Chapter IX

Virtual Organizations That Cooperate and Compete: Managing the Risks of Knowledge Exchange

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‘Co-​opetition’ describes the phenomenon that firms engage in a virtual form of interaction where they cooperate and compete with their counterparts. Such hybrid relationships challenge traditional notions of firm boundaries and strategic resource management. There seems a contradiction in the fact that partners are supposed to share knowledge which is at the same time a key determinant of their competitive advantage. This balancing act suggests the need for special competencies that enable companies to reap the benefits of temporary synergy, while avoiding risks associated with making knowledge available to external partners.

This chapter explores the art of controlling knowledge flows in ‘co-​opetitive’ relationships. We conceptualize types of knowledge flows and dependencies, resulting in four configurations. For each of these, risks in terms of deviations from the original agreement are examined. We propose control strategies that allow companies engaged in co-​opetition to anticipate deviant trajectories and define adequate responses. Directions for future research on this topic are indicated.

THE VIRTUAL ECONOMY

Digital technologies are changing economic relationships for the exchange of products, services, and knowledge. Electronic interaction facilities and information environments complement and substitute traditional business models for customer transactions (Venkatraman & Henderson, 1998). Clients start to experience the Internet as a vast resource of information and a facilitator of their consumption cycles. This ranges from a priori obtaining information on products, services and outlets, to purchasing and
Virtual Organizations That Cooperate and Compete

Ex post support (Schwartz, 1999). In turn, companies approach existing and new clienteles on the Web with a digital identity and experience environment (Breen, 1999).

Behind the emerging digital façade, organizations are changing their operations. 'Virtuality' impacts companies along two lines. First, companies start to operate in a distributed fashion. Electronic media and infrastructure allow employees to interact remotely on the same projects or business processes (Evaristo & van Fenema, 1999). Digital communication infrastructures make real-time and asynchronous connectivity possible, independent of the location of actors involved (Dertouzos, 1999). New organizational forms emerge that translate the advantages of electronic communications into flexible modes for organizing work (DeSanctis & Fulk, 1999).

Virtuality also has a second connotation that is different but often interacts with the first one. It implies cooperation among multiple companies in such a way that a quasi-organizational entity emerges. Traditional business models assume that each firm is responsible for a well-defined and complete portion of the supply chain. This relative independence is transformed to a tissue of firms that are strongly connected. Market opportunities trigger combinatorial processes that result in ad hoc forms of cooperation (Meyerson, Weick, & Kramer, 1996). Each firm contributes interactively to a coherent, aggregated performance that individual organizations could not achieve (Goldman, Preiss, & Nagel, 1997). The intricate connectivity among contributing firms implies exchange of valuable resources like knowledge and information. In this chapter, we are interested in organizations that form a quasi single entity but have interests that partially diverge (Preiss, Goldman, & Nagel, 1997).

KNOWLEDGE EXCHANGE AND CO-OPETITION

Theorists adopting a resource-based approach to strategic management have emphasized a firm's need for unique, internal resources and competencies (Nelson & Winter, 1982; Wernerfelt, 1984). Further refinements and extensions stress the role of corporate competencies to enable dynamic adaptation and competitive advantage (Barney & Hesterley, 1996). Ever since the contribution from Penrose (1959), this approach has recognized the importance of knowledge as one of the supreme enablers of competitive differentiation. Recently, some papers in Strategic Management Journal, in particular the Winter Special Issue 1996, and in Organization Science proceeded along this route by investigating synergies of knowledge management and strategic management theory (Grant, 1996a). From multiple perspectives this growing body of literature contributes to our understanding of managing knowledge transfer, integration and creation within corporations (Nonaka & Takeuchi, 1995).

In addition to intra-corporate knowledge sharing, some academics have started to investigate knowledge sharing processes across organizational boundaries (Loebbecke & van Fenema, 1998; Wathne, Roos, & von Krogh, 1996). Knowledge sharing has been defined as "the transfer of useful know-how or information across company lines" (Appleyard, 1996: 138). Research on inter-organizational knowledge sharing recognizes the fact that firms are nowadays involved in multiple temporal or more permanent agreements for cooperation (Kodama, 1994). Organizations find temporary modes for leveraging knowledge as one of their primary resources.

However, inter-organizational collaboration may confront companies with a para-
dox (Hamel, Doz, & Prahalad, 1989). On the one hand, reciprocal knowledge sharing may enhance the summed and individual added value. Partners can translate unique, hardly accessible resources from their counterparts into new business opportunities. However, from a resource-based perspective, inter-firm knowledge sharing may affect the uniqueness and thus competitive contribution of a firm's knowledge repository. Opportunistic behaviors of counterparts may make anticipated benefits of cooperation and result in unevenly distributed value. In their book Co-operation, Brandenburg and Nalebuff (1996) point to the potential tension of relationships where firms cooperate and compete, the latter possibly in other markets or at other points of time. Since companies increasingly open up to engage in these hybrid organization modes, it becomes important to understand and develop the phenomenon (Loebeke, van Fenema, & Powell 1999).

The purpose of this chapter is to investigate strategies for controlling knowledge as one of the primary resources in 'cooperative' relationships. We investigate inter-firm collaboration involving knowledge with assumed operational and business value beyond the context of the cooperative agreement. We assume that both parties can translate the collaborative knowledge into adjacent or overlapping business capabilities and hence exploit additional opportunities beyond the collaboration. This suggests partially diverging interests between collaborating partners and motivates the development of a strategic perspective on managing knowledge flows across organizational boundaries.

We discuss background theory on inter-organizational governance and elaborate modes for controlling inter-firm transactions. We interpret the strategic issues and paradoxes of inter-firm knowledge sharing as a problem of coordinating and controlling the behaviors of people within the corporation as well as exchanges across organizational boundaries. The chapter then develops a concept for distinguishing knowledge flows, and presents four configurations of knowledge exchange in virtual organizations. For each of these we examine potential risks and control strategies.

GOVERNANCE OF INTER-FIRM TRANSACTIONS

Virtual organizations operate in a fluid environment with little enduring connectivity among participating firms. For that reason, transactions among these firms become a pivotal unit of analysis (Williamson, 1994). Transaction Cost Economics (TCE) has structured our understanding of governance transactions by contrasting markets and hierarchical forms of exchange (Williamson & Ouchi, 1981). Determinants of economic governance modes include environmental factors like uncertainty and the number of transactions. In addition, a set of assumptions concerning human behaviors play a role, like bounded rationality and opportunism (Williamson, 1975). Market governance typically applies to situations where reciprocal performances are specified in detail (Williamson, 1994). Contracts thus facilitate the process of ensuring compliance between intended and actual exchange, leaving little room for opportunistic deviations (Ouchi, 1979). An alternative to market governance are internal organizations which are characterized by extensive horizontal and vertical differentiation (Rice & Shook 1990). The functioning of individuals being part of such a 'bureaucracy' is closely prepared, tracked, and evaluated. Moreover, the availability of collective experience implies refined communication processes that allow actors to economize on problem solving. For that reason, internal governance forms are apt to handle transactions that concern incompletely specified activities (Williamson, 1975).
New Perspectives on Transaction Governance

Scholars have extended the original premises of TCE in several directions. First, the rational perspective on the operation of bureaucracies is complemented with insights from Japanese firms (Ouchi, 1979). Ouchi suggests a clan mode of organizing. The selection and promotion of individuals is not only based on task-related competence, but also relies on their commitment to company goals. In the *Academy of Management Review*, More, Ghoshal and Moran (1996) critique the underlying assumption of TCE that individual behavior is driven by opportunism. They warn that organizations may translate this assumption into coercive control systems that rely on measurable behaviors and work outcomes. As a consequence, firms may recede from work that requires fluid adaptation and instead focus on specifiable work. In turn, companies may fail to leverage one of their original advantages over markets: their capability to accomplish innovative work and achieve dynamic efficiency (Ghoshal & Moran, 1996; Williamson, 1991).

Second, researchers nuance the opportunistic drive of firms operating in markets (Macneil, 1978). Organizations may decide to build sustainable relationships and focus on common interests (Kumar & van Dissel, 1996). Situations where instantaneous exchanges of tightly controlled performances are not feasible may necessitate closer examination of the counterpart’s identity to still ensure quality (Ben-Porath, 1980). For example, transactions evolve over time and need reciprocal interactions among firms to identify expectations (Roussas & McLean Parks, 1993; Thompson, 1967). This occurs in large, complicated projects where parts of the work are outsourced or even subcontracted to different firms (Bryman, Bresnen, Beardsworth, Ford, & Keil, 1987). Similarly, empirical research claims that relational contacts provide the primary means for governing transactions in regional network structures (Powell & Smith-Doerr, 1994), like the Italian industrial districts (Kumar, van Dissel, & Bielli, 1998; Lazerсон, 1995).

A third stream of research claims that firms mix elements of ‘price’ (market governance), ‘authority’ (hierarchy) and ‘trust’ (clan modes) to sculpt their internal operations and exchanges with other companies (Bradach & Eccles, 1989). Bradach elaborates examples of these hybrid or plural forms. His research on restaurant chains shows that these organizations combine internal bureaucracy with a franchising network to create large numbers of outlets that have the same outward appearance to customers (Bradach, 1997). In fact, this quasi single entity provides an example of a virtual organization as different governance forms are combined to pursue (temporarily) shared business objectives.

Finally, researchers have explored the variety of coordination mechanisms employed in inter-firm relationships (Grandori & Soda, 1995). Depending on contingencies like the type of workflow interdependence and structurability, organizations choose models for interacting and planning exchanges (Grandori, 1997; Kumar & van Dissel, 1996).

CONTROL STRATEGIES

Coordination and control approaches have dominated organization theory, and are still at the core of scholarly thinking on organizational phenomena. Theorizing has long followed two separate lines of inquiry, with one group focusing on intra-corporate linkages (Chandler Jr. & Daems, 1979), and other scholars studying inter-firm strategies
for managing transactions (Williamson, 1975). As indicated, the field starts to intermingle both perspectives as more complex, hybrid forms emerge that combine elements of both (Diabula & Eccles, 1989). In the spirit of that emerging tradition, we categorize control strategies along four dimensions. We briefly introduce both intra- and inter-firm equivalents, to be used later on when we investigate the control of knowledge exchanges. Intra-organizational coordination and control refers to the mechanisms that structure, execute and evaluate organizational task accomplishment (Ching, Holsapple, & Whinston, 1992). Management of inter-firm tasks includes contractual formalization as well as inter-organizational rules like liaisons or project teams (Grandori, 1997).

Procedural strategies indicate a process of conceiving work beforehand, and documenting that understanding in formal boundary objects like schedules, plans, and generic work instructions (Star & Griesemer, 1989). The same principle returns in case of inter-firm transactions; classical contracts govern exchanges that are “sharp in by clear agreement; sharp out by clear performance” (Macneil, 1974: 738). The fact that work is a priori conceived and prescribed implies that control efforts are simplified to monitoring for deviations in the actual execution of work (O’Reilly & Chatman, 1996).

Organizational structures stand for the design of roles that are interconnected and intended to enact the control process (Gupta, Dinsmore, & Fogarty, 1994). Within organizations, vertical control relationships are embedded in a managerial hierarchy, while lateral roles include peer assessment (McCann & Galbraith, 1981). The responsibility for inter-firm transactions are often exclusively delegated to liaisons or formal linking pins (Grandori, 1997).

Social control strategies refer to norms governing interpersonal communications in working relationships (Gabbarro, 1990), groups (Barker, 1993) or organizations (Kunda, 1992). Actors shape norms for behaviors and monitor each other to ensure compliance (Schein, 1992). Organizations may also foster relationships across their boundaries as actors on both sides get to know each other (Ben Porath, 1980), and can identify with their counterparts’ preferences and interests (Bryman et al., 1987).

Technology supports the process of work definition, and monitoring actual behaviors and outputs. Traditional forms like mechanization (Edwards, 1981) have been complemented with advanced monitoring devices and integrated business applications like ERP (Orlikowski, 1991). Technology also supports inter-organizational transactions with EDI, supply chain applications, and access to intranet or databases (Kumar & van Dissel, 1996).

**KNOWLEDGE-INTENSIVE TRANSACTIONS IN VIRTUAL ORGANIZATIONS**

Research on strategic knowledge management has predominantly focused on cognitive processes within a firm’s boundaries (Nonaka & Takeuchi, 1995). These processes include creation of knowledge, making tacit knowledge explicit (Nonaka & Takeuchi, 1995), knowledge transfer (Szulanski, 1996) and knowledge integration (Grant, 1996b). The importance of knowledge management for intra-organizational processes equally applies to inter-firm transactions. Companies are engaged in diverse modes of external cooperation (Diabula & Eccles, 1989), and the life cycle of goods and services becomes more knowledge intensive (Grant, 1996b). Our analysis of knowledge exchange in inter-firm relationships proceeds along three lines. First, we expand on the
distinction between tacit and explicit knowledge, and provide examples for our argument. Second, the direction of knowledge flows between organizations is elaborated. Finally, we propose a model that combines these dimensions and provides a steppingstone for analyzing risk control strategies.

**T tacit and Explicit Knowledge Flows**

Literature provides a rich basis for exploring the different types and characteristics of knowledge. Defining the concept itself seems a more feasible challenge for philosophers and social scientists. Hence, as an alternative, we pursue Grant’s (1996b) suggestion to focus on *types* of knowledge and their consequences for managerial actions (Machlup, 1980). Knowledge is commonly distinguished in explicit and tacit knowledge, as initially proposed by Polanyi (1967). These two types have influenced subsequent conceptual and empirical research on strategic and organizational knowledge management (Kogut & Zander, 1992; Nonaka & Takeuchi, 1995). *Explicit knowledge* refers to concepts, information and insights that are *speakable*, and that can thus be formalized in rules and procedures (Walsh & Dewar, 1987). Access, storage and transfer of this knowledge is achieved by corporate documents and information systems like databases. Examples include detailed engineering specifications for software development or product manufacturing which capture and support inter-human communications (Star & Griesemer, 1989).

On the other hand, *tacit knowledge* refers to less *speakable* insights and skills which are carried in individuals’ minds or embedded in an organizational context (Weick & Westley, 1996). Employees develop and refine collectively routines to achieve organizational innovation and learning (Nelson & Winter, 1982). March and Simon (1958: 142) referred to ‘programs’ to describe these routines: “Most programs are stored in the minds of the employees who carry them out, or in the minds of superiors, subordinates, or associates.” Understanding and transference of this type of knowledge depends on direct participation and inclusion in the context where it resides (Tyre & von Hippel, 1997). Researchers refer to this phenomenon as ‘stickiness’ (Szulanski, 1996), and pointed to the arduous process of explaining or even integrating tacit knowledge (Grant, 1996a). Exchanging tacit knowledge across organizational boundaries is supposed to exacerbate these issues as professionals lack a set of commonly shared concepts and values provided by an organization’s culture (Weick & Westley, 1996).

**Direction of Knowledge Sharing**

Inter-organizational knowledge sharing is achieved by patterns of transmitting and receiving information. These knowledge-based workflows may take the characteristics of one-way traffic. For example, in an outsourcing agreement, clients share knowledge with their vendors to enable delivery of the product or service (Iltame et al., 1989). This does not necessarily mean that a reverse flow exists, that is, vendors sharing knowledge with their clients. We call this *unidirectional* knowledge sharing. One-way knowledge flows also occur in organizations like marketing research or news agencies that even make their business of selling knowledge and expertise.

On the other hand, in many cases the underlying logic of collaboration suggests bidirectional or *reciprocal* knowledge flows. The legacy of such cooperative endeavours relies on integration of complementary knowledge and competencies. Hence, reciprocal sharing of knowledge is a principal determinant for reaping the anticipated benefits of
cooperative synergies. These include taking advantage of complementary knowledge and synergistically creating knowledge. An example is collaboration of R&D units where companies share costs by jointly investing in development and manufacturing facilities. Often, like in the semiconductor industry, collaboration is required as investments would exceed an individual firm’s resources and require economies of scale.

On an operational level, the different modes of knowledge exchange are associated with different types of workflow interdependencies (Thompson, 1967). Unidirectional, one-way knowledge flows are of a pooled or sequential nature. They comprise subsequent steps of identifying and transferring in a single direction prior agreed-upon knowledge and information. On the other hand, organizations engaged in reciprocal knowledge sharing face more complicated workflows. Managing these requires inter-firm taskforces of professionals to elaborate and mutual knowledge exchanges. The work of such a team flows back and forth between both organizations and has been referred to as reciprocal (Thompson, 1967) or team interdependence (Van de Ven, Delbecq, & Koenig Jr., 1976). This interactive mode of cooperation implies that specifying the scope and content of the flows is often not feasible (Kumar & van Dessel, 1996).

Model for Analysis

When the two dimensions are combined, an interesting model emerges as depicted in Table 1. We refer to each type of interaction among the variables as a configuration. The use of configurations for investigating organizational phenomena is a common approach in organization science (Meyer, Tsui, & Hinings, 1993). Scholars like Burns and Stalker (1961) and Mintzberg (1979) have built typologies of organizational forms. Choosing relevant variables, they reduce real-life complexity to a limited set of templates. In our case, each configuration epitomizes how virtual organizations can be interconnected. Their distinct properties have different implications for potential risks and control strategies. After the next section, we explore and illustrate each configuration successively.

**CO-OPETITION AND THE RISKS OF KNOWLEDGE FLOWS**

Virtual organizations involved in cooperative but competitive relationships may experience deviation between intended and actual knowledge flows. Be it deliberately or unconsciously, parties may have different perspectives on the direction and boundaries of knowledge sharing.

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<tr>
<th>Table 1. A model for inter-firm knowledge flows</th>
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<td><strong>Explicit, structured knowledge flows</strong></td>
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<td>Configuration 1: Outsourcing strategies:</td>
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<td><strong>Configuration 2</strong>: Exchange of complementary</td>
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<td><strong>Explicit, nonstructured knowledge flows</strong></td>
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<td>Configuration 3: Client-supplier nexus</td>
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<td><strong>Configuration 4</strong>: Collaboration of R&amp;D units</td>
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the knowledge component in their exchange relationship. Understanding these risks is important to avoid undesirable distribution of valuable knowledge at the end of the cooperative life cycle. We assess here for the dimensions presented in Table 1 potential deviations between originally assumed and actually evolving knowledge interactions.

**Explicit Knowledge Flows**

Knowledge that is *explicit* can be specified and documented. This enables storage, transfer and sharing by means of corporate documents or information systems. Coordinating these flows requires determining which knowledge companies are willing to share, and reaching agreement on transfer modes. Contracts formalize the contents, the procedures and the deliverables, supplemented by control procedures to verify that actual delivery of knowledge occurs within contractually predefined standards. However, as earlier indicated, our focus is on companies sharing knowledge that both can leverage to adjacent business opportunities beyond their initial agreement. Hence, access to partners’ knowledge repository seems a tempting opportunity to absorb knowledge in excess of priorly agreed-upon boundaries as defined in the contract. This may include collecting more knowledge of the same-type parties formalized in the contract. Alternatively, a company tries to pull tacit knowledge on top of the explicit knowledge that was specified in the contract. An example of such ‘overgrazing’ behavior is an outsourcing agreement in which the vendor indicates its need for more detailed specifications and in-depth corporate knowledge that does not bear direct relevance to the execution of the contract (Hamel et al., 1989).

**Risks of Tacit Knowledge Flows**

Virtual organizations that agree to share *tacit knowledge* expose themselves to the risk of minimally specified interactions. The embedded, intricate nature makes it difficult to confine these knowledge exchanges in advance. Assuming some degree of opportunistic behavior, the receiving firm may employ dynamic tactics to enlarge the flows beyond initial agreements. Similarly, an organization pretending to share tacit knowledge may in practice structure knowledge flows and thus reduce the value of cooperation to its counterpart.

**Risks Related to Direction of Knowledge Flows**

Unidirectional knowledge flows occur when companies subscribe to a research agency to keep them updated on market trends and developments. At the outset, the agency is supposed to deliver valuable information to its clients, for example by means of a controlled Internet environment. Yet in an attempt to customize its products or resell client-related information, it may track and trace clients’ search behaviors. Unilateral provision of knowledge thus transforms into reciprocal exchanges, a possible deviation from the clients’ original intentions.

The inverse situation occurs when partners agree upon reciprocal exchanges. Firms formally agree upon collegial collaboration and the necessity of bidirectional information flows. However, if firms pursue a resource-based strategy, they may attempt to restrict mutual sharing to one-way knowledge absorption. Hamel, Doz and Prahalad (1989: 138) quote managers from a Japanese firm employing this strategy: "we don’t feel any need to reveal what we know. It is not an issue of pride for us. We’re glad to sit and listen. If
we're patient we usually learn what we want to know.)

Of course, combinations of the risks discussed so far may surface. The next four sections assess for each configuration possible deviation strategies and modes for controlling these.

**UNIDIRECTIONAL, STRUCTURED KNOWLEDGE FLOWS (CONFIGURATION 1)**

In a strategy aimed at concentrating and nurturing core competencies, increasingly firms outsource peripheral business services like IT projects, marketing, and investment management (McFarlan & Nolan, 1995). To some extent, vendors need corporate knowledge and information to provide their services, and client firms will hence allow vendors to pull from their know-how repository. Our focus here is on the unidirectional transmission of explicit knowledge, like specifications for building and maintaining software. In principle, the outsourced activities do not bear strategic relevance to the client’s business, implying a low risk knowledge flow. Yet both client and vendor may run the risk that exchanges evolve in an undesirable manner.

First, vendors may attempt to absorb more (tacit) knowledge than initially agreed upon, a change to Configuration 3 in Table 1. As they are nested in a particular industry and serve clients with competitive positions, they may build increasingly sophisticated industry-specific knowledge and use it synergistically in their network. If a client’s knowledge is thus leveraged to the vendor’s clientele, it becomes a commonly shared good and may lose its uniqueness. In addition, vendors may collect industry-specific know-how to strengthen their competitive position. This enables them to bypass clients and enter their market. Second, clients may change the direction of knowledge flows from unidirectional to reciprocal, encouraging vendors to display their internal competencies (a shift to configuration 4 in Table 1). Incorporation of this know-how decreases the uniqueness of the vendor’s performance and hence its competitive position.

**Control Strategies**

We outline strategies for controlling transitions of exchange relationships using Figure 1. Continuing our example, Company A stands for the client, Company B for the vendor. Knowledge is supposed to flow one-way from A to B. At each organization three teams are involved in the transaction process. Since the transaction concerns the structured transmission of knowledge, it is formalized in detail. The contract specifies which knowledge will be shared, how transmission will be organized, and what procedure will be followed for special requests. The structure of the process substitutes for direct interactions between staff. The articulated character of the knowledge

![Figure 1: Controlling the unidirectional flow of structured knowledge](image-url)
enables transfer modes with low information processing capacity, such as document handovers or controlled access to databases (Daft & Lengel, 1986). Company A reinforces prevention of undesirable knowledge leakage by indirect organizational structures (Petrow, 1999). That is, a centralized coordinator assembles knowledge intended for the external partner prior to the actual exchange process (Allen, 1984). Interaction with Company B is exclusively handled by this gatekeeper, either in person or by controlled access to a digital environment.

Unilateral flows imply that teams at Company B (the vendor) have only direct contact with A’s liaison. B can avoid reciprocal interactions between teams at both sides by sticking to that procedure. Enforced by internal guidelines, this approach substitutes for an elaborate safety structure like A has.

**RECIPROCAL, STRUCTURED KNOWLEDGE FLOWS (CONFIGURATION 2)**

Presence in, and knowledge of local markets often differs between companies having comparable R&D and marketing competencies. In order to enable both companies to leverage their competencies, exchange of complementary local knowledge often seems a viable strategy. This may trigger a process of exchanging for example marketing and sales information, and knowledge of local business opportunities.

From a strategic point of view, such exchange processes make sense. However, when it comes to the actual execution, partners may choose two deviation trajectories. First, each partner can attempt to limit outgoing knowledge flows. As long as only one actor succeeds in pulling knowledge while holding back deliverables, a shift to Configuration 1 occurs. Bilateral attempts to abuse the transactional agreement results in a deadlock situation. Second, one of the firms may try to collect more extensive, tacit knowledge on top of the structured information as agreed upon. In response, the counterpart may choose to pursue the same strategy. Lacking sufficient a priori mandate, the cooperation tends to evolve in an intricate exchange relationship (shift to Configuration 4).

**Controlling Reciprocal Exchange**

The fact that both partners receive and deliver knowledge provides for a complex form of interdependence with recurrent interactions (Thompson, 1967). Still, they can formalize the exchange process as a basic form of transaction governance. The contract stipulates how reciprocal deliveries are intertwined across the life cycle of cooperation. Teams at both sides do not cooperate directly, but funnel their interactions through

**Figure 2: Bilateral control strategies**
respective coordinators (Figure 2). Internal control procedures stress the exclusive use of coordinating liaisons and technology to submit knowledge for external use (Jaeger & Baliga, 1985).

Exchange between partners is *quid pro quo:* “I will share this with you if you share that with me” (Hamel et al., 1989: 136). Hence, coordinators closely monitor and document knowledge flows to avoid uneven accumulation of know-how. Since the behaviors of partners are complexly interlocked, deviations from the planned exchange process easily occur (Van de Ven et al., 1976). This leads to feedback loops to assess mutual constraints and feasible action patterns. Technology may support the coordinating liaison to plan, monitor and document exchanges. Coordinators have a pivotal role to funnel interactions between teams from both sides. As a substitute for direct interactions between teams, this procedure helps avoid the risk of flow expansion: that is, partners attempting to collect additional, tacit knowledge contrary to initial agreements.

**UNIDIRECTIONAL, TACIT KNOWLEDGE FLOWS (CONFIGURATION 3)**

The automotive industry has featured many examples of adaptive coordination between a focal organization and its network of suppliers. Pivotal organizations like Toyota tend to intertwine with suppliers to share tacit knowledge in a *keiretsu* network structure (Powell, 1990). In turn, this enables the supplier network to fine-tune their strategic development and business processes (Reve, 1999). In this example, the focus is not on reciprocal knowledge sharing in local industrial networks. Instead, this section analyzes one-way adaptive behavior of a supplier to the client’s processes. This induces the client to share knowledge that is intricate, contextual and tacit, enabling adjustment and integration of the supplier’s operational processes.

The knowledge we discuss here resides in a tissue of actors used to cooperate on a daily basis (Azeh, 1982). The fluid evolution of interaction patterns implies that know-how resides in the minds of participants rather than being sedimented in extensive documentation (Kogut & Zander, 1992). Hence, access to this knowledge tissue can hardly rely on remote electronic communications. People need to explain the context of their know-how, and show artifacts like drawings (van Fenema & Kumar, 1999; von Hippel, 1994). Moreover, unlike the previous configurations, knowledge transfer cannot rely on mediating coordinators because contextual information would get distorted. Besides, clarifying feedback loops would suffer from long turnaround times as coordinators need to screen and pass on reciprocal exchange flows.

**Possible Deviation Trajectories**

As teams from both sides start to interact directly, a number of risks emerge. First, the supplier in our example may try to pull more information from the client than agreed upon. The supplier’s legitimate access to tacit knowledge enables gaining an in-depth understanding of the client’s competencies and integrative capabilities (Grant, 1996b). If the supplier maintains connections to firms competing with the client organization, this access becomes rather undesirable. The supplier may share, leverage or even sell its understanding to these competing firms. For the supplier this is a tempting option as tacit knowledge is assumed to provide more intricate and thus valuable information.
Figure 3: Controlling one-way tacit knowledge flows

Outgoing knowledge flows, a vertical shift to Configuration 1. For the supplier this implies a dysfunctional restriction that undermines his process of identifying with client's needs and concerns. Third, as teams from both organizations interact directly, the transmitting client organization may attempt to absorb knowledge from the receiving vendor, a shift to Configuration 4. Client teams may abuse requests for clarifications to pull additional information from the supplier context. Reciprocal flows enable the client to decrease the uniqueness of the supplier's competencies and their business.

Tacit Knowledge Control Strategies

The need for direct exchange among teams changes the nature of the contract. As the contractual specifications necessarily remain vague and general, control strategies will focus on progressively managing the dynamics of inter-firm cooperation. The position of the coordinator also changes as team members take over his role of facilitating external connectivity (Ancona, 1992). His role of mediating knowledge flows alters to coaching teams from a background position (Figure 3). That includes promoting a clan-type of environment to make sure that team members remain committed and comply to organizational goals (Ouchi, 1979). As Hamel, Doz and Prahalad (1989: 136) point out: “Limiting unintended transfer ultimately depends on employee loyalty and self-discipline.” This suggests people-based strategies that cover selection, socialization and training of people to internalize organizational values and commitment (Tettier, 1978). The purpose is to develop and internalize collective routines and commitment that enables staff to define the boundaries of tacit knowledge sharing. Bureaucratic control strategies bear less relevance in this environment since detailed specification and observation of appropriate behaviors is not feasible (Kunda, 1992). Still, the organization's interests and goals are translated into generic rules for external knowledge transfer. This so-called semi-structure exhibits partial order, and ties between the extremes of very rigid and highly chaotic organization (Brown & Eisenhardt, 1997: 28). The client can impose generic structure to the supplier organization. For example, supplier personnel are only granted access for a limited period of time or to distinct locations.

The supplier organization must avoid that the client limits the type of knowledge shared, or even triggers reverse information flows. As Figure 3 depicts, a more complex interaction environment arises between firms. Hence, the client may attempt to abuse the multiplicity of available channels between teams to press for more information on the supplier's organization. At the same time, outgoing flows may be unduly codified and
zation, supplier teams should relate in a clan type of fashion to avoid these risks. Maintaining lateral contacts, they reinforce and enact external behaviors that are consistent with company goals. At the same time, internal procedures specify escalation processes in case the client organization violates earlier agreements. Managers are alerted when deviations occur to liaise with counterparts from the client.

RECIPEICAL, TACIT KNOWLEDGE FLOWS (CONFIGURATION 4)

In hi-tech industries that thrive on rapid R&D developments, information and knowledge sharing is crucial to remain on the competitive edge. Examples include semiconductor industry in which knowledge transfer has a prominent role (Appleyard, 1996). In conjunction with the pace of technological progress, such industries often require considerable investments in R&D. This motivates external cooperation to mutually benefit from complementary know-how and resources (Powell, 1996). Co-petition implies here that although partners shape some form of sustainable entity, they may use final results to compete, like the examples of NEC/Honeywell, GM/Toyota show (Hamel et al., 1989). A similar business model is becoming common in the airline industry. Partners leverage resources to achieve economies of scale and enhance the quality of their products and services (Jain, 1999).

Often, these virtual organizations start an exploratory process of exchanging resources without having a clear notion of operational consequences and risks. Staff at both sides are expected to work together and connect. As team members materialize strategic objectives, an intricate form of connectivity unfolds (Van de Ven et al., 1976). Incomplete specification of the scope and content of knowledge transfer necessitates needful interacting to adjust and refine progress (Weick & Roberts, 1993). Hence, a quasi single team emerges consisting of staff from both sides. Subsequent phases of socialization and interpersonal contacts promote feelings of collegiality and commitment to the group's functioning (Katzanbech & Smith, 1993). Such a context induces team members to share their know-how as a natural part of the cooperative effort.

Yet the successful formation of inter-organizational teams also increases the risk that partners lose grip on the knowledge exchange process. Co-competition implies that the cooperation may end at some point of time with each partner counting their take-home value. A cohesive team may lose sight of that strategic context and share valuable resources in excess of initial agreements and intentions (Hamel et al., 1989). In addition, their exclusive contacts outside the firm may alienate them from the internal organization.

Figure 4: Organizing two-way tacit knowledge flows

![Diagram](image_url)
and reduce incorporation of newly acquired knowledge across other business units.

A different type of risk occurs when partners deliberately deviate from the initial agreement. Because organizations can leverage information beyond their cooperative relationship and have partially conflicting interests, they are tempted to free ride on their counterpart’s input, for example by providing less or inaccurate information. They may also structure and restrict outgoing knowledge flows contrary to initial agreements. This strategy obviously undermines the partnership as it results in asymmetrical distribution of know-how.

**Bilateral Control Strategies**

As virtual organizations engage in a fluidly evolving exchange process, they need adjustable and flexible control strategies. A similar control structure will emerge at both sides as knowledge flows back and forth, and each partner runs comparable risks. Prior to starting operational connections, some form of relationship or reciprocal familiarity will probably exist. The intention to cooperate is translated into a relational contract that broadly outlines areas of exchange and codes of conduct (Macneil, 1978). It roughly structures scope, duration and content of exchange to provide a minimal backbone for steering the actual interaction process over time (Brown & Eisenhardt, 1997).

Complementary strategies are required to cater for the remaining open ends and risks. Both companies install a coordinator who regularly meets with team members involved in the exchange process, and mediates between project teams and the stable organization (Figure 4). As the figure depicts, the coordinator is not directly involved in operational exchanges but has an internal role.

The purpose of that role is to enhance and ensure knowledge reception from the partner organization. He also makes sure that novel resources are leveraged to the rest of the organization. In fact, this liaison role may require a small group that interfaces between the company and its teams that interact with the partner firm. Maintaining regular contact with the team, the coordinator keeps them focused on organizational goals. Although his role is on the background, he traces and guards knowledge exchanges to ensure reciprocity and quality of the flows. Team members are put into contact with other staff from their organization to share recently acquired insight (Hamel et al., 1989). To some degree experiences can be summarized and documented. Technologies like intranets or groupware facilitate controlled circulation of relevant information to others in the company. Long-term or remote cooperative endeavors suggest job rotation of team members to foster company-wide learning (Edström & Galbraith, 1977). Novel insights are leveraged and anchored to prepare the organization for subsequent competitive phases. Rotation also maintains the relationship between the organization and employees working on the fringe, and may avoid unwelcome turnover.

Reciprocal, tacit exchange in virtual organizations calls for gradually adapting and elaborating control strategies. Temporary partners juggle to make a hybrid focus work. The complexity they face traces back to their effort to combine temporary collegiality with a “cooperative” relationship.

**DISCUSSION AND CONCLUSION**

The virtual economy changes the mode of organizing transactions between firms. The traditional notion of individual organizations taking care of well-defined portions of
supply chains is making place for an open and embedded perspective on their functioning. One implication is that firms seek to cooperate with partners in adjacent business domains, even including competitors. Cooperation means that firms combine specific resources to take advantage of novel opportunities. For virtual organizations that cooperate and compete, this exchange process introduces a complex decision environment. Each organization can use knowledge made available for purposes beyond the definition of their hybrid relationship. As long as both partners comply with the original agreement of cooperation, temporary exchanges evolve without too much risk. Yet at the same time, access to unique knowledge from the counterpart seems a tempting opportunity to enhance benefits derived from the relationship. Mastering the balancing act seems to be one of the novel competencies required in the virtual economy.

This chapter extends earlier literature by focussing specifically on knowledge exchanges. We elaborate a model for knowledge flows and identify four configurations of co-opetitive transaction modes. Each configuration features its own risk profile depending on the deviation trajectory counterparts may choose. Control strategies are proposed to anticipate and monitor the actual exchange processes. Unknown distribution of knowledge resources is avoided by a combination of control strategies. These apply to both the internal organization and the external relationship with the partner firm. Four categories of control mechanisms are distinguished: bureaucratic mechanisms like work task and monitoring; organizational roles like coordinators; social relationships and interpersonal exchanges; and technology employed for organizing transfer of, and access to knowledge.

The analysis extends the field of co-opetition in virtual organizations and has relevance to professionals and academics alike. Professionals may use the analysis to determine feasible configurations and anticipate risk profiles. In addition, they can detect eventual patterns of deviation, and implement remedies to increase the likelihood of a satisfactory co-opetitive relationship.

From an academic point of view, the model provides a starting point for conceiving and empirically investigating the complexity of hybrid relationships between firms. Academics may use the proposed line of thought for elaborating connections with other theoretical areas like supply chain management, management of information systems, innovation management, management of joint ventures, and strategic management. In addition, researchers may want to introduce time as a variable to assess the evolution of co-op company interactions over time. Empirical observation may include survey type of research to validate hypotheses derived from the model. Another opportunity is (longitudinal) case study research where exchange processes are documented and analyzed. Finally, grounded research in the spirit of Burgelman (1983) may shed light on intra- and inter-organizational communications that help shape co-opetitive relationships.

ENDNOTE

As a spin-off from transaction cost economics, incomplete contracting theory elaborates on situations where parties cannot specify their transaction in advance. In particular, this theory investigates the consequences of contingencies for the distribution of unanticipated value differences among parties (Hart, 1991).
REFERENCES


