Degree and Type of Inter-organizational Learning Required in Strategic Alliance's First New Product Development Project: The Tradeoff Between Benefits and Risks

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Abstract--**We draw on theories of inter-organizational learning, social networks, and transaction cost economics to examine two strategic options available to a firm in managing a new strategic alliance's first NPD project. These two strategic options are "benefits-driven strategy" and "risk-driven strategy." In the first option, the management may encourage its project team to have a highly intense level of communication, and use rich communication media with the firm's partner team so as to reap maximum benefits of inter-organizational learning. In the second option, due to transaction-cost-economizing considerations and the fear of partners' opportunistic behavior, the management may encourage its project team toward low intensity level of communications, and a lower degree of media-richness.**

Under each option, we identify: the amount and type (tacit vs. simple) of inter-organizational learning required and the risks of partner's possible opportunistic behavior and cost of communication with this partner. We examine the strategic option that would be selected under several conditions and propose the optimum option, based on the trade-offs between the benefits and risk. These conditions are: i) type of innovation (radical/incremental), ii) competitor/non-competitor partners (high/low partners' market overlapping), iii) NPD mode of work (separate vs. integrated) and iv) partners with similarity/complementary technical skills.

I. INTRODUCTION

In recent strategy management and organization studies, three leading perspectives have received an increasing amount of attention from a broad range of audiences: transaction cost economics [1-3], social network theory [4, 5], and interorganizational learning [6, 7]. The transaction cost perspective stresses the efficiency benefits that result from reducing the cost of a transaction [8]. It has focused primarily on economizing transaction costs, and the need to minimize the negative impact of any partner's opportunistic behavior [9-11]. Interorganizational learning deals with how firms gain capabilities from their strategic alliances [12, 13]. The social network approach allows consideration of the strategic alliance benefits from each tie in the network [14]. The social network literature highlights the importance of network structure forms that can be appropriately regarded as beneficial [4, 15]. Researchers have studied the impact of strong and direct ties [16, 17] and weak and indirect ties [18, 19][18, 19] on innovation, and the benefits provided by each to the network actors.

Although these theories have different origins, Powell and Smith-Doerr [20] emphasize the fact that economic action – like any other form of social action – does not take place in a barren social context but is embedded in social networks of relationships. Therefore, they impact each other. Granovetter [21] states that wherever there is economic exchange, there is likely to be social interaction. In other words, network ties also matter. If we recognize that any transaction is embedded in a history of prior relationships and a broader network of relationships, the analysis of transaction costs and contracting issues needs to be significantly revised [22].

By the same token, scholars have argued that interorganizational learning takes place in a social network context. For interorganizational learning to occur in alliances, social network ties between partners are necessary [6, 7]. The literature suggests that there is a positive relationship between social network ties and the degree of learning in alliances [23].

One important implication of firms' embeddedness in social networks is the enhanced trust between firms that can in turn mitigate the moral hazards anticipated at the outset. Trust between firms refers to the confidence that one partner will not exploit the vulnerabilities of the other [24]. Trust is a central issue in social networks and it evolves from past experiences and current interactions [5, 25]. Previous research on interorganizational learning and social network has highlighted the importance of repeated transactions and the existence of previous relationship for the development of strong ties [26]. Larson [27] has shown that strong ties promote and enhance trust, reciprocity, and long-term perspectives. In turn, trust increases interorganizational learning [7, 28]. However, there has been limited research on how these three perspectives (interorganizational learning, transactions cost economics, and social network) interact and impact each other in the early phases of the alliance formation, which is characterized by a lack of prior experience and insufficient trust between partners.

In this article, we focus on new product development (NPD) partnerships, in which the allying firms work together on a project to develop a high-tech new product. We investigate the early phases of the alliance formation and study the alliance's first project, herein referred to as an "alliance's first NPD project." In this specific context (alliance's first NPD project), the process of building social network ties, trust, inter-organizational learning, and economic transactions take place simultaneously. In other words, the learning activities and economic transactions are not embedded in an established social network, as is the case in most prior research. We examine the internal conflict a firm's management may encounter in managing strategic alliance's NPD first project due to the opposing requirements

of maximizing benefits and minimizing risks of working with partners. On the one hand, management may encourage its project team to have a highly intense level of communication, and use rich communication media with the firm's partner team so as to reap maximum benefits of inter-organizational learning. On the other hand, due to transaction-cost-economizing considerations and the fear of partners' opportunistic behavior, a firm's management may encourage its project team toward low intensity level of communications, and a lower degree of media-richness.

We argue that the strategic option selection, whether "benefits-driven strategy" or "risk-driven strategy", results from conditions surrounding the alliance's NPD first project. These conditions make a firm's management take some decisions which will determine the option selection. Our objective is to understand the project- and partner- related circumstances under which a firm's management may favor inter-organizational learning and consequently establish strong ties, or, conversely, favor minimizing the fallout from opportunism and cost burdens and consequently elect to maintain weak ties. We examine the strategic option that would be selected under several conditions and propose the optimum option, based on the trade-offs between the benefits and risk. These conditions are: i) type of innovation (radical/incremental), ii) competitor/non-competitor partners (high/low partners' market overlapping), iii) NPD mode of work (separate vs. integrated) iv) partners with similarity/complementary technical skills. Although these four conditions are discussed in the literature separately, they overlap to some extent. Therefore, we first discuss the two strategic options under each individual condition, and then iv) consider them under a combination of the four conditions.

In this paper, we focus on a contractual alliance. Specifically, we consider non-equity relationships between otherwise independent alliance members based on written agreements and verbal understandings [29, 28, 27, 36] Although an equity-based relationship minimizes the risk of opportunism and may, to some extent, substitute for the lack of trust, not many high-tech companies become involved in this kind of relations. First, an equity-based relationship most likely means that the two companies have to commit to the relationship. In the current technological environment of rapid and unpredictable change, there will always be a better technology outside the relationship. Also, the changes in the environment may lead to changes in the firm's needs and its orientation toward ongoing partnership [29]. Equity-based relationships may actually forgo the potential benefits of better technology, thereby becoming a liability rather than an asset. Second, in a newly formed relationship, there is uncertainty about the competencies of the partner [30]. This may reduce the desire of the companies to engage in an equity-based relationship in the initial stages.

In the next section, we review the literature related to inter-organizational learning and communication, and describe the strategic options available to the firm's management in managing the alliance's first NPD project. We then offer a conceptual model and propositions for option selection under a variety of differing NPD contexts, including i) partners' technical skills (similar vs. complementary technical skills; ii) partners' market overlap (competitors vs. non-competitors); iii) type of innovation (radical vs. incremental); iv) NPD mode of work (separate vs. integrated); and v) a combination of these four conditions. Finally, we discuss implications and future research directions.

II. STRATEGIC OPTIONS IN MANAGING ALLIANCE'S FIRST NPD PROJECT

In this section, we first review the related literatures on type of knowledge and communication. Secondly, we offer the two strategic options of risk minimization and benefit maximization. Under each option, we identify the benefits of inter-organizational learning, the risks of partner's possible opportunistic behavior and cost of communication with this partner, the nature of knowledge (tacit vs. simple) to be exchanged, and the intensity and media-richness of communication required.

A. Types of knowledge and communication

Scholars divide knowledge into two types: **i)** explicit knowledge; and **ii)** know-how, tacit or complex knowledge [31-33]. Explicit knowledge is systematic and easily codifiable; it can be communicated in the form of hard data or written procedures [34]. In contrast, tacit knowledge is hard to formalize or articulate, not easily visible, difficult to codify, and sometimes can only be acquired through experience [35, 36]. In organizations, tacit knowledge involves intangible factors embedded in personal beliefs, experiences, and values. Compared with explicit knowledge, tacit knowledge is more likely to result in advantages that are sustainable, since it is difficult to imitate or transfer [37] [5, 38]. In alliance-based NPD projects, the kind of knowledge that partners seek to exchange is tacit and rather difficult to codify [32]. As a result, alliance partners that are particularly effective at transferring tacit knowledge are likely to outperform competitors who are not [38].

Depending on the kind of knowledge, explicit or tacit, different levels of communication intensity and media richness are required, and consequently, different strength of ties between partners evolves. The intensity level of communication refers to the frequency of interaction and communication between project partners related to task execution [39]. Characteristics of the communication media used is another important consideration in communicating different kinds of knowledge effectively [40]. Communication media have varying capacities for resolving ambiguity, negotiating varying interpretations, and facilitating understanding. Daft, Lengel, and Trevino [41] present a media richness hierarchy, which incorporates five media classifications – in order of decreasing richness: face-to-face, telephone, personal documents such as emails, letters

or memos, impersonal written documents, and numeric documents. The medium's capacity for immediate feedback, the number of cues and channels utilized, degree of personalization, and language variety contribute to a medium's richness [40]. Tacit knowledge transfers better through frequent contact [42] using rich media, such as through direct contact between individuals, when one person advises another about how to complete a specific task [43]. Such strong communication, as indicated by both high intensity and rich media, leads to establishing strong ties linking the partners' development team members [44].

In contrast, explicit and codified knowledge can be obtained using more sterile communications media, from written documents available in paper or in electronic format [45]. In this case, the direct interaction between the source and the recipient project team members is likely to be infrequent. Non-verbal and one-way communications are appropriate to transfer this kind of knowledge. Recipient team members have to interpret and modify the non-codified knowledge, often with no further explanations [44]. Consequently, the intensity level and media richness of communication and interaction needed, based on the type of knowledge to be transferred, may determine the level of investment a firm is willing to make in developing strong ties.

The literature suggests that there is a positive relationship between trust and the degree of learning in alliances [23]. On the one hand, for inter-organizational learning to occur in alliances, strong social ties between partners are necessary [6, 7]. Strong social ties are established through frequent interaction and communication between partners who exchange knowledge and information mutually [7, 46]. Such social ties require time and effort from both sides. On the other hand, sharing sensitive and important information with a partner promotes and hastens trust building [5]. In turn, trust increases inter-organizational learning [7, 28]. Greater trust makes each partner more willing to release information previously held in reserve [47]. It follows that firms sharing information, exchanging knowledge, communicating, and interacting with each other before sufficient levels of trust are built, can use these activities as a mean of building trust. Indeed, in the alliance's first NPD project, where there is a need to build trust, the more likely scenario is give-and-take, in which partners build trust through mutual learning, contributing knowledge and expecting to receive the same. In other words, the learning benefits are symmetric. However, exchanging knowledge and information with a first time partner, as a mean to gain partner's trust, can be very risky. Some firms may actively pursue alliance learning strategies while seeking to prevent their partners from acquiring the needed knowledge [33]. *The question is what would happen if, after investing time and effort in communication and knowledge sharing, the partner turns out to be not trust worthy, or the partner behaves opportunistically during the trust building phase? Does the knowledge the firm may learn from the partner justify the risk?* These are some issues that may face the first-time partners.

B. Management's Internal Conflict: Two Strategic Options

This section presents the two strategic options available to a firm in managing a new strategic alliance's first project. The two options have different impact on the firm's operational level, and each leads to a different strength of relationship with the partner. In the first option "*benefits-driven strategy*", the firm's management may attempt to maximize the benefits of inter-organizational learning and knowledge sharing with the partners. In the second option "*risk-driven strategy*", the firm's management may push toward minimizing the risks of over-cost (due to communication and coordination with the partner) and negative impact of any possible opportunistic behavior. While we recognize that managers are concerned with both benefit maximization and risk minimization simultaneously (co-opetition, [48]), we consider them separately here for purposes of developing theory regarding relationship management practices associated with each. In many cases, we find that the practices we theorize under each option oppose one another. Reconciling these to achieve optimal outcomes is left for future, empirical work.

1) First strategic option: Benefits-driven strategy

In the current highly competitive and globalized marketplace, firms need to develop new capabilities and knowledge to outperform their competitors, gain market share, and survive [49]. Knowledge is vital to competitive success, because firms that know more often develop more sustainable competitive advantages [50] and outperform competitors [51]. Strategic alliances seem an effective means to learn and gain new knowledge [13, 52-54], and to attain ends firms could not achieve alone, or at least not as quickly [5, 55].

Von Hippel [35] states that a production network with superior knowledge-transfer mechanisms among users, suppliers, and manufacturers will be able to "out innovate" production networks with less effective knowledge-sharing routines. Others argue that organizations able to transfer knowledge effectively are more productive than organizations that are less capable of knowledge transfer [45, 56-58]. Inter-organizational learning and knowledge-transfer across partners have many other potential benefits, including enhanced capabilities, creation of new resources [59], improved productivity, innovation, and implementation of strategy [51].

Inter-organizational learning has additional value for first-time partners, in two ways. First, it offers a way to build trust [27]. Second, the amount of knowledge to be learned from a new partner is higher than that which can be attained with an old partner, as most required knowledge has already been transferred. With time, established partners come to know each other quite well. For first-time partners, the learning

opportunity is enhanced because of the potential new knowledge from outside the firm's knowledge base [33].

The more tacit and non-codified the knowledge, the greater the likelihood that the knowledge is valuable for the firm [33]. For high-tech and innovative projects, as the case examined in here, partners' tacit knowledge is what is needed to diminish uncertainty, which characterizes high-tech NPD projects.

When the knowledge being transferred is tacit, the firm's management may encourage its project team to have high communication and interaction with the project partner's team so as to reap maximum benefits of inter-organizational learning. A rich medium of communication will be used to transfer tacit knowledge, including to face-to-face meetings, personnel transfers between partners, and visits and tours of partners' facilities [33, 44, 45, 60, 61].

Option 1:

In the alliance's first NPD project, the desire to learn from, and exchange knowledge with the first-time partner, necessitate having highly intensive and rich communication media.

2) Second strategic option: Risk-driven strategy

In the alliance's first NPD project two risk related issues may be of concern to a firm's management: how to minimize the risks associated with potential opportunistic behavior on the part of the partner, or relational risk [62], and how to minimize transaction costs associated with the project [8]. Alliances yield opportunities for learning races between partners [13], which can lead to opportunistic behaviors that may yield 'private benefits' to the firm, but are costly to the alliance and difficult to control [62].

Alliances create favorable conditions for inter-partner learning and knowledge spillovers and, by doing so, may allow one partner to appropriate and internalize resources that the other partner contributed [63]. Additionally, partner firms may have unequal capacities to learn, resulting in differential rates and amounts of learning even if partners contribution of knowledge are similar [5]. In an alliance's first NPD project, the partners cannot assess each other's "absorptive capacity." The partner that first learns the desired capabilities may then dissolve the alliance, even if the other partner has not completed learning the desired know-how [13]. Over time, substantial knowledge acquisition by one partner can erode the value of the knowledge contributed by the other partner, breaking down the bargaining relationship between the partners [33], reducing motivation to engage in the alliance [64] and forcing a reconfiguration of the relationship [5, 65].

The literature suggests that there are different risk levels of opportunism, ranging from high to low, each representing a different level of threat to the firm. The highest risk is that the partner may become a direct competitor, through the absorption of the partner's unique knowledge and capabilities and willingness to act in a competitive manner [13]. The second risk level is when an alliance partner turns over the knowledge gained through jointly development of the NPD project to a direct or indirect competitor of the other partner. We may consider this as a medium risk for several reasons. The partner who seeks to transfer knowledge and skills learned from the partner firm to its competitor may require time, short or long, to do so, depending on the complexity of knowledge to be transferred. In current dynamic market conditions, knowledge obsolesces rapidly and loses value as a result. Additionally, the more tacit the knowledge, the more likely it will not be transferred precisely, also reducing its value. Because of the time and precision factors, we consider transferring knowledge to the direct competitor as a lower level of threat compared to the partner becoming a direct competitor itself. The third kind of relational risk is "private benefits," in which a firm learns from its partner and applies the knowledge to its own operations in areas unrelated to the activities of the alliance [59]. This is the lowest risk level because, while such knowledge spillovers may benefit the receiving firm, they do not necessarily threaten competition in the arena of the partner firm's interest.

When trust exists, the firm does not fear these circumstances [66] and accepts risks [67]. In the absence of trust or in the period of building trust, as the case with first-time partner, partners may not want to take such risks. A firm's management may feel that they have to protect the firm from possible opportunistic behavior on the part of the partner [28] and may encourage its development team to minimize the exchange of knowledge and information with this partner, and limit it to explicit, rather than tacit knowledge. Under such circumstances, low intensity levels of communication would suffice to accomplish knowledge transfer.

Along with the risk of opportunism, a firm's management may also be concerned with development costs. Firms try to minimize such costs by controlling alliance communication and coordination costs, incurred in decomposing tasks among partners [10, 68]. Communication within a firm comes with its own cost [69]. However, communication across a firm's boundaries is more costly, as there are issues like trust, control, monitoring, fear, and culture differences, all of which render communication between partners more complex. In addition, some aspects of communication that take place between an alliance's NPD project teams may not be related to the project itself (e.g., socializing to build trust). Child [70], for instance, calls for open communication and an intensive exchange of knowledge and information, even if knowledge sharing is not necessitated by current projects. For learning to take place, information or a concept available to one person or group needs to be shared by others who may not need it immediately. These communication activities are often not directly related to a specific project and may distract a project team from its task [44]. This kind of communication is costly as it requires frequent contact between project partners. As a result, the project cost might be higher than expected, leading to less competitive market offerings.

Due to transaction-cost-economizing considerations and the potential for a partner's opportunistic behavior, a firm's management may encourage its development team toward using lower degree of media richness and infrequent communication with the partner with the resulting consequence of establishing weak ties with the partners. Therefore,

Option 2:

In the alliance's first NPD project, the desire to minimize cost and the negative impact of any possible opportunistic behavior of a first-time partner necessitate having low intensity level of communication and using media of low richness.

III. STRATEGIC OPTION SELECTION UNDER SEVERAL CONDITIONS

In this section, our objective is to consider the circumstances under which a firm's management may adopt a benefit-driven vs. a risk-driven strategy. We investigate the trade-off associated with each under five conditions: i) type of innovation (radical/incremental), ii) competitor/non-competitor partners (high/low partners' market overlapping), iii) NPD mode of work (separate vs. integrated) iv) partners with similarity/complementary technical skills. Fig 1 shows the strategic choices and the trade-off between benefits and risks.

A. Type of Innovation (Radical/Incremental)

A central issue in selection of a risk/benefit strategic option is the type of innovation sought in the alliance. A radical innovation may tax existing systems of communication and patterns of collaboration and learning more than incremental innovation [71]. Radical and incremental innovations differ in the degree of new technological content and, therefore, the extent of new knowledge embodied in the innovation [72].

First-time partners involved in developing radical innovations may prefer high levels of inter-organizational learning over risk minimization, for two reasons. First, radical innovations require greater outlay of resources and are riskier than incremental advances [73]; they are inherently more unpredictable and uncertain [74]. This requires that participants engage in more learning rather than relying on their previous knowledge stock, and necessitates the development of new capabilities [72] which are created through a combination of tacit and explicit knowledge [75].

Secondly, the final products in most radical innovation projects are not clearly defined at the outset, given the ambiguity associated with the opportunity. There is a need for goal adjustment and task coordination. This kind of innovation requires that a measure of flexibility be granted to those directly involved with the project [71, 76]. As partners work together for the first time, they need to know about each other functions, capabilities, processes, systems and routines [61] in order to develop the radical innovation successfully. Thus, for radical innovation, tacit knowledge sharing and information exchange is necessary in order to adjust to changes that inevitably arise in the project plan and to enable superior innovation performance.

In contrast, first-time partners involved in incremental innovation may be more likely to adopt a risk minimization strategy. Incremental innovation benefits greatly from

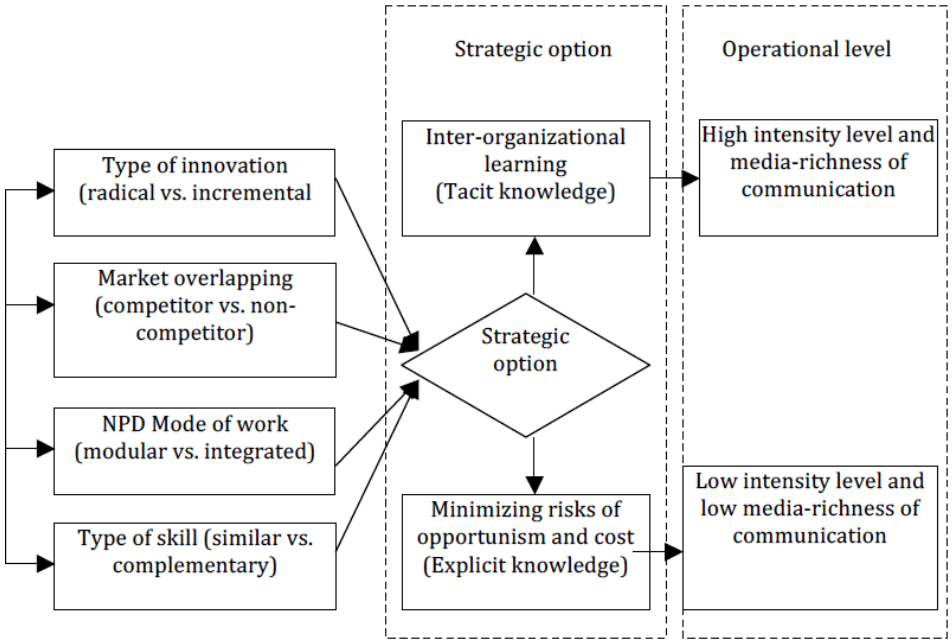

FIG. 1: Strategic Choices and the Trade off between Benefits and Risks

existing competencies, and organizational relationships and demands placed on participants are comparatively lower [72].The final product and the required improvements are largely defined. Partners know to a great extent most product features and characteristics, what to change, and what to retain. Knowledge is more likely to be codified, thereby rendering inter-organizational learning less important than for radical innovation.

1) Benefits/risk tradeoff

Although radical innovative products present great opportunities for firms in terms of growth and expansion into new areas, innovation almost always incurs risk [77]. Radical innovation has a high probability of failure but can be more profitable than incremental innovation [77]. Many radical innovation projects do not achieve their goals and those that succeed in developing new products may still fail in the market. [71].

When a new product fails to achieve its goals, it causes considerable financial loss and embarrassment to its promoters [78]. The firm may lose market share, its competitiveness, customer trust, and brand value. Comparing the possible risk of opportunism to the risk of product failure that may result from limited or insufficient inter-organizational learning and ineffective communication, the first risk seems less important, for two principal reasons. First, by successfully bringing a radically new product to the market, the firm reaps all the advantages that first entrants enjoy over later entrants [79]. First movers tend to earn profits in excess of the cost of capital [80], achieve larger market share, and survive longer than competitors [80]. Some researchers argue that first movers could preempt competitors from accessing valuable space [81] or production resources [82], and benefit from patenting key innovations [83]. In such a nascent competitive arena, it would be difficult for a partner to benefit from opportunistic behavior. Second, inter-organizational learning is mutual between first-time partners. The firm thereby gains new knowledge and skills from its partner. By combining its old and new knowledge and skills, gained from the partner, the firm reinforces its market competitiveness.

2) Cost of communication

With radical innovation, the cost of communication seems less important than with incremental innovation. First, competitive intensity is low for radical innovations, by definition, since the technology and market may just be emerging. Pricing pressure is therefore less of a concern than educating the market and finding application markets that perceive the innovation's value. Second, leveraging partnerships for acquiring new knowledge and skills through investing in high inter-organizational learning diminishes the need to invest in other methods for achieving these objectives. It is true that the cost of the NPD project will be higher, but for the firm this will still be beneficial in that it will save the cost of acquiring knowledge and skills independently. Scholars argue that first entrants achieve cost advantages via learning economies [84], and create cost advantages derived from causal ambiguity and imperfectly imitable knowledge and practices [85]. Thus, we propose the following:

Proposition 1. In the alliance's first NPD project, when partners work on radical innovation, the benefits of inter-organizational learning become more important than the risk of over-cost and opportunism.

B. Partners' Markets Overlap

The competition between partners is represented in this research by their market overlap, and defined as the degree to which two or more organizations overlap each other's domains. Meyer and Roberts [86] provide guidelines for recognizing product domains. The general market is "segmented" into areas ─ market segments ─ representing distinct classes of users. Each segment has specific needs, and each individual need area is called a market "niche." These niches are discovered only through extensive knowledge of the industry, and may change over time [86]. It should be noted that partners with high market overlap may not necessarily have similar technical skills.

Market overlap influences alliance partners' incentives to collaborate [87]. In contrast to cooperative behavior, competitive behavior is disruptive, and harms value [88]. Competitive behavior results in the firm pursuing its own interests at the expense of others [89] and can lead to a potential failure of the alliance. The challenge to managers is to convince the partner to pursue mutually beneficial objectives rather than attempting to gain a larger portion of the alliance benefits [90]. The more the partners' markets overlap, the more difficult it becomes to pursue objectives that are mutually beneficial.

Few reasons can be given as to why competitors may collaborate; certainly inter-organizational learning is not likely to be an objective. Collusion on price or geographic territory allocation is one possible reason [91]. Another is to share the risk and cost associated with product development processes [47, 92]. Again, minimizing development cost is a firms' priority in this context, and organizational learning is what competing firms want to avoid. Although firms may sometimes allocate activities to partners that lack certain capabilities so that the partner can learn by doing, particularly in technology transfer alliances among non-competing firms, this will generally not be a goal in strategic alliances between competitors [92].

Although inter-organizational learning is not among the goals of competing partner, it is very easy to achieve in this context. Research [93] has shown that firms are better able to acquire new capabilities when they already have a competence base that is similar to the new knowledge that they seek. Firms operating in the same business typically share a common competence base because they use similar technologies, satisfy similar customer needs, serve similar

customers, and offer related products. Firms that share similar concerns and face similar problems can more easily learn from one another [94, 95].

The higher the market overlap of partnering firms, the higher the ability for inter-partner learning, and the higher the risk. Inter-partner learning may allow one partner to appropriate and internalize resources that another partner contributed [63]. Allied firms that are also competitors have even greater incentives to use the alliance to acquire capabilities they lack [96], improving their competitive position and reducing their dependence on a partner that is also a rival.

Alliances between competitors can lead to the loss of critical proprietary knowledge and even to the take-over of one partner by the other [97]. Due to the high risk and threat associated with this kind of partnership, firms may withhold knowledge that may be considered detrimental to them if disclosed. Therefore, the firm may try to minimize the communication and interaction between its development team and that of the partner.

Proposition 2. In the alliance's first NPD project, when partners have high market overlap, the benefits of inter-organizational learning are less important than the risk of over-cost and opportunism.

C. NPD Mode of Work (Modular vs. Integrated)

Selecting a benefit maximizing or risk minimizing strategy also depends on whether the development team adopts a modular or an integrated approach to product development. With both approaches, the risks and benefits have, most likely, a linear relationship with each other. For instance, the risks of partner opportunistic behavior and high development cost and the benefits of learning from partners are high when the development processes are conducted in an integrated mode, and lower when the development processes are conducted in modular mode. This linear relationship makes the option selection even more difficult for firms.

Modularity is an approach for organizing complex products and processes efficiently [98]. By decomposing complex tasks into simpler activities so they can be managed independently and produced separately by specialists who are expert in their respective knowledge arenas [99]. Specialists may cooperate with each other while sharing only modest amounts of their knowledge bases. A high-degree of independence [100] between component designs is assured by standardizing component interface specifications [101] ─ what Baldwin and Clark [102] called "design rules" ─ that describe how different parts of the system will interact, ensuring compatibility among system modules produced by multiple firms. Many firms pursue modular product development to shorten NPD lead time; to introduce multiple product models quickly with new product variants; to reduce communication, coordination and production costs as well as time to market; to increase scope and speed of innovation; and to introduce many successive versions of the same product line with increased performance levels [99, 103].

Modularity allows for information hiding [102]; knowledge regarding the inner workings of one component need not be shared with the makers of other components. Each group retains the responsibility for the design and development of its module. First-time partners may successfully develop the product without engaging in high communication and interaction in that there is no need for inter-organizational learning. Consequently, product modularity may reduce the opportunity for and negative impact of opportunistic behavior, in that the partners get limited information about each other's core knowledge and technical capability.

In the absence of trust, as is the case in an alliance's first NPD project, the modular approach may be the optimum choice for product development. However, this choice is not always the preferred. The decision to adopt a modular approach as a way to minimize the negative impact of opportunism and to reduce the cost of development should be compared with the loss of functionality that results from separated development work. Some products need to be developed using an integrated development approach [104] and much may be lost in their separation [103]. The choice between a modular or an integrated mode of work must be based on the product's requirements.

With tightly integrated product development, each component is designed to work specifically with other particular components in a tightly coupled system [105]. If all components must be closely integrated, their production often requires that all individuals involved also work in close contact. This means that partners must be aware of each other's functions and capabilities and have to share the knowledge and information necessary for development activities. Inter-organizational learning is an important factor in this work mode. Partners will require high intensity of communication, and high media richness, which may result in higher cost of product development. As a consequence, the risk of opportunism will be high, in that the partners share knowledge and information, which can be very risky when there is insufficient trust.

If an integrated development approach is important to the quality of product functionality, the firm may compare the risk of opportunism and over-cost not only with inter-organizational learning and knowledge-sharing, but also with the product quality itself. If product quality and functionality are reduced by adopting a modular development mode, risk minimization is not worth the consequences. Trying to protect the company from opportunism and over-cost becomes less important than developing a high quality product and gaining or reinforcing market position. Based on the above arguments, we may suggest the following:

Proposition 3a. In the alliance's first NPD project, when development activities are conducted in a modular mode, the benefits of inter-organizational learning are less important for product functionality than the risk of over-cost and opportunism.

Proposition 3b. In the alliance's first NPD project, when development activities are conducted in an integrated mode, the benefits of inter-organizational learning are more important – for product functionality – than the risk of over-cost and opportunism.

D. Partners with Complementary vs. Similar Technical Skills

Given similar skills, each partner has the knowledge necessary to conduct the NPD project alone. Their motivation to work together may be to substantially limit the inherent risks in development, to establish a new industry-wide standard ahead of competing technologies [47], or to distribute the development cost.

Learning from the partner is generally considered one of the most important benefits of an alliance [13, 54]. Through such learning, a company acquires new knowledge and also fills any gaps in its existing knowledge base [47]. Where similar skills exist, there is little of importance to be learned from the partner [92]. In addition, as partners have similar technical skills, they most likely operate in the same market. If not, it would be easy to switch into the partner's market, especially if one partner gains the necessary knowledge about the partner's market. In such circumstances, both partners will not be interested in knowledge sharing and the most likely information to be exchanged between partners is explicit. Consequently high intensity of communication and interaction are not required. The cost of knowledge transfer and information sharing can be saved, resulting in overall project cost reduction.

Proposition 4a. In the alliance's first NPD project, when partners have similar technical skills, the benefits of inter-organizational learning are less important than the risk of over-cost and opportunism.

In contrast, collaboration among businesses that possess complementary skills is often necessary to provide a means to exploit new business opportunities, since no one business can create all the resources it requires to prosper and grow [92].

When two partners have complementary skills, no one partner can execute the project without the participation of the other [47]. Partners have to combine their resources, knowledge, information, and skills, and also must be aware of each other's functions and capabilities in order to produce a high quality new product. Partners with complementary skills bring distinctive knowledge to the alliance, which, when combined, results in a synergy wherein the combined knowledge endowments are more valuable, rare, and difficult to imitate than they are before they are combined [32]. Consequently, these alliances produce stronger competitive positions than those achievable by firms operating individually. A key element in this highly interdependent development context is tacit knowledge, an important source of competitive advantage [106]. The more tacit learning is achieved, the more benefits can be derived from learning from one's partner [32].

From a risk perspective, as partners' skills differ, they most likely operate in different market segments and serve different kinds of customers. The probability of a partner becoming a competitor in the future is small. In addition, the mutual inter-organizational learning and tacit knowledge exchange between the two partners during the development process will likely positively impact project performance and the final product's functionality. The success of an NPD project, which neither partner was able to implement alone, will encourage the partners to continue their partnership. This is expected to hasten the process of building trust, which in return will reduce the probability of opportunistic behavior.

It should be noted that in this context, the cost of communication – to share tacit knowledge – and cost of coordination – due to high interdependency between partners – are expected to be higher. However, firms need to acquire knowledge to keep their competitive advantage, and this knowledge acquisition comes with a price tag. By working with a partner, a firm will develop a product and acquire new knowledge at the same time. Learning by doing has been shown to be effective [107]. This unique knowledge – gained through costly high communication and interaction with the partner – is likely more valuable for the firm than a cost saving would be.

Proposition 4b. In the alliance's first NPD project, when partners have complementary technical skills, the benefits of inter-organizational learning are more important than the risk of over-cost and opportunism.

IV. CONCLUSIONS

Unlike most of the extant research on alliances, the theory presented here deals with social networks, transaction costs, and inter-organizational learning theories in a climate of low or insufficient trust. Our research investigates newly formed alliances, in which, social ties, economic transactions and learning activities take place concurrently with the process of building trust. Our theory focuses primarily on the alliances' first NPD project, which is a context characterized by lack of prior experience and low level of trust between partners.

We investigate how a firm's management makes a strategic decision at the beginning of an alliance's formation, during which limited information is available, that impacts partner's future relationship. Our objective is to understand the circumstances under which a firm's management may favor inter-organizational learning, or, on the contrary, favor minimizing the fallout from opportunism and over cost.

The logic underlying the framework presented in this paper can be summarized as follows: A firm's management involved in a newly formed alliance will opt to adopt a benefits-driven strategy or adopt risk-driven strategy on the basis of the project's objectives and characteristics of the partners. We have argued that the option selection depends largely on five conditions (similarity/complementary of technical skills, kind of innovation, mode of development

work, degree of market overlap between partners, and combination of these four conditions).

In a benefits-driven strategy, management favors inter-organizational learning and knowledge exchange with the first-time partner. The kind of knowledge needed in this case is tacit in nature. The two partners will have high communication intensity levels, and use communication mechanism that is media rich to transfer tacit knowledge. On the other hand, in risk-driven strategy, the management favors minimizing the possible risk of opportunism and over-cost of the development project, resulting in having low intensity levels of communication, and use media with a low degree of communication richness, in interacting with the partner.

We develop several propositions for how a strategic decision that a firm involves in new alliance take in the beginning of relationship shape the future relationship with its partner. We provide new explanations for how the processes of communication and trust interact with each other and evolve, and what impact, either positively or negatively these processes.

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