ordinal ranking of the two options is not affected). Under high time-to-market pressures, both partners will be more motivated to reduce the number of complex negotiations on the critical path that can cause delay. As Dual Separate deals mainly with the valuation, allocation, and protection issues, while Dual Integrated (Consensus) involves both valuation, allocation, and protection and project management issues, the former option should have fewer delays, and so become the preferred alternative.

Tacit knowledge is information embedded in individuals that is hard to formalize and articulate. Because tacit knowledge is an important source of competitive advantage, the potential for high versus low learning means that more benefits can be derived from learning from one's partner in both options (although the ordinal rankings are not disturbed). With high tacit learning obtainable, both partners will favor lengthy interaction between the project's participants (as this is the means through which tacit learning occurs). Because with Dual Integrated (Consensus) the companies' representatives spend more time working together, this option will tend to be chosen.

Finally, the existence of high versus low integration needs in future projects means that more benefits can arise from contributing to the development of a network (again with the ordinal rankings left unaffected). With high future integration needs, both partners will be more favorably disposed to lengthy interaction among the project's participants. The Dual Integrated (Consensus) option provides more time for the company representatives to become familiar with each other by working together.

Based on this reasoning, we can now establish certain propositions that are summarized in Table 4. All of the propositions assume a recently initiated contractual alliance for multiple projects among first-time partners, and a project involving cospecialized skills and symmetric learning benefits. When time-to-market pressures, tacit learning opportunities, and future integration needs are all low, our reasoning suggests that there is little advantage in one option over the other. However, whenever the two options are roughly comparable, the partners may see different advantages across the options and, thus, come into conflict over their relative judgments. To avoid such unnecessary conflict, a decision rule will be used to facilitate attainment of some supplementary objective. One such rule would be to stimulate creative ideas by choosing the option desired by the firm that initially suggested doing the project. When no supplementary objective exists, tossing a coin will suffice.

Table 4 Option Selection for Condition II with Symmetric Learning Benefits*

	Low Tacit Learning		High Tacit Learning	
	Low Future Integration Need	High Future Integration Need	Low Future Integration Need	High Future Integration Need
Low time-to-market pressures	(4) Use of a decision rule	(5) Dual integrated (consensus)	(6) Dual integrated (consensus)	(6) Dual integrated (consensus)
High time-to-market pressures	(7) Dual separate	(7) Dual separate	(7) Dual separate	(7) Dual separate

Note. *The numbers in each cell represent the corresponding proposition number.

PROPOSITION 4. *When time-to-market pressures, tacit learning opportunities, and future integration needs are all low, a supplementary decision rule will be adopted to choose the project organization.*

When time-to-market pressures and tacit learning benefits are low, while future integration needs are high, the first two characteristics do not favor the selection of one option over the other, but the third characteristic points to Dual Integrated (Consensus).

PROPOSITION 5. *Low time-to-market pressures, low tacit learning opportunities, and high future integration needs lead to the adoption of the Dual Integrated (Consensus) option.*

With low time-to-market pressures, high tacit learning opportunities, and either low or high future integration needs, our reasoning leads to:

PROPOSITION 6. *Low time-to-market pressures and high tacit learning opportunities (irrespective of future integration needs) lead to the adoption of the Dual Integrated (Consensus) option.*

On the other hand, when time-to-market pressures are high, and tacit learning benefits and future integration needs are both low, our reasoning would lead the partners to choose Dual Separate. If time-to-market pressures are high, and one or both of the other two factors are high, consensus might be a luxury. However, the immediate, tangible transaction costs will be of more concern and dominate the mainly future, intangible benefits of learning and/or the network contribution. Dual Separate would be the choice in this situation as well. Hence:

PROPOSITION 7. *High time-to-market pressures, irrespective of tacit learning and future integration needs, favor adoption of the Dual Separate option.*

Finally, we can relax the assumption that the partners receive symmetric learning benefits. Suppose instead that one company enjoys a higher level of learning than the other in all of the Dual options. In this situation, because the amount of a company's learning will be proportional to the time the partners work together in an option, each company's separate ordinal ranking of

options is still indicated by the third row in Table 3. Because the learning disparity will also be proportional to the time the partners work together in an option, the table will exhibit a difference in benefits for the Dual Separate option that is much smaller than the difference for the Dual Integrated options. Even with these adjustments, Table 3 indicates that for either firm, Dual Integrated (Consensus) still dominates the Single and Dual Integrated (Manager) options.

If Dual Separate is not technically viable, then Dual Integrated (Consensus) becomes the only recourse, hence, the asymmetric learning counterpart of Proposition 3 has the same choice of option. To do the project, and perhaps to maintain the alliance, the firm expecting the least learning will accept the situation.

On the other hand, if Dual Separate and Dual Integrated (Consensus) are both viable, we will need to examine time-to-market pressures, tacit learning, and future integration needs. Given that the benefits of learning are asymmetric, a difference exists in the amount of tacit learning obtainable by the partners in either option. This difference is always much smaller in Dual Separate than in Dual Integrated (Consensus), because in the former, the partners work together much less. We allowed these differences in tacit learning to be both either relatively small or relatively large.

Table 5 summarizes the asymmetric learning counterparts of Propositions 4–7. All assume a just-initiated contractual alliance for multiple projects among first-time partners, and a project involving cospecialized skills and asymmetric learning benefits. The counterparts of Propositions 4, 5, and 7 use similar reasoning to choose the same options. The following proposition on low time-to-market pressures and large tacit learning differences (irrespective of future integration needs) deals with a situation that would appear analogous to that of Proposition 6, but does not yield the same result. Contrary to that proposition's outcome, the partners avoid Dual Integrated (Consensus), because the large learning difference between the partners creates a dispute with heavy immediate tangible costs.⁹

PROPOSITION 8. *Low time-to-market pressures and large tacit learning differences (irrespective of future integration needs) lead to the selection of the Dual Separate option.¹⁰*

Table 5 Option Selection for Condition II with Asymmetric Learning Benefits

	Small Tacit Learning Differences		Large Tacit Learning Differences	
	Low Future Integration Need	High Future Integration Need	Low Future Integration Need	High Future Integration Need
Low time-to-market pressures	Use of a decision rule	Dual integrated (consensus)	Dual separate	Dual separate
High time-to-market pressures	Dual separate	Dual separate	Dual separate	Dual separate

Effects of a Cooperative Relationship and Other Situations

Instead of just beginning, the alliance may have evolved into a durable cooperative relationship. A degree of trust and reciprocity now exists, such that riskier or asymmetric arrangements can be more easily negotiated and the potential gains from cooperation more readily realized. Suppose the partners have similar skills for a project (Condition Ia instead of Condition I). Because a cooperative relationship facilitates assent, the project’s transaction costs should be lower in every option. These decreases are likely to be proportional across options and, hence, should not lead to a change in their ordinal ranking.

On the other hand, an evolved cooperative alliance also means that the social relations network has been more fully developed so that the benefits of a contribution to network development may be lower. There is still some advantage, however, in maintaining, widening and deepening the network, and incorporating individuals who are working on a project for the first time. Because these benefits depend on how much time the partners work together in each option, the ordinal ranking should not change.

Because moving to Condition Ia from Condition I does not disturb the rankings of the project organization options on the separate costs and benefits, the counterparts of Propositions 1 and 2 choose the same options. The only possible exception results from additions to the umbrella agreement that may have occurred since the initiation of the alliance. For example, the agreement may now have a clause that facilitates the use of a project manager. The presence of this clause establishes that sufficient trust now exists to overcome the threat of opportunism that a single manager would have created in the past. The clause’s general guidelines then provide some help, but leave details to be worked out on a project-by-project basis. In Table 2, the project organization costs for the Dual Integrated (Manager) option are now lower, creating the possibility that its total transaction costs are now below those for Dual Integrated (Consensus). If so, as indicated by Table 1, the former will replace the latter in the propositions.

Suppose next that the partners have cospecialized skills for a project (Condition IIa instead of Condi-

tion II). As with similar skills, the cooperative relationship should facilitate agreement on all issues and allow transaction costs to be lower for every option without disturbing the ordinal ranking. To the extent that each company has absorbed some learning from the other in the past, each company’s skill acquisition costs will be somewhat lower. Once again, the ordinal ranking should be unaffected, as the skills needed for the Single option should still far outweigh those needed under Dual Integrated (Manager).

The benefits of learning from one’s partner may be smaller or larger. A good deal of information may already have been absorbed so that learning could be smaller (Hamel 1991). On the other hand, greater trust makes each partner more willing to release information previously held in reserve, and each partner has continued to learn from sources external to the alliance (Hennart et al. 1999). Under the assumption that learning is symmetric, the ordinal ranking in Table 3 depends on how long the partners work together in each option, and so should be unaffected. Finally, while we would expect the benefits of a contribution to the continued development of a network to be somewhat lower, the ordinal ranking will again be unaffected because it also depends on how much work is done together.

In sum, if learning benefits are symmetric, the ordinal rankings in Condition IIa are the same as in Condition II. The counterparts of Propositions 3–7, therefore, select the same options. Once again, there might be alterations because of additions to the umbrella agreement.

Finally, the benefits of learning from the partner may be asymmetric. Although one company enjoys a higher level of learning than the other for this project, each company’s ordinal ranking, which depends on the partners’ amount of interaction, remains as indicated in Table 3. As any learning disparity is also proportional to the amount of time the partners work together, the learning entries in Table 3 would reflect a difference in benefits for the Dual Separate option that is much smaller than that for the Dual Integrated options.

Thus, even with asymmetric learning benefits, the ordinal rankings in Condition IIa are the same as in Condition II. Given no relevant additions to the umbrella agreement, the project organization options remain the same, with one exception. In Proposition 8, low time-to-market pressures and large tacit learning differences



(irrespective of future integration needs) led to the Dual Separate option. The partners wished to avoid the dispute over asymmetric learning under Dual Integrated (Consensus). Now the umbrella agreement will have been able to defuse enough of this conflict, so that the disadvantaged company, after working out details at the project level, will not object to its partner's choice of Dual Integrated (Consensus). Hence, in a contractual alliance for multiple projects in which the partners have a cooperative relationship, and for a project involving cospecialized skills and asymmetric learning benefits:

PROPOSITION 8A. *Low time-to-market pressures and large tacit learning differences (irrespective of future integration needs) will lead to the Dual Integrated (Consensus) option.*

The theory also applies to a just-initiated contractual alliance with multiple projects in which the firms have previously worked together on new product development. Their willingness to establish the current alliance implies that a cooperative relationship already exists. Because doing a project in this situation resembles Conditions Ia and IIa (an evolved alliance with a cooperative relationship), the theory for those conditions applies here.

In a contractual alliance for a single new product development project, the project's organization represents a further elaboration of the overall governance structure. It specifies how the mid- and low-level administrative and technical people who will implement the project will relate to each other. The three project organization questions in Figure 1 help identify options in this situation. The answer to the first organizing question is always dual participation. The Single option is ruled out because our concern is only with an alliance in which at least some joint new product development occurs. Because both alternatives are viable for the second question on separate versus integrated work and for the third question on a project manager versus a team, the three dual options are initially available. Dominance considerations, however, lead to a choice between Dual Separate and Dual Integrated (Consensus).

What other adjustments must be made for this situation? For first-time partners, only Condition I or II applies, as no other project will commence if the alliance evolves into a cooperative relationship. When partners have worked together in previous alliances, only Condition Ia or IIa is valid. The variable determining the priority given to a social relations network will be the anticipated length of the project rather than the amount of integrated work contemplated in future projects.

The theory also applies, with suitable modifications, to new product development projects undertaken in an institutional alliance such as a joint venture. Because a project that is conducted by just one of the partners would likely occur within that company's organization rather than within the collaborative venture, the

first organizing question is again moot (see Figure 1). Because both alternatives are viable for the second question on separate versus integrated work and for the third question on a project manager versus a team, the three dual options exist initially.

However, the two integrated options should now exchange their roles in the theory. Dual Integrated (Consensus) should be dominated by Dual Integrated (Manager) as (1) the existence of an institutional hierarchy will nullify the costs of agreeing on a project manager and (2) the close working relationship among the partners, which facilitates learning, should considerably reduce the project manager's skill acquisition costs when cospecialized skills exist.

Discussion

Our discussion covers implications and future research opportunities.

Implications

While it is easy to see why research on new product development projects within one firm is not sufficient for understanding project organization issues, it is perhaps harder to see why research on global alliance governance is not sufficient. To illustrate the importance of distinguishing between the alliance and project levels of analysis, we have emphasized the following differences:

(1) Deciding whether to work alone or in an alliance is different than deciding whether one partner in an alliance or both will do a specific project. The latter decision requires the partners' joint agreement on who will work alone.

(2) At the alliance level, an umbrella agreement usually codifies overall guidelines for organizing new product development projects, but the specificity of each project means that the partners must work out organizational details on a project-by-project basis.

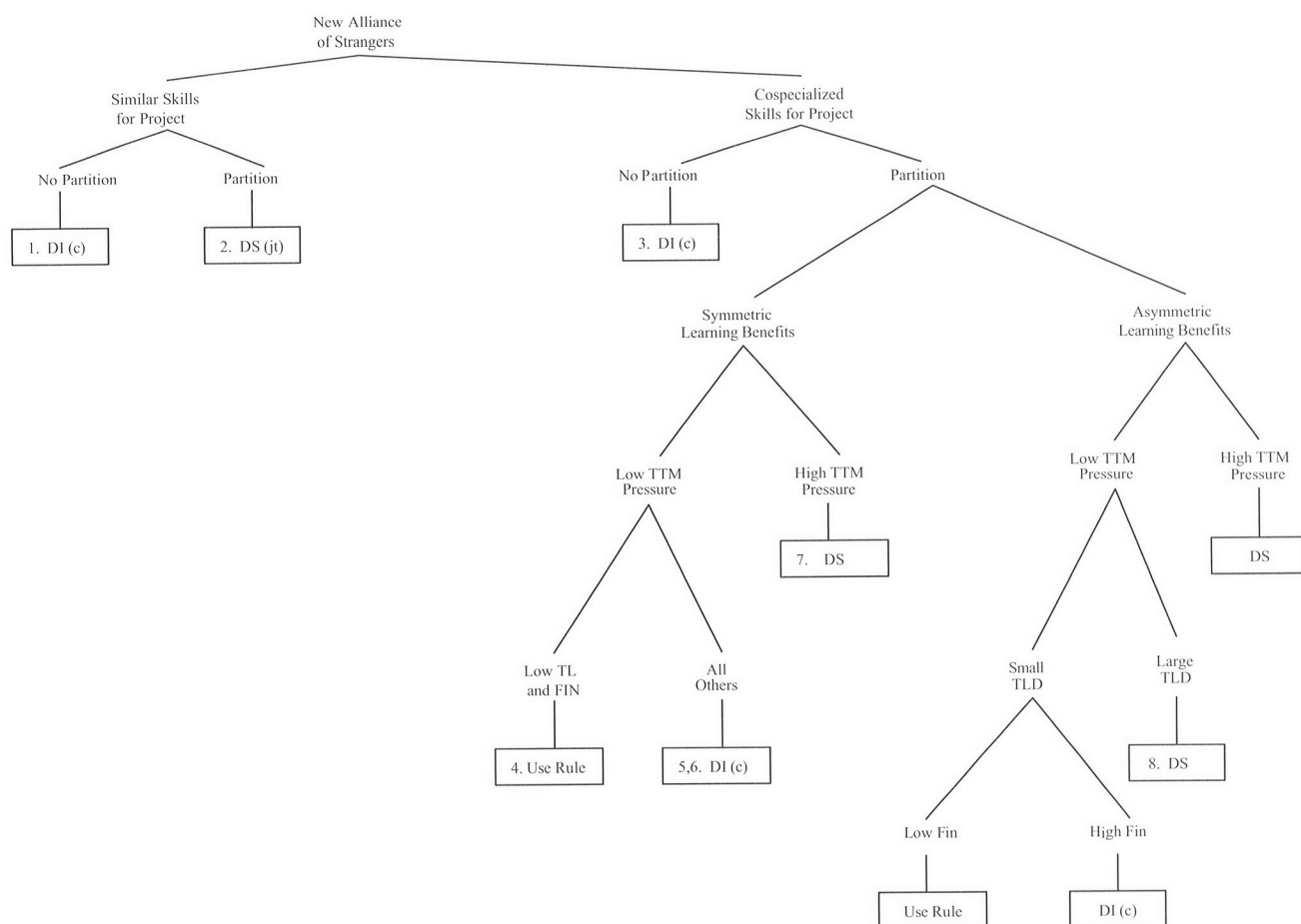
(3) Alliance-level governance in a contractual relationship does not include an ultimate individual authority, yet the partners may agree to have one manager lead a specific project.

(4) At the alliance level, firms typically have either broadly similar or broadly cospecialized skills (Henart et al. 1999), but the distribution of specific skills between the partners at the project level may vary across projects.

(5) The global governance structure of an alliance (i.e., a contractual alliance for multiple projects, a contractual alliance for one project, or a joint venture) influences the number of organizational options available at the project level.

Figure 2 provides an overview of that part of the theory based on a recently initiated contractual alliance between first-time partners doing multiple projects (because in an evolved alliance with a cooperative relationship only one of the propositions changes). With

Figure 2 The Theory for a New Contractual Alliance with Multiple Projects and No Cooperative Relationship



Note. The boxes contain numbers that correspond to the propositions.

similar skills, the inability to partition the project leads to the choice of Dual Integrated (Consensus) or DI (c). If a suitable partition exists, Dual Separate (Joint Teams) or DS (jt) will be the choice.

With cospecialized skills, the inability to partition will also lead to Dual Integrated (Consensus). However, if the circumstances involve a partition with symmetric learning benefits and low time-to-market pressures, then low tacit learning (TL) and future integration needs (FIN) mean that the partners will resort to a decision rule to pick between the two options. Under the same circumstances, all other combinations of tacit learning and future integration needs lead to Dual Integrated (Consensus). If the circumstances change to include high time-to-market pressures, the partners will select the Dual Separate (DS) option.

If the circumstances involve a partition with asymmetric learning benefits and low time-to-market pressures, then small tacit learning differences (TLD) in combination with low future integration needs lead to the use of a decision rule. Under the same circumstances, small tacit learning differences and high future integra-

tion needs indicate Dual Integrated (Consensus). Under the same circumstances, large tacit learning differences suggest Dual Separate. When the circumstances change to involve high time-to-market pressures, Dual Separate will be chosen.

Perhaps surprisingly, a cooperative history (because of prior alliances or the evolution of this alliance) has little effect on the propositions. For example, it does not necessarily lead to the substitution of the Dual Integrated (Manager) option for Dual Integrated (Consensus). Use of the former will depend on what the umbrella agreement can achieve. With such an accord, a project manager's ability to quickly resolve project management issues, especially under high time-to-market pressures, should lead to significant efficiencies.

While a cooperative history may have little effect on the propositions, it can alter the frequencies with which each option is selected. Condition Ia, for example, has lower transaction costs than does Condition I, which should increase the frequency of choosing Dual Integrated (Consensus). This tendency is countered somewhat if in Condition Ia, the partners see less benefit in

further development of a social relations network. Any addition to the umbrella agreement that makes the Dual Integrated (Manager) option less costly further counters the increased frequency of Dual Integrated (Consensus).

Our theory implies the following usage for the options within a contractual alliance (single or multiple project) and an institutional alliance.

(1) Dual Separate (Joint Teams) occurs in any of the alliances, with or without a cooperative history, when the partners bring similar skills to a project and a suitable partition exists.

(2) Dual Integrated (Consensus) occurs in a contractual alliance, with or without a cooperative history, if a suitable partition cannot be achieved.

(3) There is a choice between Dual Separate and Dual Integrated (Consensus) in a contractual alliance, with or without a cooperative history, when the partners bring cospecialized skills to a project and a suitable partition is feasible. This choice depends upon time-to-market pressures, tacit learning, future integration needs (or project length), and whether learning is symmetric or asymmetric.

(4) Dual Integrated (Manager) replaces Dual Integrated (Consensus) in Items 2 and 3 above, if in a contractual alliance, a cooperative history leads to a suitable addition to the umbrella agreement. This option also replaces Dual Integrated (Consensus) under all circumstances in an institutional alliance.

The Single option appears to be viable only in a contractual alliance with multiple projects, and only there when one company has all the skills to do a project while its partner does not. Because one firm has more of the relevant skills needed for this project, an important new benefit is a higher level of product quality than in any of the Dual options. For the same reason, the costs of agreeing on who will do the work should not be as high. One way to ensure low costs of agreeing is to create a mutual safeguard, as when each partner can utilize skills not possessed by the other to develop a product needed for the alliance. In the alliance of the two telecommunications equipment manufacturers, the partners agreed to each contribute a different-sized switch that could not readily be developed by the other.

Future Research

We have examined the influence on project organization of conditions such as the skill distribution, the presence or absence of a cooperative history, and the type of global governance structure. When one firm is responsible for a project, new product development research has examined the impacts of other factors such as the new product's characteristics (see, e.g., Eisenhardt and Tabrizi 1995, Liker et al. 1999, Susman and Ray 1999). Perhaps the most frequently studied characteristic has been the new product's innovativeness (its extent of new versus existing technology), especially if one includes

a related variable, task uncertainty (the extent to which the appropriate functions and features for the new product are unknown). Innovativeness could be examined in our theory through its impact on the three factors determining the priority assigned to each benefit or cost. The uncertainty in developing an innovative product may augment time-to-market pressures. Innovativeness should also increase the amount of tacit learning available from the project, but should have no effect on future integration needs. Other possible influences on project organization could be studied in a similar manner.

Our project organization options represent superstructures within which further structural elaboration occurs in terms of, for example, the amount of authority for the project manager, degree of collocation, type of reward system, and business and technical functions to be represented on the team. When a single company does a new product development project, new product development research has explored how moving from one major phase of the development process to another alters this detailed structural elaboration (e.g., Song et al. 1998). It would be useful to examine the same issue for joint new product development projects.

To provide this research with a specific time orientation, it would be useful to study the sequence of major and minor revisions of a new product within an alliance. Because these revisions often occur frequently, they represent an excellent way to examine how previous choices on collaborative work affect current choices (Argyres and Liebeskind 1999). For example, prior decisions on project organization may limit which options are currently available.

Concluding Remarks

Our theory for the barely studied choice of how to organize new product development projects in strategic alliances directly applies to contractual alliances doing multiple new product development projects, either exclusively or in conjunction with other activities. The partners may initially intend to do new product development or these opportunities may surface as the alliance evolves. The alliance may have first-time partners or firms that cooperated on new product development in the past. Project organization was studied at the start of an alliance and in the event that a cooperative relationship emerges. Finally, we demonstrated that, with certain modifications, the theory also applies to a contractual alliance for one project and an institutional alliance such as a joint venture.

Our approach contributes a number of new building blocks for conceptualizing and theorizing about an alliance's project organization problem. One of our contributions is to distinguish between the alliance level and a project level lying underneath with its own set of concerns. This corresponds to new product development research's distinction between administering a

portfolio of projects and managing an individual project (Wheelwright and Clark 1992, Cooper et al. 1999). Most alliance research has not recognized this distinction.

We also contributed three questions that shape a collaborative project's organization: Single or Dual participation, working separately or together, using a project manager or a team consensus. While these questions resemble certain global alliance queries, they require different considerations for their resolution. In addition, we identified various options that could be used to organize a joint new product development project, the benefits and costs of each option, and variables determining the benefits and costs.

Last, but not least, the hybrid nature of our problem and its solution is matched by the combined relevance of two otherwise distinct literatures. We took concepts such as transaction costs, interpartner learning, and social networks from strategic alliance research and concepts such as portfolio versus product management, modular versus integral architecture, and time-to-market pressures from the new product development literature. In our view, it is indispensable to draw upon both strategic alliance and new product development research for further study of organizing joint new product development projects.

Acknowledgments

This research was supported by a strategic grant from the Social Sciences and Humanities Research Council of Canada (SSHRC) and two Canadian companies. The authors are indebted to Keith Acheson, Darren Meister, and Alan O'Sullivan for their helpful comments.

Endnotes

¹The theory also covers the situation in which new product development opportunities, rather than being designed into the start of a contractual alliance, emerge based on the evolving relationship.

²There are other less significant project organization issues that also arise when one company works alone. They include the amount of authority for the project manager, degree of collocation, type of reward system, and the business and technical functions to be represented on the team. Since a given set of choices on these issues represents a particular variation of any of our four options, each option has innumerable variations. We assume, however, that the partners will adopt the most efficient set of choices for the development of this particular product and use it in all of the four options. By most efficient we mean the set that, as compared to alternative sets, will have the highest overall expected returns given the costs and benefits. The assumption seems reasonable as firms engaged in new product development ordinarily draw on their own learning and commonly accepted "best practices" to make these choices.

³Why do we consider two dual integrated options if having a project manager should make for a more efficient project structure than allowing the team to make decisions? We shall see that there are special costs in selecting the project manager that may outweigh the advantages.

⁴Since the necessary cospecialized skills may vary from project to project, it is conceivable that a project requires a specific skill that neither partner has. Because including this possibility does not alter the theory, we disregard it.

⁵We handled other possible costs and benefits as follows. First, we assumed that the new product's sales revenues minus non-transaction costs do not vary between options. This means that in all four options, the new product is designed to the same requirements, which is analogous to the transaction cost economics assumption that irrespective of the governance option, the characteristics of the product produced are the same. It also means that irrespective of the option, the partners will select the same (presumably most efficient) manufacturing alternative. Second, we did not consider differences in the cost of a project manager's time among the four options, as these differences undoubtedly have smaller orders of magnitude than the costs and benefits already included. Third, we did not include the portfolio risk advantage of the dual options over the Single option, as it would have no impact on our propositions. Fourth, learning by doing (Arrow 1962, Argote 1999) is excluded for the same reason.

⁶If each partner has new product development experience with third parties, routine issues can be codified at the start, but even here the details may need to be worked out at the project level.

⁷Even if we included learning from the partner there would be no change in the propositions.

⁸It seems reasonable that any Dual Separate partition that requires the companies to learn new skills in time to meet the market window will have skill acquisition costs greater than the transaction cost advantage over the Dual Integrated (Consensus) option. Any such partition will therefore be dominated by the latter option and eliminated from consideration.

⁹Even with the dispute over asymmetric learning, the transaction costs for Dual Integrated (Consensus) should still be far less than for the Single option.

¹⁰We have assumed that each company has the same expectations for both firms' learning benefits. Removing this assumption facilitates examining various combinations of misalignments, such as one firm expecting it will have the most learning benefits and the other expecting these benefits to be equal. This might occur if the former believes the content of its learning is particularly significant. For each combination, there are counterparts to Propositions 4, 5, and 7 that choose the same options. Depending on whether or not a conflict exists, the counterpart to Proposition 6 will choose Dual Separate or Dual Integrated (Consensus).

References

- Amit, R., P. J. H. Schoemaker. 1993. Strategic assets and organizational rents. *Strategic Management J.* **14**(1) 33–46.
- Argote, L. 1999. *Organizational Learning: Creating, Retaining and Transferring Knowledge*. Kluwer, Boston, MA.
- Argyres, N. S., J. P. Liebeskind. 1999. Contractual commitments, bargaining power, and governance inseparability: Incorporating history into transaction cost theory. *Acad. Management Rev.* **24**(1) 49–63.
- Arrow, K. J. 1962. The economic implications of learning-by-doing. *Rev. Econom. Stud.* **29**(1) 155–173.
- Baldwin, C. Y., K. B. Clark. 2000. *Design Rules: The Power of Modularity*. MIT Press, Cambridge, MA.

- Bonaccorsi, A., A. Lippardini. 1994. Strategic partnerships in new product development: An Italian case study. *J. Product Innovation Management* **11**(2) 134–145.
- Brown, S. L., K. M. Eisenhardt. 1995. Product development: Past research, present findings, and future directions. *Acad. Management Rev.* **20**(2) 343–378.
- Clark, K., T. Fujimoto. 1991. *Product Development Performance: Strategy, Organization and Management in the World Auto Industry*. Harvard Business School Press, Boston, MA.
- Cohen, W., D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Admin. Sci. Quart.* **35**(1) 128–152.
- Cooper, R. G., E. J. Kleinschmidt. 1994. Determinants of timeliness in product development. *J. Product Innovation Management* **11**(5) 381–396.
- Cooper, R. G., S. J. Edgett, E. J. Kleinschmidt. 1999. New product portfolio management. *J. Product Innovation Management* **16**(4) 333–351.
- Doz, Y. L. 1996. The evolution of cooperation in strategic alliances: Initial conditions or learning processes? *Strategic Management J.* **17**(1) 55–83.
- Doz, Y. L., G. Hamel. 1998. *Alliance Advantage: The Art of Creating Value through Partnering*. Harvard Business School Press, Boston, MA.
- Dussauge, P., B. Garrette, W. Mitchell. 2000. Learning from competing partners: Outcomes and durations of scale and link alliances in Europe, North America and Asia. *Strategic Management J.* **21**(2) 99–126.
- Dyer, J. H., H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Acad. Management Rev.* **23**(4) 660–679.
- Eisenhardt, K., B. Tabrizi. 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Admin. Sci. Quart.* **40**(1) 84–110.
- Folta, T. B. 1998. Governance and uncertainty: The trade-off between administrative control and commitment. *Strategic Management J.* **19**(11) 1007–1028.
- Gerwin, D., N. J. Barrowman. 2002. An evaluation of research on integrated product development. *Management Sci.* **48**(7) 938–953.
- Griffin, A. 1997. PDMA research on new product development practices. *J. Product Innovation Management* **14**(6) 429–458.
- Gulati, R. 1998. Alliances and networks. *Strategic Management J.* **19** 293–317.
- Gulati, R., H. Singh. 1998. The architecture of cooperation. *Admin. Sci. Quart.* **43**(4) 781–814.
- Hamel, G. 1991. Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management J.* **12**(Summer Special Issue) 83–103.
- Harrigan, K. R. 1988. Joint ventures and competitive strategy. *Strategic Management J.* **9**(2) 141–158.
- Hennart, J. 1988. A transaction costs theory of equity joint ventures. *Strategic Management J.* **9**(4) 361–374.
- Hennart, J., T. Roehl, D. Zietlow. 1999. “Trojan horse” or “work-horse”? The evolution of U.S.-Japanese joint ventures in the United States. *Strategic Management J.* **20**(1) 15–29.
- Inkpen, A. C., P. W. Beamish. 1997. Knowledge, bargaining power, and the instability of international joint ventures. *Acad. Management Rev.* **22**(1) 177–202.
- Khanna, T., R. Gulati, N. Nohria. 1998. The dynamics of learning alliances: Competition, cooperation, and relative scope. *Strategic Management J.* **19**(3) 193–210.
- Kogut, B. 1988. Joint ventures: Theoretical and empirical perspectives. *Strategic Management J.* **9**(4) 319–332.
- Langlois, R., P. Robertson. 1992. Networks and innovation in a modular system: Lessons from the microcomputer and stereo component industries. *Res. Policy* **21**(4) 297–313.
- Larson, A. 1992. Network dyads in entrepreneurial settings: A study of the governance of exchange relations. *Admin. Sci. Quart.* **37**(1) 76–104.
- Lawrence, P. R., J. W. Lorsch. 1967. *Organization and Environment*. Graduate School of Business Administration, Harvard University, Boston, MA.
- Liker, J. K., P. D. Collins, F. M. Hull. 1999. Flexibility and standardization: Test of a contingency model of product design-manufacturing integration. *J. Product Innovation Management* **16**(3) 248–267.
- Lorenzoni, G., A. Lippardini. 1999. Leveraging interfirm relationships as a distinctive organizational capability. *Strategic Management J.* **20**(4) 317–338.
- Milgrom, P., J. Roberts. 1990. Bargaining costs, influence costs, and the organization of economic activity. J. Alt, K. Shepsle, eds. *Perspectives in Positive Political Economy*. Cambridge University Press, New York, 57–89.
- Mintzberg, H. 1983. *Structure in Fives: Designing Effective Organizations*. Prentice-Hall, Englewood Cliffs, NJ.
- Mowery, D. C. 1992. International collaborative ventures and the commercialization of new technologies. N. Rosenberg, R. Landau, D. C. Mowery, eds. *Technology and the Wealth of Nations*. Stanford University Press, Stanford, CA.
- Pisano, G. P. 1990. The R&D boundaries of the firm: An empirical analysis. *Admin. Sci. Quart.* **35**(1) 153–176.
- Pisano, G. P., D. J. Teece. 1989. Collaborative arrangements and global technology strategy: Some evidence from the telecommunications equipment industry. *Res. Tech. Innovation, Management Policy* **4** 227–256.
- Ring, P. 1996. Networked organization: A resource-based perspective. *Acta Universitatis Upsaliensis, Studia Oeconomiae Negotiorum* (39). Almqvist & Wiksell, Uppsala, Sweden.
- Ring, P. S., A. H. Van de Ven. 1994. Developmental processes of cooperative interorganizational relationships. *Acad. Management Rev.* **19**(1) 90–118.
- Schilling, M. A. 2000. Toward a general modular systems theory and its application to interfirm product modularity. *Acad. Management Rev.* **25**(2) 312–334.
- Shenhar, A. J. 2001. One size does not fit all projects: Exploring classical contingency domains. *Management Sci.* **47**(3) 394–414.
- Song, X. M., R. J. Thieme, J. Xie. 1998. The impact of cross-functional joint involvement across product development stages: An exploratory study. *J. Product Innovation Management* **15**(4) 289–303.
- Susman, G. I., J. M. Ray. 1999. Test of a model of organizational contributors to product development team effectiveness. *J. Engrg. Tech. Management* **16**(3–4) 223–245.
- Ulrich, K. 1995. The role of product architecture in the manufacturing firm. *Res. Policy* **24**(3) 419–440.
- Ulrich, K. T., S. D. Eppinger. 2000. *Product Design and Development*. McGraw-Hill, New York.

- von Hippel, E. 1987. Cooperation between rivals: Informal know-how trading. *Res. Policy* **16** 291–302.
- Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management J.* **5**(2) 171–180.
- Wheelwright, S., K. Clark. 1992. *Revolutionizing Product Development*. The Free Press, New York.
- Williamson, O. 1985. *The Economic Institutions of Capitalism*. The Free Press, New York.
- Williamson, O. E. 1991. Comparative economic organization: The analysis of discrete structural alternatives. *Admin. Sci. Quart.* **36**(2) 269–296.
- Yoshino, M. Y., U. S. Rangan. 1995. *Strategic Alliances: An Entrepreneurial Approach to Globalization*. Harvard Business School Press, Cambridge, MA.
- Zollo, M., J. J. Reuer, H. Singh. 2002. Interorganizational routines and performance in strategic alliances. *Organ. Sci.* **13**(6) 701–713.