Chapter 6

Towards a Theory of IS-Supported Inter-Organisational Knowledge Exchange

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INTRODUCTION

The resource-based approach to strategic management emphasises a firm’s need for unique internal resources and competencies (Nelson and Winter, 1982; Wernerfelt, 1984) as enablers of sustainable, dynamic adaptation and competitive advantage (Stalk et al., 1992; Barney and Hesterley, 1996). Since Penrose (1959), this approach has recognised the importance of knowledge as a fundamental basis for competitive differentiation. Recent research (Spender, 1996; Szulanski, 1996; Grant, 1996a; 1996b) investigates the interaction of knowledge management and strategic management and contributes to the understanding of how to manage knowledge transfer, integration and creation within firms (Nonaka and Takeuchi, 1995).

In addition to intra-firm knowledge sharing, researchers are beginning to investigate knowledge sharing across organisational boundaries (Appleyard, 1996; Wahne et al., 1996; Loebbecke and van Fenema, 1998). Knowledge sharing is “the transfer of useful know-how or information across company lines” (Appleyard, 1996). This research recognises that many firms are now involved in multiple temporary or permanent co-operative agreements (Kodama, 1994). In their book *Co-opetition*, Brandenburg and Nalebuff (1996) point to the potential for conflict in collaboration between competitors.

Inter-organisational collaboration presents firms with a paradox (Hamel et al., 1989): on one hand, collaborative knowledge sharing may enhance the joint and individual added value as firms leverage otherwise inaccessible resources from their partners into 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 base. Hamel et al. report inter-corporate management strategies that enhance the added value from collaboration and anticipate opportunistic behaviour. This paper extends their analysis by incorporating co-ordination and control theory (Pfeffer, 1997). The strategic issues and paradoxes of inter-firm knowledge sharing are analysed as problems of co-ordinating and controlling the behavior...
of people within the firm as well as governing knowledge flows between organisations. This chapter investigates inter-firm collaboration involving knowledge with assumed operational and business value beyond any co-operative agreement.

This chapter assumes that both parties can translate the collaborative knowledge into adjacent or overlapping business capabilities and hence exploit additional opportunities beyond the collaboration. This suggests (at minimum) partially diverging interests between collaborating partners, and necessitates the development of a strategic perspective on managing knowledge flows across organisational boundaries.

This chapter identifies the dimensions of inter-firm knowledge sharing, the nature of the knowledge shared (explicit or tacit) and the direction of knowledge flows (one-way or reciprocal). A matrix of these dimensions yields four configurations of inter-firm knowledge sharing – uni-directional-explicit, uni-directional-tacit, bi-directional-explicit and bi-directional-tacit. For each configuration the chapter investigates intra- and inter-firm co-ordination and control issues and strategies. This chapter concludes by discussing implications for those managing the processes and it outlines an agenda for future conceptual and empirical investigation.

RESEARCH METHOD

Research on inter-organisational knowledge sharing may be characterised as conceptual (e.g. Grant, 1996; Liebeskind, 1996) or survey-type (e.g. Appleyard, 1996; Szulanski, 1996). Given the paucity of extant literature on inter-organisational knowledge sharing, the research described here is, by necessity, explorative (Yin, 1994). The initial stage involves theory building. As a first step, this work develops a comprehensive theoretical framework, the basis of which is presented here. Subsequent, on-going stages involve case studies armed at close empirical investigation (Walsham, 1995) and the development of new theoretical insights (Eisenhardt, 1989). The case study research includes collection of data from multiple sources to allow triangulation (Markus, 1994; Marshall and Rossman, 1995).

CONTINGENCIES OF INTER-ORGANISATIONAL KNOWLEDGE TRANSFER

Type of Knowledge: Explicit versus Tacit

This chapter takes up Grant’s (1996b) suggestion of focusing on knowledge types, their characteristics and management consequences (Machlup, 1980). The conceptualisation of knowledge as explicit or tacit (Polanyi, 1967) has driven both conceptual and empirical research on strategic and organisational knowledge management (Kogut and Zander, 1992; Nonaka and Takeuchi,
Explicit knowledge refers to concepts, information and insights that are specifiable, and can be formalised in rules and procedures (Walsh and Dewar, 1987). Access, storage and transfer of this knowledge is achieved by documents and information systems such as databases; examples include detailed specifications for software development or product manufacture.

Implicit or tacit knowledge is less specifiable insights and skills which are 'embedded' in individuals or in the organisational context (Weick and Westley, 1996). Employees collectively develop and refine routines to achieve organisational adaptation and learning (Nelson and Winter, 1982). March and Simon refer 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. For many purposes, the simplest and most accurate way to discover what a person does is to ask him'' (1) Thus, understanding and transferring this type of knowledge depends on direct participation and inclusion in the context where it resides (Tyre and von Hippel, 1997). This phenomenon has been referred to as 'stickiness' (e.g. Szulanski, 1996), and researchers point to the arduous process of extracting or integrating tacit knowledge (Grant, 1996a). Indeed, it might be argued that the failure of such pieces of technology as expert systems to gain much of a commercial foothold is due to this problem. Exchanging tacit knowledge across organisational boundaries exacerbates these problems, as workers lack a set of shared concepts and values provided by a common culture (Weick and Westley, 1996).

Direction of Knowledge Transfer: 'Uni-directional' versus Bi-directional

Inter-organisational knowledge flows may be one-way (termed here 'uni-directional'). Examples include outsourcing agreements where clients share knowledge with vendors to enable delivery of the product or service without the vendor sharing their knowledge with clients (Hamel, et al., 1989). Unidirectional knowledge flows also occur in organisations such as consultancies, market research or news agencies whose business is selling knowledge and expertise. In many instances, such knowledge flows will be almost osmotic. In other words, some of the knowledge will be absorbed unconsciously by the project members.

Frequently, however, the underlying logic of collaboration suggests bi-directional or reciprocal knowledge flows involving the integration of complementary knowledge and competencies. Reciprocal sharing of knowledge is a principal determinate for reaping the anticipated benefits of co-operation synergies. These include taking advantage of complementary knowledge and synergetically creating knowledge. An example is collaboration of R&D units

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involving joint investment in development and manufacturing facilities. Often, as in the semi-conductor industry, collaboration is required, since investments exceed an individual firm's resources and require economies of scale and thus expertise is shared. The term bi-directional is preferred here as, though there is intention to share, such sharing will not always be equal. Bi-directional implies the potential for a two-way flow but recognises that full quid pro quo is unlikely.

Integrating these directions of flow with the knowledge types gives rise to four configurations: uni-directional-explicit, uni-directional-tacit, bi-directional-explicit and bi-directional-tacit. Table 6.1 summarises the two dimensions of inter-firm knowledge sharing and provides examples for each configuration.

Table 6.1: Inter-organisational knowledge sharing: examples of contingent configurations

<table>
<thead>
<tr>
<th>Explicit knowledge</th>
<th>Uni-directional knowledge sharing</th>
<th>Bi-directional knowledge sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outsourcing strategies</td>
<td>Exchange of complementary</td>
</tr>
<tr>
<td></td>
<td>client-supplier software</td>
<td>market research information</td>
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<tr>
<td></td>
<td>specifications</td>
<td>between competitors.</td>
</tr>
<tr>
<td>Tacit knowledge</td>
<td>Client-supplier nexus</td>
<td>Collaboration of R&amp;D units</td>
</tr>
<tr>
<td></td>
<td>in automotive industry</td>
<td>in semi-conductor industry.</td>
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Intra- and Inter-organisational Co-ordination and Control

Research to date on strategic knowledge management has largely focused on cognitive processes within firm boundaries (e.g. Nonaka and Takeuchi, 1995). These processes include creation of knowledge (Nonaka and Takeuchi, 1995), conversion of tacit into explicit knowledge, knowledge transfer (Szulanski, 1996) and knowledge integration (Grant, 1996b). In managing these processes, problems of co-ordination or integration play a prominent role. Grant (1996b) assesses the complementarity and synergy of co-ordination theory (Lawrence and Lorsch, 1967; Galbraith, 1973; Van de Ven et al., 1976) and knowledge management theory (Levitt and March, 1988; Nonaka, 1994), and elaborates upon mechanisms for integrating intra-corporate knowledge. Loebebecke et al. (1998) analyses some of the issues concerned with managing inter-organisational knowledge sharing (IOKS) under co-operation.

This work extends Grant's analysis in two ways. First, it assesses the implications of knowledge flows across organisational boundaries for co-ordination strategies. Second, as firms have partially diverging interests, this suggests not only an important role for co-ordination but also for contrasting intra- and inter-firm performances. Moreover, as will become apparent, co-
ordination and control strategies are mutually dependent and need, therefore, to be considered and managed simultaneously.

Transition from Intra- to Inter-organisational Governance

Traditionally, co-ordination theory has provided conceptual insight and normative pointers for co-ordinating work processes between inter dependent organisational units (McCann and Galbraith, 1981). Examples of co-ordination mechanisms include decision rules for grouping (or differentiating) tasks and people, and designing linking mechanisms such as hierarchies, liaisons, task forces or integrative teams (Pennings, 1992). In the case of stable, routine situations this can be complemented with standards for behaviours, skills and outcomes (Mintzberg, 1979). On the other hand, task uncertainty and interdependence between units increase the need for adaptive, ad hoc information processing capacity. Hence, people need to interact and adjust individual behaviors (Van de Ven et al., 1976).

The transition from managing intra-corporate processes to co-ordinating inter-firm collaboration has received attention in Williamson's theory (1975, 1985, 1991) Transaction Cost Economics. This theory has been highly influential, yet it is also criticised (e.g. Ghezheal and Moran, 1996). Hence, more recently Williamson (1991) explains the transition from intra- to inter-organisation co-ordination on the basis of adaptation needs and assumed opportunism. Low levels of adaptation needs suggest classical contract law in which the transaction is "sharp in, by clear agreement; sharp out, by clear performance" (Macneil, 1974). However, the need to manage transactions adaptively becomes apparent in the case of 'incomplete contracts' (Williamson, 1991).

Linkage Between Co-ordination and Control

The links between co-ordination and control not only require adaptations, different modes and transitions for co-ordinating inter-firm transactions; in parallel, they also affect the appropriateness of control strategies. Control processes aim to ensure alignment of individual or organisational performances with expectations (Merchant, 1988). Two dimensions of performance are potential objects of control: the behaviors of work processes and the outcomes (Ouchi, 1977). In case of classical contract law, the formal agreement pre-specifies reciprocal performance expectations in indisputable processes or outcomes. Thus, parties have clear standards to measure, observe and compare actual behaviors and deliveries with those pre-defined (Hofstede, 1978). Increasing needs for adaptive performance (incomplete contracts /uncertain means that parties cannot feasibly assess and articulate reciprocal processes and outcomes. For controlling intra-corporate, non-routine work, researchers have suggested people-based strategies like clan controls, self-control-
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ling teams and socialisation (Ouchi, 1980; Manz and Stewart, 1997). Ensuring inter-organisational performance under these conditions requires close inter-firm contact, relational contracting and trust building (Powell, 1996).

Management of Knowledge Transfer

The articulatable nature of explicit knowledge enables manage, transfer and sharing by means of documents or information systems once the knowledge is recognised. Co-ordinating these flows requires determining that the knowledge firms are willing to share and agree on modes of transfer. Contracts formalise the content, procedures and deliverables. Control consists of verifying actual delivery and knowledge content with the contractually predefined standards.

Collaboration involving tacit knowledge flows poses a risk because, by definition, this type of knowledge is less articulatable. Assuming some degree of opportunistic behavior, the receiving firm may engage in tactics aimed at changing the direction of knowledge flows or enlarging the flows beyond initial agreements. In such a context, firms need to design inter-organisational liaisons or task forces to meet regularly and co-ordinate reciprocal expectations. As the initial specification will necessarily remain vague and general, control strategies will focus on managing the dynamics of inter-firm co-operation (co-opetition). This includes, for example, installing gatekeepers and instructing employees to control their counterparts socially in the task force.

Four Configurations for Managing Inter-organisational Knowledge Transfer

Co-ordination and control theory has been influenced considerably by a contingency perspective. Contingency theory seeks to explain variations in the structure of organisations and their performance by characteristics of the task, technology and environment (Pennings, 1992). The common notion of 'knowledge work' refers to tasks becoming increasingly non-routine, cognitive and interdependent (Purser and Montuori, 1995). Hence, researching co-ordination and control of such tasks suggests adopting task contingencies that reflect the knowledge characteristics.

The research here integrates the explicit/tacit dimension of knowledge (Polanyi, 1967) with the direction of knowledge flows (Thompson, 1967). The four resulting configurations (uni-directional-explicit, uni-directional-tacit, bi-directional-explicit and bi-directional-tacit) provide a set of contingencies suggesting different co-ordination and control modes. The four configurations differ in their complexity and in the extent to which they are amenable to management.

The inter-firm dimension of work flows suggest a focus on two types of
co-ordination and control strategies: intra-organisational co-ordination and control refers to mechanisms that structure, synthesise, execute and evaluate organisational task accomplishment (Ching et al., 1992). Management of inter-firm tasks includes contractual formalisation as well as inter-organisational structures like task forces or project teams. The strategic and opportunistic nature of inter-firm knowledge sharing (Brandenburger and Nalebuff, 1996) suggests particular dynamics and risks. Table 6.2 provides a summary of co-ordination and control mechanisms for the four configurations.

In practical terms, it is clear that any form of knowledge sharing requires significant planning and preparation. This is about what to share as well as what not to share. The firm must also identify beforehand the knowledge that they wish to gain, though ‘knowing what you don’t know’ is problematic. There needs to be mechanisms for using the knowledge gained, and probably for using it rapidly. Contracts need to be developed wherever possible, even if they cannot fully specify the exchanges. The process of inter-firm interaction should be formalised as much as possible.

Internally, this needs to be reflected in new operating procedures. This should also involve monitoring the activities and outputs of partners. The choice of partner is crucial. While placing the best people on the team will enhance the team and team members will probably absorb more knowledge by osmosis, a preferable strategy might be to assign those with limited knowledge beyond that necessary for fulfilment of the contract. Such people are less likely to inadvertently ‘share’ the wrong knowledge.

Table 6.2: Inter-organisational knowledge sharing: co-ordination and control mechanisms within and between firms

<table>
<thead>
<tr>
<th>Explicit knowledge</th>
<th>Uni-directional knowledge sharing</th>
<th>Bi-directional knowledge sharing</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Contract covering procedures and contents of knowledge sharing.</td>
<td>• Contractually defined <em>quid pro quo</em> knowledge exchange contents and procedure unclear wording.</td>
</tr>
<tr>
<td></td>
<td>• Formalised inter-organisational knowledge exchange.</td>
<td>• Inter-organisational co-ordination by mutual adjustment.</td>
</tr>
<tr>
<td></td>
<td>• Inter-organisational procedures and guidelines (bureaucratic co-ordination and control).</td>
<td>• Inter-organisational planning and control procedures.</td>
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</table>
CONCLUSIONS AND IMPLICATIONS

Managing knowledge and information processes will play an increasingly prominent role in achieving sustainable competitive advantage. Recent contributions reflect the necessity to develop and apply novel, integrative, conceptual perspectives (Grant, 1996b), enabled and sustained by insights from strategic management, economics, organisation theory, information systems and knowledge management (Spender, 1986). This chapter contributes to the latter stream by proposing two contingencies of managing inter-firm knowledge flows: the direction of knowledge flows between organisations (one-way or bi-directional) and the type of knowledge companies share (explicit or tacit). Four configurations of knowledge sharing are derived from these dimensions: uni-directional-explicit, uni-directional-tacit, bi-directional-explicit and bi-directional-tacit. From the co-ordination and control literature, management approaches geared to the four configurations are suggested.

The configurations of inter-organisational knowledge sharing provide insight for both practitioners and academics. They give professionals involved in processes of projects crossing their organisation’s boundaries insights and guidelines on how to manage and anticipate opportunities and pitfalls. From an academic perspective, analysing the four configurations suggests a role for corporate competencies complementing the more internally-oriented strategies aimed at the transfer, integration and creation of knowledge (Nonaka and Takeuchi, 1995; Szulanski, 1996; Grant, 1996b).

Organisations involved in inter-firm knowledge sharing need to develop capabilities and routines to understand and handle complex knowledge flows across their boundaries. Moreover, they need to develop contingent IT support strategies. This paper provides the basis of a theory of managing inter-firm knowledge sharing. Further research may pursue the following: first, the conceptual model needs refinement, extension and integration with re-
lated theories. In parallel, empirical research may start to investigate a set of hypotheses based on the configuration theory outlined.

REFERENCES


