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**Learning and Developmental Processes in Inter-organisational
Collaborations**

by

Anna Goussevskaia

**A thesis submitted in fulfilment of the requirement for the degree of
Doctor of Philosophy**

**Warwick Business School
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LIST OF ABBREVIATIONS

AGC – Agricultural Genetics Company

CAM – Computer Aided Manufacturing

DEFRA – Department for Environment, Food and Rural Affairs

HRI – Horticulture Research International

NACE – The National Association of Corrosion Engineers

TWI – World Centre for Materials Joining Technology

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DECLARATIONS

This work has not been previously accepted in substance for any degree and it is not being currently submitted in candidature for any degree.

STATEMENT 1

This thesis is the result of my own investigations, except otherwise stated. My indebtedness to other sources is indicated in the text and bibliography.

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ABSTRACT

It has long been recognised that inter-organisational collaborations have great potential for learning and knowledge creation, although there has been very limited attention paid to the way in which organisations actually create new knowledge jointly. The present study contributes to this area of research, and examines the processes that facilitate and constrain new knowledge creation in inter-organisational collaboration. It draws upon five longitudinal case studies of inter-organisational collaborations across different sectors: pesticides, biotechnology, life sciences, engineering manufacturing, and software development. The study conceptualises inter-organisational learning as production and re-production of inter-organisational rules that govern inter-organisational relationship, and facilitate and shape joint knowledge creation. The study advances understanding of the mechanisms underlying inter-organisational learning which rely on such aspects of collaboration as the nature of inter-partner interactions, interdependency between collaborating organisations, and power balance among partners. The longitudinal analysis of inter-organisational learning in the course of collaboration development also contributes to understanding of the relationship between inter-organisational learning and collaboration dynamics. The findings indicate that inter-organisational learning can have positive, as well as negative, effects on collaboration development. The results also suggest that inter-organisational learning closely co-evolves with the developmental dynamics of collaboration, meaning that inter-organisational learning is not only a product of collaboration development, but is also a force capable of shaping it.

CHAPTER 1 INTRODUCTION

1.1 RESEARCH BACKGROUND

Inter-organisational collaboration has long been recognised as having an important role to play in organisational learning (Dodgson, 1996; Powell, et al., 1996; Child, 2001; Hagedoorn and Duysters, 2002). Most of the research directly referring to learning in an inter-organisational context has focused on examining learning outcomes in terms of knowledge transfer between partners, and on the factors influencing these outcomes such as properties of knowledge (Collinson, 1999; Lynskey, 1999; Simonin, 1999), absorptive capacity (Mowery and Oxley, 1996; Lane and Lubatkin, 1998; Lane, et al., 2001), and the organisational differences between the partners (Parkhe, 1991). Although these contributions examine crucial factors that might influence learning in inter-organisational contexts, they remain limited in explaining its dynamics, as they take a snapshot view of collaboration which undermines the organisational processes involved. In this way, while inter-organisational partnerships are seen to have great potential for new knowledge creation, there has been very limited attention in the existing literature to the way in which organisations actually learn and create knowledge jointly (Larsson, et al., 1998; Lubatkin, et al., 2001).

The present study sets out to contribute to this area of research and to examine the processes that enable and constrain new knowledge creation in inter-organisational

collaboration. The approach taken in the present study emphasises that inter-organisational collaborations are socially complex arrangements, consisting of concrete relationships and interactions involving individuals and groups with certain mindsets and interests. This indicates that learning in an inter-organisational context cannot be considered separately from the collaboration activity (Brown and Duguid, 2001; Orlikowski, 2002). This perspective informed and guided this longitudinal study of learning and developmental processes in inter-organisational collaborative relationships.

To implement this research, a collective case study was employed. The decision in this regard was informed by the interpretative approach, which implies that data should enable and support interpretation (Alvesson and Skoldberg, 2000). The interpretative task is facilitated by comparing the similarities and differences provided by multiple organisational settings (Tsoukas, 1989). In this way, the emphasis of the chosen methodology is not on replication of case studies and generalisation of findings, but on highlighting similarities and differences across cases, which informs and stimulates the interpretation process and inductive thinking leading to theory generation. A number of cases were selected, first, according to the choice of research topics and questions being posed (Stake, 1995), and, second, by the possibility of capturing both historic and contemporary processes to inform the longitudinal approach (Pettigrew, 1990).

The selected companies comprised five cases of inter-organisational collaboration in different sectors: pesticides, biotechnology, life sciences, engineering manufacturing, and software development. The research emphasis on learning implied the selection of those cases where the potential presence of a variety of learning processes would be maximised. The selected collaborations consisted of three R&D and two product development partnerships. All of these collaborations had as a main motivation creation of new knowledge in the form of new technologies, processes, or products. Moreover, in all five cases, collaboration activity had been going on for a significant period of time in relation to the overall estimated duration of a partnership, and was still on-going during the research period. This permitted the collection of data which would provide a current, as well as retrospective, view of the development.

The present study aims to address three main areas of research. First, it will longitudinally examine the process of inter-organisational collaboration, by focusing on a variety of developmental forces, and the interrelation between them. Second, it aims to further develop the concept of inter-organisational learning, by viewing it as an inseparable part of collaboration activity. Instead of focusing solely on the outcomes of learning processes and factors affecting those outcomes, this study aims to examine how inter-organisational learning is actually achieved or not achieved, by drawing upon the notion of learning and knowledge as a 'situated' social phenomenon grounded in organisational practices (Cook and Brown, 1999; Tsoukas and Vladimirou, 2001; Orlikowski, 2002). Finally, by examining learning processes

in the longitudinal context of collaboration development, this study aims to address the way in which inter-organisational learning is interrelated with the developmental dynamics in collaborative relationships.

1.2 THESIS OVERVIEW

This thesis is organised as follows. Chapter 2 provides theoretical background for the present study. The aims of this chapter are to bring together the contributions from the research that has directly addressed learning in collaborations and the research that has addressed the developmental processes in inter-organisational formations, in order to provide a fuller view of inter-organisational learning. Ultimately, it builds upon the theoretical background and understandings developed by the existing literature to derive and focus the research questions for the present study.

Chapter 3 outlines methodological and philosophical approaches taken in this study. It also discusses how these choices shaped the methods and procedures employed for the fieldwork and the strategies used to analyse the empirical material. Furthermore, this chapter provides a detailed account of how the empirical material was collected and analysed. It draws special attention to the issues of theorising from process data, and how this process relates to the quality of the theoretical explanations produced. By assessing the methods used in the research, the rigour of the interpretation

process, and the strategies for developing process theories from process data, this chapter aims to instil confidence in the reliability and validity of the findings.

Chapter 4 presents the analysis of the cases selected for this study. The first two parts of each case study are dedicated to describing the particular industrial context and its development over the period of collaboration, as well as to examining organisational contexts of the partner firms and their evolution over the same period. The third part of each case study contains the main body of a case narrative, which is built around the sequence of events, and provides rich description of the surrounding contexts and their evolution over time. The last two parts, following the main narrative, focus specifically on examining the pattern of collaboration development over time and the inter-organisational learning process as the collaboration develops.

Chapter 5 presents cross-case analysis and outlines the research findings. It also discusses the implications of these findings. Finally, Chapter 6 starts with an outline of the general conclusion of the present research, referring to the research questions proposed at the beginning of this study. It then addresses the implications of the study for theory and managerial practice. It concludes with the discussion of the limitations of the present study and indication of some directions for future research.

CHAPTER 2 THEORETICAL BACKGROUND AND RESEARCH QUESTIONS

2.1 INTRODUCTION

Participation in inter-organisational collaborative relationships such as alliances, joint ventures and broader multi-partner networks, has long been recognised as having an important role to play in organisational learning (Mody, 1993; Dodgson, 1996; Child, 2001; Hagedoorn and Duysters, 2002). It has been increasingly acknowledged that learning and value-creation are inescapably embedded in various forms of inter-organisational relationships. This is because a significant amount of learning takes place in the ‘interstices between firms, universities, research laboratories, suppliers, and customers’ (Powell, et al., 1996: 118). In this way, a network may serve as a locus of learning and innovation because it provides timely access to knowledge and resources that are otherwise unavailable.

Given the importance placed by firms on the forming of collaborative arrangements to exploit learning opportunities, recent research has extensively addressed the effects of inter-organisational networks on learning. Although it has been recognised that inter-organisational partnerships provide potential for value-creation precisely because of the opportunities for joint knowledge development, relatively few studies have examined how firms actually learn and produce knowledge jointly (Holmqvist, 1999; Dyer and Nobeoka, 2000; Lubatkin, et al., 2001; Holmqvist, 2003a; 2003b;

2004). The major part of this stream of research has focused on the way organisations learn from each other, emphasising how partners themselves can improve their respective knowledge by participating in inter-organisational collaborations (Hamel, 1991; Parkhe, 1991; Mowery and Oxley, 1996; Inkpen and Dinur, 1998; Lane and Lubatkin, 1998; Larsson, et al., 1998; Collinson, 1999; Lyskey, 1999; Simonin, 1999; Lane, et al., 2001).

The research that has started to address the inter-organisational nature of learning in collaborative relationships conceives inter-organisational learning as *a social production and re-production of inter-organisational rules based on experience that leads to a changed organisational behavior* (Larsson, et al., 1998; Holmqvist, 2003a). Although the studies of Dyer and Nobeoka (2000) and Holmqvist (1999; 2003a; 2003b; 2004) started to examine the important aspects of inter-organisational learning, such empirical studies directly investigating learning in inter-organisational collaborations are still very scarce. It has also been emphasised in the literature (Larsson, et al., 1998; Holmqvist, 2003a) that a more long-term perspective on inter-organisational learning was needed. These accounts indicate that, in an inter-organisational context, learning cannot be considered separately from the collaboration activity taking place over time. This means that process oriented research (Pettigrew, 1997) of inter-organisational collaboration will make an important contribution to the understanding of the nature of learning processes in inter-organisational environments.

The aims of this chapter are to bring together the contributions from the research that has directly addressed learning in collaborations and the research that has addressed the developmental processes in inter-organisational formations, in order to provide a fuller view of inter-organisational learning. Ultimately, it builds upon the theoretical background and understandings developed by the existing literature to derive and focus the research questions for the present study.

The chapter is structured as follows. The following second and the third sections provide a review of the literature on organisational knowledge and learning. They outline the available views of knowledge and learning in organisations, and provide the conceptual basis for the examination of studies of inter-organisational learning. The fourth section offers a detailed review of research that has directly addressed learning in inter-organisational environments, outlining its limitations and highlighting the limited number of studies that have started to address the actual inter-organisational nature of learning in this context. The fifth section examines the process of inter-organisational collaboration as depicted in the emergent stream of process research in this area. First, it provides an overview of the theoretical approaches to understanding networks, and then it reviews the process studies of collaborative inter-organisational networks. Finally, it outlines how this research has contributed to the understanding of inter-organisational learning. The sixth section of this chapter presents the research questions derived from the theoretical background, as developed above. The concluding part of the chapter summarises the

argument developed throughout the previous sections, and highlights the implications of the reviewed research for the present study.

2.2 KNOWLEDGE AND KNOWING IN ORGANISATIONS

In recent years, knowledge has been proposed as the prime mechanism for economic value creation. There is now much discussion of organisational knowledge and related themes, such as organisational learning. In this growing literature, two groups of studies characterised by distinctive views of organisational knowledge can be discerned. The first is associated with making or generating knowledge (Nonaka, 1994; Nonaka and Takeuchi, 1995; Spender, 1996b) and using it in terms of organising, representing, sharing, transferring, measuring, etc., (Kogut and Zander, 1992; Zander and Kogut, 1995; Grant, 1996a; 1996b; Spender, 1996a). This perspective can be categorized as 'the epistemology of possession' (Cook and Brown, 1999), which regards knowledge as a resource that can be 'possessed' and processed more or less independently of the container it occupies. This view of knowledge has been repeatedly challenged in the literature drawing on the long-established argument that knowledge cannot be understood without reference to social practice and context (Brown and Duguid, 1991; Blackler, 1995; Tsoukas, 1996; Brown and Duguid, 2001; Tsoukas and Vladimirou, 2001; Orlikowski, 2002). The socially embedded and situated nature of knowledge implies that instead of focusing on knowledge per se, the study of organisational knowledge should emphasise the process whereby knowledge assumes form and becomes articulated;

in other words, the practices or acts of representation that lead to the constitution of knowledge. Cook and Brown describe this second approach to knowledge as 'the epistemology of practice' (1999).

The first group of studies often distinguishes between different types of knowledge: tacit and explicit, individual and collective knowledge. These distinctions define, to a great extent, the concerns and issues highlighted by this stream of research as it seeks to classify the different types of knowledge and to draw out the implications of each type. Drawing on Polanyi's (1967) concept of tacit knowledge, Nonaka and Takeuchi (1995) postulate that there are two distinct types of organisational knowledge: tacit and explicit, and that 'knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge' (Nonaka and Takeuchi, 1995: 61). Tacit knowledge is treated as an informal, implicit, and unarticulated kind of knowledge that has to be made explicit, in order to be accessible for practical purposes. The authors suggest a model of organisational knowledge creation through its conversion from one form to another: tacit to tacit through 'socialisation', tacit to explicit through 'externalisation', explicit to explicit through 'combination' and explicit to tacit through 'internalisation'. The process of knowledge creation starts with 'socialisation' or the sharing of tacit knowledge between individuals. The key to acquiring tacit knowledge is experience. The socialisation process enables the sharing of individuals' experiences and perspectives, ultimately resulting in 'externalisation' or articulation of ideas and concepts. These newly born concepts are combined with other existing explicit

knowledge, creating more tangible and concrete specifications, which are in turn, disseminated to others within the organisation. Through this 'spiral of organisational knowledge creation', knowledge passes from individual to organisational level, and vice versa.

Spender (1996b) has also suggested a model of organisational knowledge, seeking to capture the different types of knowledge and the way organisations make use of it. He retains the distinction between tacit and explicit knowledge proposed by Nonaka (1994) and also assumes that knowledge exists at individual as well as collective level. Thus, by juxtaposing these two dimensions, Spender (1996b) defines four types of organisational knowledge: 'conscious' or explicit knowledge held by the individual, 'objectified' or explicit knowledge held by the organisation, 'automatic' or preconscious individual knowledge, and 'collective' or highly context-dependent knowledge, which is manifested in the practice of an organisation. The author argues that organisations can only be understood as the actualisation of all four types of knowledge and interaction between them. In this way, the research that relies on the distinction between tacit and explicit, individual and collective knowledge views organisations as systems processing different kinds of knowledge, which do not exist independently of each other, but rather interact, constituting and reconstituting each other (Spender, 1996a; 1996b).

This view of organisational knowledge is closely related to the relatively recent conceptualisation of the knowledge-based theory of the firm, which emphasises

'combinative capability' (Kogut and Zander, 1992; Zander and Kogut, 1995) or the 'knowledge integration' capability (Grant, 1996a; 1996b), meaning that 'the central competitive dimension of what firms know how to do is to create and transfer knowledge efficiently within an organisational context' (Kogut and Zander, 1992: 384). A knowledge-based view of the firm has its roots in the tradition of the resource-based view of the firm (Penrose, 1959; Prahalad and Hamel, 1990; Barney, 1991; Teece, et al., 1997), which is concerned with the question of how firms can create sustainable competitive advantage on the basis of their resources. Kogut and Zander (1992) postulate that firms can create knowledge and grow by continuously recombining their current capabilities. In this way, the cumulative knowledge of the firm provides possibilities for expansion, applying it to new market opportunities.

Grant (1996b) elaborates further the mechanisms of 'integration' of organisational knowledge. This author draws attention to coordination mechanisms within organisational design, relating them to characteristics and the role of knowledge. He suggests four such mechanisms for integrating specialised knowledge: 'rules and directives', which regulate the interactions between individuals, and provide a means by which tacit knowledge can be converted into more comprehensible explicit knowledge; 'sequencing' - the organisation of production activities in a time-patterned sequence, allowing the input of each specialist to be given independently; 'routines', which support complex patterns of interaction between individuals in the absence of rules and directives; and 'group problem-solving and decision-making', which require more personal and communication-intensive forms of integration, and

are reserved for unusual and complex tasks. The knowledge-based view tends to associate efficiency in organisations with the maximising of the use of rules, routines and other integration mechanisms that economise on communication and knowledge transfer. It also recognises that integration mechanisms depend upon the existence of common organisational knowledge for their operation. Common knowledge consists of shared meaning and forms of symbolic communication, such as language. It also relies on the recognition of individual domains or, in other words, knowledge about who knows what.

The above group of studies has made important contributions to the understanding of organisational knowledge by showing its multifaceted nature. At the same time, other researchers point out the aspects of organisational knowledge and the knowledge-based approach to organisations not captured by these studies. Thus, according to Tsoukas (2002),

Knowledge-based perspectives on organizations draw our attention not only to routines and experiences but, also, to the constituents of *skilled action*, and the emergence and maintenance of *novelty* in organizations. Considering organizations as knowledge systems highlights the irreducibly *social* character of individual skilled action, insofar as it views individuals as drawing on both the propositional statements that are institutionalized across the organization *and* the narratives reflecting the collective experience and values of communities of practice. (2002: 420) (emphasis in original)

Given that much experience is profoundly context-specific, knowledge sharing across organisations has proved challenging, as the situated character of knowledge makes it both 'sticky' (i.e. difficult to share) and 'leaky' (i.e. difficult to protect) (Zander and Kogut, 1995; Szulanski, 1996). Organisations are socially complex arrangements, consisting of concrete relationships and interactions involving individuals and groups with certain mindsets and interests. Knowledge flows among social actors are heavily dependent on both their social structure and their motivation to engage in knowledge sharing (Swan, et al., 1999; Hislop, et al., 2000). Swan et al. (1999), in their study of the introduction of IT systems such as the Intranet for knowledge sharing in two large multinational companies, found that active design and facilitation of face-to-face communication and social networking, rather than absolute focus on the use of IT was crucial for individuals to develop common knowledge and expertise. The authors argued that knowledge was not transferred, but was continuously created and recreated through social interaction between people and participation in the communities of practice (Brown and Duguid, 1991).

Tsoukas and Vladimirou (2001) studied the operation of a call centre in Greece, focusing on examining the link between knowledge and human action. They observed that the operators of the call centre resolved customers' queries by relying not only on the information systems provided for that purpose by the company, but also on the informal knowledge gained while carrying out their tasks. In this way, the operator's ability to diagnose and respond to a customer's query was a skill

developed and constantly refined through the operator's daily activities and participation in formal and informal social networking with co-workers at the call centre. The authors conclude that,

Organizational knowledge is the capability members of an organization have developed to *draw distinctions* in the process of carrying out their work, in particular *concrete contexts*, by enacting sets of generalizations (*propositional statements*) whose application depends on historically evolved *collective understandings* and experiences. (ibid: 983) (emphasis in original)

The implications of social context and everyday activities engaged in by people for organisational knowledge prompt researchers to change their approach from considering types of knowledge alone to focusing on the systems through which people achieve their knowing and the processes through which new knowledge may be generated. In contrast to a more cognitive-based perspective on organisational knowledge, this approach implies that knowledge needs to be understood as being embedded in everyday organisational practice. Drawing on such works as Bourdieu (1977) and Turner (1994), Cook and Brown (1999) define practice as 'coordinated activities of individuals and groups in doing their "real work" as it is informed by a particular organisational or group context' (ibid: 387). In this way, practice is regarded as human action informed by meaning drawn from a particular organisational context. By focusing on organisational practices, this approach is

concerned with knowledge *in becoming*, rather than knowledge per se, introducing the notion of *knowing* in organisations (Blackler, 1995; Cook and Brown, 1999).

The stream of research informed by this approach raises a different set of concerns and issues to be considered in the study of organisational knowledge. It recognises that knowing is mediated, emphasising the importance of understanding the dynamics of the systems through which knowledge is produced and reproduced. Furthermore, it embraces the situated nature of knowing by affirming the significance of people's interpretations of the contexts within which they act, and the key role that 'communities of practice' play in the development of skills. This approach suggests that systems of knowing are in constant development, emphasising the provisional nature of knowledge. It also draws attention to the issue of power, as the concepts of knowledge and power are interrelated. Conflicts are expected during the development and change of the systems of knowing, as knowledge is contested by different groups of professionals and managers. The view of knowledge as embedded in practice stresses the pragmatic aspects of knowing, implying that collective action is driven by people's conceptions of the object of their activities. In this way, knowing in organisations is approached as an active process, that is, one that is *mediated, situated, provisional, pragmatic, and contested* (Blackler, 1995).

The 'epistemology of practice' perspective (Cook and Brown, 1999) proved fruitful in approaching difficulties associated with knowledge sharing across organisations.

Brown and Duguid (2001) developed their ideas based on the social practice perspective, which is helpful in understanding knowledge flow within and between organisations. In attempting to provide an explanation of what appears to be the simultaneous ability of knowledge to 'stick' within organisations and to 'leak' outside them, the authors argue that the socio-cultural context in which knowledge is embedded is of crucial importance. According to their approach, it is common know-how developing from shared experience within communities of practice that enables the sharing of knowledge within such communities. The authors highlight the need to share some practice to be able to share new ideas. Drawing upon Giddens' (1990) observation of the importance of 'disembedding' and 'reembedding' knowledge, they point to the role that shared practice plays in providing the similar conditions necessary to allow re-embedding to occur. Consequently, shared practice becomes the key to understanding the sharing of knowledge. In the words of Brown and Duguid (2001: 207), 'knowledge leaks in the direction of shared practice, it sticks where practice is not shared'.

Orlikowki (2002) also adopted the practice-based perspective on organisational knowing in a study of global product development in a large software company in the Netherlands. She examined the way the geographically dispersed and diverse team conducted software development, focusing on how organisational members developed competence in their work. The author identified a number of organisational practices, defined as the sets of activities engaged in by organisational members, through which knowing relevant to complex product development was

enacted in everyday work. This approach to organisational knowing implied that the important aspects of the organisational members' competence in global product development were 'an ongoing accomplishment, situationally enacted capability inseparable from the practices that constituted it recurrently over time' (ibid: 267). Organisational actors were continuously reconstituting their knowledge by changing their practices. In this way, 'competence generation may be seen to be a process of developing people's capacity to enact what we may term useful *practices* – with usefulness seen to be a necessary contextual and provisional aspect of situated organisational activity' (ibid: 253). In this way, the study suggests that competence – whether individual or collective – is never given by being 'embodied' or 'embrained', but is continuously achieved through the ongoing and situated practices of the organisation's members.

The studies informed by the 'epistemology of practice' (Cook and Brown, 1999) seek to broaden understanding of organisational knowledge. This perspective emphasises both knowledge and knowing, and the essential role of human agency in accomplishing knowledgeable work (Orlikowski, 2002). Cook and Brown (1999) make the point that individuals and groups make use of knowledge in interaction with the phenomena and activities of the social and physical worlds. In this way, people's knowledge also lies in the actions themselves. Furthermore, they develop a notion of 'bridging epistemologies' by examining the relationship between knowledge and knowing in organisations.

Knowing does not sit statically on top of knowledge. Quite the contrary, since knowing is an aspect of our interaction with the world, its relationship with knowledge is dynamic. Each of the forms of knowledge is brought into play by knowing when knowledge is used as a tool in interaction with the world. Knowledge, meanwhile, gives shape and discipline to knowing. It is this reciprocal interplay between knowledge and knowing that we call bridging epistemologies.’ (ibid: 393)

This section presented two complementary views of knowledge in organisations. The present research will draw mainly upon the view informed by the ‘epistemology of practice’ (Cook and Brown, 1999) to study learning in inter-organisational collaborations (the reasons for which will be discussed in Section 2.6). Section 2.3 will address the available perspectives on organisational learning. It is important to understand the nature of organisational learning, in order to start examining learning processes in the inter-organisational domains. At this point, it is necessary to outline the relation between organisational knowledge and learning. Learning is understood in this study as change in organisational knowledge which can be applied in new or changed practice (Orlikowski, 2002). In other words, learning is knowing how to do things differently.

2.3 ORGANISATIONAL LEARNING

The notion of organisational learning has received extensive attention in the literature. Authors have attempted to conceptualise such learning by employing a

variety of perspectives, including psychology, sociology, evolutionary economics, management science, and cultural anthropology (Easterby-Smith, 1997). The central focus of the debate is upon how the concept of learning, often associated with the cognition and mental activities of individuals, can be applied to organisations. One answer consists of accepting the dichotomy between individual and organisational learning, and examining the relationship between the two.

According to some authors, individuals are the primary learning entities in organisations, who create organisational forms that facilitate learning in ways conducive to organisational transformation. These authors adopt cognitive (Kim, 1993), behavioural (Argyris and Schon, 1978; Huber, 1991), or experiential (Dixon, 1994) perspectives on individually based learning. Kim (1993), for example, argues that individuals build cognitive maps of their work contexts, and these maps can then be made explicit and distributed across the organisation. Huber (1991) offers a 'behavioural' definition of learning:

An entity learns if, through its processing the information, the range of its potential behaviors is changed...an organization learns if any of its units acquires knowledge that it recognizes as potentially useful to organization.
(1991: 89)

According to this view, the potential of organisations to learn lies in the feedback loops, when behaviour can be adjusted based on the consequences of previous actions. Argyris and Schon (1978) also employed this idea of an information

processing model derived from cybernetics, in their notion of single, double, and deuterio-loop learning, which draws a distinction between learning that leads to simple adaptation, and learning that fosters more profound changes in organisational practices.

The tradition of experiential learning implies that individual learning starts with concrete experience before moving on to reflective observation, abstract conceptualisation, and then to active experimentation. This view defines learning as a process, rather than an outcome. Dixon (1994) developed an organisational learning cycle model, in which information is generated through the direct experience of employees, which is shared and interpreted collectively, leading to the responsible action of those involved. In this way, this research addresses organisational learning in terms employed by the individually based theories of learning. Such direct projection proves to be problematic, as the term organisational learning is often regarded as an oxymoron, suggesting that it can only be used as a metaphor; otherwise, it would imply the considering of organisations as independent entities, and would ascribe human-like qualities to them (Dodgson, 1993).

Weick (1991), and Weick and Westley (1996) argued that the way in which the above perspectives addressed organisational learning was limited, as they reduced it to individual learning in an organisational context or assumed organisations to be independent cognitive entities, which inevitably would lead to ontological fallacies of antropomorphisation. They suggested that organisational learning should be

interpreted in terms more appropriate to organisations, such as changing an organisational culture. In this way, the development of shared norms and values would be indicative of organisational rather than individual learning. According to Hedberg (1981),

Although organizational learning occurs through individuals, it would be a mistake to conclude that organizational learning is nothing but the cumulative result of their members' learning. Organizations do not have brains, but they have cognitive systems and memories... Members come and go, and leadership changes, but organizations' memories preserve certain behaviors, mental maps, norms, and values over time. (1981: 3)

Individuals are seen as the agents or instruments of learning, but what has been learned is made independent of any individual by embedding it into organisational memory (Walsh and Ungson, 1991) or by institutionalising it into organisational systems, rules and routines (Crossan, et al., 1999). This means that individuals learn through cognitive activities (Walsh and Ungson, 1991) and experience (Levitt and March, 1988), and then these inferences are embedded in the individuals' memories, organisational culture, transformations, structures, and artifacts (Walsh and Ungson, 1991), as well as in collective understanding, shared stories and frameworks (Levitt and March, 1988), together with standard operating procedures (Cyert and March, 1992; Starbuck and Hedberg, 2001), organisational routines (Nelson and Winter, 1982; Cohen and Bacdayan, 1994), and other 'organisational rules' (March, et al., 2000). In the words of Levitt and March (1988),

Inferences drawn from experience are recorded in documents, accounts, files, standard operating procedures and rule books; in the social and physical geography of organizational structures and relationships; in standards of good professional practice; in the culture of organizational stories; and in shared perceptions of “the way things are done around here”.

(1988: 327)

The concept of organisational memory as a repository of organisational knowledge implies the considering of different types of memory stretching from organisational culture to actual physical structure of a workplace. Such division of possible repositories leads to the categorisation of organisational knowledge along the dimensions of tacit versus explicit and individual versus collective, and consideration of the respective processes of storage and retrieval of such knowledge (Walsh and Ungson, 1991; Spender, 1996). Crossan et al. (1999) offer an explanation of organisation level learning by employing the notion of institutionalising - the process of ensuring that routinised actions occur. What becomes institutionalised in organisations has a certain degree of consensus and shared understanding.

In this way, learning results, first, in the development of systems, structures, and other ‘organisational rules’ (Levitt and March, 1988; March, et al., 2000) that provide a context for interactions and, second, emergence of standard operating procedures (Cyert and March, 1992; Starbuck and Hedberg, 2001), in other words,

organisational routines. Such routines consist of organisational behaviours informed by rules, which can be defined as 'patterned sequences of learned behaviour involving multiple actors who are linked by relations of communication and/or authority' (Cohen and Bacdayan, 1994: 555). Such routines can be explicit and well-defined in their outcomes, or more difficult to identify and their effects hard to appreciate, due to their diverse nature (they may involve multiple actors), their emergent characteristics, and the partially inarticulate nature of their underlying knowledge base (Cohen and Bacdayan, 1994). Once organisations have learnt, i.e. have established over time certain organisational rules and routines, learning can become biased and narrow, exploiting only particular experiences that come to dominate further learning (Hedberg, 1981; Levinthal and March, 1993). Thus, because of this 'myopia of learning' (Levinthal and March, 1993), organisational learning can make a negative as well as a positive contribution to the capacity for new knowledge development. In this, way, in order to maintain experiential variety, organisations must unlearn, i.e. discard obsolete experiences, to be able to experience situations in a new way (Hedberg and Jonsson, 1978; Hedberg, 1981).

Another approach to the problem of the conceptualising of organisational learning is not to dichotomise individual and organisational learning, but rather to view such learning as taking place in a social context. Learning therefore, is regarded as not merely a cognitive activity, but a social process, contrasting with the learning theories that assume that learning takes place in individual minds only. This 'situated' perspective of learning is consistent with the view of organisational

knowledge informed by the 'epistemology of practice' (Cook and Brown, 1999), discussed in the previous section. This implies that learning processes are seen not as consisting of transfer and absorption of knowledge, but as a participation in the practices of a community (Lave and Wenger, 1991). Consequently, what is learned is profoundly connected to the conditions in which it is learned. In this way, 'social learning is a creative achievement, therefore, which involves a degree of personal investment; it can only be achieved by active participation' (Blackler, 1993: 870).

Lave and Wenger (1991) outlined a view of learning as integral to social practice by locating or 'situating' learning within everyday work practices, and emphasising the embeddedness of such practices in power relations, rather than cognitive contents of individual minds. Learning is conceived as occurring as individuals become members of the 'communities' in which they are acculturated, and as they participate actively in the diffusion, reproduction, and transformation of knowledge. According to Lave and Wenger, learning is not adequately understood as the transmission or acquisition of information or skill; rather, it 'involves the construction of identities' (1991: 53). In this way, learning is manifested in the ability to 'read' the local context and act in ways that are recognised and valued by other members of the immediate community of practice. Furthermore, the authors draw attention to the way communities and practices develop and are reproduced within a wider nexus of power relationships and institutional contexts. They emphasise that the understanding of learning implies the understanding of the way people become members of a community. Therefore 'power' as well as 'community

of practice' are central to Lave and Wenger's theory, and what they identify as the 'defining characteristic' of learning as a process is 'legitimate peripheral participation' (Lave and Wenger, 1991: 29).

Building on the work of Lave and Wenger (1991), Brown and Duguid (1991) developed further the notion of communities of practice, by bringing together the ideas of 'learning' and 'working' in organisation theory. According to the authors,

Workplace learning is best understood, then, in terms of the communities being formed or joined and personal identities being changed. The central issue in learning is *becoming* a practitioner, not learning *about* the practice.

(ibid: 48) (emphasis in original)

By reinterpreting Orr's (1996) ethnographical study of the work of Xerox photocopier technicians, Brown and Duguid examined the processes of how the technicians learned to service machines. Their analysis revealed that this sort of learning took place in the process, and was inseparable from work. The technicians developed their understanding of the machines not in training programmes, but through the activities of their daily work. The essential part of the technicians' practice was creating and exchanging narratives or stories about their experiences with machine problems, on which they relied heavily to perform diagnosis and troubleshooting services. These narratives also acted as repositories of accumulated knowledge, and were a manifestation of a collective rather than individual nature, as the insight accumulated was not of private substance, but was socially constructed

and distributed. In this way, Brown and Duguid regarded the formation of identity and community membership as the central unit of analysis of learning in organisations. They focused on learning as recurring practices in which knowledge is developed by a range of actors, and stretched over time and space.

Gherardi (2000), in a study of learning dynamics of a group of managers, politicians and researchers involved in a project to plan and introduce changes in a municipal organisation in Italy, also employed a situated approach to organisational learning. The author focused on the process of knowledge production while the planning group was envisioning a process of organisational development. The study examined the way the project evolved through the process of group negotiation of differences among its members' perspectives and identities. Within the discursive community, which involved researchers, politicians and managers of the organisation, power relations shaped the opportunity for knowledge creation, as its members were 'learning by comparing different perspectives' and 'negotiating a shared frame of action'.

Contu and Willmott (2003) developed further understanding of the role of power relations in communities of practice, originally highlighted by Lave and Wenger (1991). The authors also reinterpreted Orr's (1996) original empirical work by focusing on the power relationships associated with the employment conditions in influencing the ways in which the photocopier technicians developed their working practices. In contrast to Brown and Duguid (1991), they stressed that the

development of a community of practice in this case could be seen not as being driven by a collective desire to improve customer service, but as a way of constructing meaning and identity within the group, and of thereby coping with pressures associated with the downskilling and intensifying of their work by managers (Contu and Willmott, 2003). This exploration of power in the context of learning therefore, emphasised the importance of power relations and dynamics that are concomitant with learning processes.

The situated learning perspective presents a view of organisational learning in which the increase of knowledge applicable in practices within an organisation cannot be realised outside the context of those practices. Neither is organisational learning a process completely distinct from individual cognition, as knowledgeable actors are necessary creatively to realise practices. Furthermore, these learning practices are shaped, facilitated and constrained within relations of power. This study will argue that the 'situated' perspective of organisational learning and knowledge can contribute to an enhanced understanding of learning in inter-organisational collaboration, as discussed in the Section 2.6. The next section, drawing on the notions of knowledge and learning developed here, will review and discuss the existing studies of learning in an inter-organisational context.

2.4 LEARNING IN AN INTER-ORGANISATIONAL CONTEXT

Participation in inter-organisational collaborative relationships, such as alliances, joint ventures and broader multi-partner networks, has long been recognised as playing an important role in organisational learning (Mody, 1993; Dodgson, 1996; Child, 2001; Hagedoorn and Duysters, 2002). It has been increasingly acknowledged that learning and value-creation are inescapably embedded in various forms of inter-organisational relationships. Learning takes place in the ‘interstices between firms, universities, research laboratories, suppliers, and customers’ (Powell, et al., 1996: 118). Powell et al. (1996) studied a large sample of inter-organisational collaborations in the biotechnology industry. Their findings showed that knowledge development occurred beyond the boundaries of any particular organisation, being embedded in the context of a community. The authors argued that in a field of rapid technological development such as the biotechnology industry they studied, the locus of innovation was found within the networks of inter-organisational relationships that sustained a fluid and evolving community. A network serves as a locus of innovation because it provides timely access to knowledge and resources that are otherwise unavailable. Consequently, the degree to which firms learn about new opportunities is a function of the extent of their participation in such activities. Research on the supplier networks and partnering in other sectors, such as Lowe, Delbridge and Oliver’s (1997) study of the automotive components industry, and Bresnen and Marshall’s (2000) study of the construction industry, also revealed the

inter-organisational nature of production systems, and reliance in terms of value-creation on the integration and coordination of inter-organisational activities.

Given the importance placed by firms on forming collaborative arrangements to exploit learning opportunities, researchers have begun to extend the concept of organisational learning to the inter-organisational domain (Dyer and Singh, 1998). This presents the challenge of conceptualising how inter-organisation learning differs and relates to intra-organisational learning (Holmqvist, 2003a), discussed in the previous section. Recent research has extensively addressed the effects of inter-organisational environments on learning (Hamel, 1991; Parkhe, 1991; Mowery and Oxley, 1996; Inkpen and Dinur, 1998; Lane and Lubatkin, 1998; Larsson, et al., 1998; Collinson, 1999; Holmqvist, 1999; Lynskey, 1999; Simonin, 1999; Dyer and Nobeoka, 2000; Lane, et al., 2001; Lubatkin, et al., 2001; Holmqvist, 2003a; 2003b; 2004). Although it has been recognised that inter-organisational partnerships have great potential for value-creation, precisely because of the opportunities for joint knowledge development, only a small fraction of this research has started to examine how firms actually learn and produce knowledge jointly (Holmqvist, 1999; Dyer and Nobeoka, 2000; Lubatkin, et al., 2001; Holmqvist, 2003a; 2003b; 2004), while the majority of the above studies have focused on the way organisations learn from each other, emphasising how partners themselves can improve their respective knowledge by participating in inter-organisational collaborations. In this way, the existing research into learning in inter-organisational contexts is outcome oriented rather than process oriented (Pettigrew, 1997).

2.4.1 Learning by one partner

This research has focused on the notion of external partners while addressing learning in an inter-organisational context. Partners are generally assumed to be organisations that differ in terms of background and experience, and come together to collaborate on various activities, bringing a varying set of capabilities. A number of these studies examined partners' learning in terms of outcomes, linking the extent of inter-organisational knowledge transfer to the properties of knowledge and the ability of the partners to learn from each other based on their 'absorptive capacity' (Cohen and Levinthal, 1990), and the similarities or differences between their organisational characteristics (Parkhe, 1991; Mowery and Oxley, 1996; Inkpen and Dinur, 1998; Lane and Lubatkin, 1998; Lynskey, 1999; Simonin, 1999; Lane, et al., 2001). Others focused on a particular aspect of the way in which inter-organisational environments influence learning, namely, the dilemma between cooperative and competitive interests of the partners, and the way these affect learning in an inter-organisational relationship (Hamel, 1991; Khanna, 1998; Khanna, et al., 1998; Larsson, et al., 1998). The following two sections will discuss the research concerning inter-organisational knowledge transfer and the implications of the existence of cooperative as well as competitive interests of the partners for learning in inter-organisational collaborations.

2.4.1.1 Inter-organisational knowledge transfer

This group of studies adopts a view of organisational knowledge that implies the distinction to be drawn between different types of knowledge, such as tacit and explicit. It focuses on linking such properties of knowledge to the possibilities of knowledge sharing across organisational boundaries. A number of studies illustrate how tacit knowledge presents particular difficulties for sharing because of its implicit and ambiguous nature and embeddedness in social context (Inkpen and Dinur, 1998; Lynskey, 1999). Consequently, the development of the appropriate organisational mechanisms becomes crucial for knowledge sharing between organisations.

Inkpen and Dinur (1998), in their study of 40 two-partner joint ventures between North American and Japanese suppliers in the automotive industry, found that transfer mechanisms involving more intensive social interaction, such as personnel transfers, inter-partner visits and periodic meetings, provided an opportunity to share tacit knowledge and experiences, which allowed partners to gain important insights into each other's business, insights which would otherwise have been difficult to obtain. On the other hand, mechanisms such as technology transfer were more appropriate for sharing objectified and explicit knowledge. In his case study of an alliance in the computer industry, Lynskey (1999) examined the exchange of technology and know-how between the alliance's partners. The author also found that while formal and explicit mechanisms were appropriate for capturing and

transferring those aspects of technology that could be ‘embodied’, other approaches involving closer human interaction were necessary, in order to share the tacit component of knowledge locked up in a technological product or process, such as, for example, the design methodology used by one of the partners.

Another frequently addressed issue in the literature on knowledge transfer is the organisation’s ‘absorptive capacity’ (Cohen and Levinthal, 1990) as an important determinant of inter-organisational learning outcomes (Mowery and Oxley, 1996; Lane and Lubatkin, 1998; Lane, et al., 2001). Cohen and Levinthal (1990) defined the ability ‘to recognise the value of new, external knowledge, assimilate it, and apply it to commercial ends’ as absorptive capacity (Cohen and Levinthal, 1990: 128). Mowery and Oxley (1996), in their study based on a database containing information on over 9000 alliances, examined inter-organisational knowledge transfer in terms of a change in partners’ patent portfolios as a result of alliance activity, and found that absorptive capacity helped to explain the extent of knowledge transfer in some alliances.

Lane and Lubatkin (1998; 2001) developed further the concept of absorptive capacity, and defined the notion of ‘relative absorptive capacity’ by linking the ability to understand and assimilate knowledge from a specific partner to learning outcomes in collaboration. Relative absorptive capacity is determined by a set of different factors: first, by the similarities and complementarities between partners’ knowledge domains and, second, by the differences in organisational structures and

practices. The authors argue that relative absorptive capacity is higher when partners' basic knowledge, which refers to a general understanding of the traditions and techniques in the domain of collaboration, is similar and, at the same time, the partner's specialised knowledge is complementary. For example, in the biotechnology industry, large established pharmaceutical firms often form collaborations with new small companies, which house highly specialised biotechnology know-how. The pharmaceuticals might not be competent in these specific knowledge areas, but they are fluent in basic biological science and have complementary specialised knowledge in product development and testing. While the similarities in the basic knowledge allows partners to recognise and evaluate the importance of each other's potential contribution to collaboration, the complementarities of the specialised knowledge provide the motivation to engage in collaboration in the first place.

Other factors responsible for relative absorptive capacity, according to Lane and Lubatkin (1998; 2001), pertain to the organisational differences between partners. Their findings support the argument that the similarity of organisational structures and practices, such as the degree of formalisation and centralisation, task allocation, compensation and decision-making, provides higher relative absorptive capacity. This is consistent with Parkhe's (1991) framework, which considers more broadly inter-organisational differences and their relation to learning outcomes. The framework identifies four dimensions along which partner organisations can differ: institutional environment, in which organisations are embedded; their national

context; organisational culture; and, finally, organisational practices at strategic and operational levels. Each dimension can influence ongoing learning within collaborative relationships. For instance, one can consider the influence of a broader social context and national culture on inter-organisational processes, as they mould epistemological structures of perceiving and thinking and determine the general attitudes of organisational members towards outsiders. The impact of such organisational differences on inter-organisational learning is often depicted in the studies of international collaboration. For example, Barkema et al. (1997) examined the longevity of the international joint ventures of 25 large Dutch firms, and found that it was affected by lack of skill in managing joint ventures in unfamiliar foreign environments. Furthermore, Simonin (1999) conducted a cross-sectional study of 147 alliances, focusing on the transfer of technological knowledge between partners. This author also found some evidence of how knowledge specific factors, such as tacitness, and partner specific factors, such as organisational and cultural differences, affected the extent of knowledge transfer.

The studies above have highlighted the important factors that might influence the outcome of inter-organisational learning. However, they have largely produced a snapshot view of inter-organisational learning, namely, of how learning outcomes are related either to the nature of knowledge or to the characteristics of the partner organisations. As a result, the complexity of inter-organisational learning, and especially, the role of social context have not been properly addressed in this literature. Inter-organisational collaborations are social arrangements with

information sharing among actors dependent on their social structure and motivation (Liebeskind, et al., 1996; Collinson, 1999). Liebeskind et al. (1996) studied the sourcing of scientific knowledge in two organisations in the biotechnology industry. They found that in sourcing scientific knowledge, the organisations relied heavily on the social networks that transcended organisational boundaries. Knowledge sharing in such networks was governed by the shared norms of trustworthy behaviour developed through socialisation and tradition among the actors involved. Collinson (1999) conducted a detailed case study of an alliance between British and Japanese steel makers aimed at transferring some of the best practices of each from one partner to another. He found that a number of practices were more difficult, if not impossible, to transfer between partners because they were more deeply embedded in broader contextual factors.

2.4.1.2 Cooperation versus Competition

Besides providing opportunities for learning, the nature of inter-organisational environments also implies barriers to partners' learning. The origin of the barriers lies in a dilemma faced by learning oriented inter-organisational relationships resulting from the possibility of opportunistic behaviour by one of the partners while learning. Such a problem is made more apparent when the competitive element prevails in a relationship. The following studies explored this dilemma and proposed explanations of inter-organisational learning behaviour in terms of the balance between organisations' competitive aims and co-operative means.

Khanna, Gulati and Nohria (1998) approached this dilemma, postulating that learning behaviour is influenced by the degree to which partners' interests are complementary or competitive, as well as by each partner's opportunity to apply learning outcomes outside an alliance. They developed the notion of common and private benefits. Private benefits are those that an organisation can gain unilaterally by applying acquired knowledge in its own domain, while common benefits can only be gained from collective application of knowledge as a consequence of joint activities. In terms of this framework, the relation between these two types of benefits determines partners' learning behaviour. Thus, the lower the ratio of private to common benefits, the closer the alliance approximates to pure cooperative behaviour characterised by joint, profit-maximising resource allocation. In this way, collaborative relationships balanced differently along these two dimensions are likely to exhibit different patterns of learning behaviour.

In his study of nine international alliances in Europe, United States and Japan, Hamel (1991) found that not all partners were equally adept at learning, or had the same degree of 'receptivity'. On the other hand, the partners also had different degrees of 'transparency', which was determined by the combination of the characteristics of knowledge involved and the balance between partners' 'openness' and 'protectiveness'. These were the important determinants for how the benefits of collaboration were being captured by the partners. Thus, having a competitive

element prevailing in a relationship, one could expect 'learning races' to occur (Hamel, 1991), a situation in which the partners strive to 'outlearn' each other.

Larsson et al. (1998) expanded this analysis by proposing a framework that captured the dynamics of partners learning in collaboration through the interaction of the individual learning behaviour of the partners. The authors presented learning dynamics as a path-dependent process going beyond the partners' unilateral choices to compete or cooperate. In the proposed framework, they considered both the integrative dimension of how joint outcomes were produced and the distributive dimension of how these outcomes were divided between the partners. In this way, the possibility of 'learning races' was limited by the combination of the partners' previous learning behaviour, and, on the other hand, the combination of certain learning behaviour could lead to a 'deadlock' situation, in which any joint learning was made impossible.

This group of studies makes an important contribution to the understanding of learning in an inter-organisational environment by emphasising the hazards associated with the divergence of the partners' interests. They propound an argument, similar to the prisoner's dilemma of collective action in the game theory (Axelrod, 1984), about the possibility of narrow organisational rationality in learning creating dysfunctional behaviour when the nontransparent withholding of information inhibits collective learning, and the nonreciprocal intent by one partner undermines the other partner's willingness to cooperate. However, these studies tend

to overemphasise the prevalence of opportunistic behaviour by ignoring the influence of experience gained from previous interactions in the course of a relationship, which can generate norms of exchange based on reciprocity as the partners learn about each other through ongoing or previous interactions (Granovetter, 1992; Gulati, 1995). In this way, the studies that explain learning dynamics based on the dilemma between cooperative and competitive interests present a somewhat limited view, and do not address adequately the complexity of the social dynamics involved.

2.4.2 Inter-organisational learning

The following studies, in contrast to the research discussed in the previous section, focus on inter-organisational learning, in so far as they consider an inter-organisational collaboration, rather than each separate partner, as a learning entity. They do recognise though, that inter-organisational learning does not occur by itself, but occurs as the result of a confrontation and a combination of single organisations' experiences. Thus, inter-organisational learning is addressed in the relation between individuals and organisations, where learning of a single organisation is the driver for learning in an inter-organisational relationship (Holmqvist, 2003a; 2003b).

Lubatkin et al. (2001) proposed a model of inter-organisational learning that emphasised that the partners learned not only how to improve their respective knowledge, but also how to learn together, in order to develop new knowledge

through collaboration. Their model is partially grounded in the theory of relational governance (Dyer and Singh, 1998), which argues that collaborative arrangements involve non-economic understandings based on trust and norms of reciprocity, as well as those specified in formal contacts. The authors draw particular attention to the difficulties associated with the governance and the development of coordination mechanisms (Grandori, 1997) in those collaborative relationships, the primary intent of which is to co-experiment and leverage each other's unique, but complementary, knowledge.

Dyer and Nobeoka (2000) approached directly the development of inter-organisational coordination mechanisms in their empirical study of Toyota suppliers network. The authors addressed inter-organisational learning in this particular network environment by examining inter-organisational routines and rules. Toyota and their suppliers have developed bilateral and multilateral routines by creating a strong shared 'network identity'. Such an identity has emerged through a number of network level processes designed by Toyota, which have become routines, such as participation in the supplier association, serving as a basis for a shared social community among the suppliers; operation of a management consulting division, attending to all the suppliers, and responsible for accumulating and diffusing network level experiences; participation in small learning teams, designed to bring together smaller numbers of suppliers for closer interaction; and, finally, inter-firm employee transfers. In addition to the routines, Toyota has also established 'network rules' of participation, which prevent members from free-riding. By openly sharing

its production know-how, Toyota has established a norm that most of a firm's knowledge about processes can be shared amongst the members. It has created 'showcase suppliers' to demonstrate how they have implemented elements of the Toyota's production processes, and encourage suppliers to open their operations to one another. Such rules are the 'price of entry' into this type of network.

Holmqvist (1999; 2003a; 2003b), in his longitudinal qualitative study of learning in collaboration of a Scandinavian software producer and its business partners, also concentrated on inter-organisational learning as the production and re-production of inter-organisational rules and routines. The author followed the emergence of such inter-organisational rules and routines through the interaction between the employees of different organisations as they 'bargained' when confronted with specific situations in new or on-going product development projects. These included highly formalised and written rules and routines, as well as more tacit and informal conventions and codes based on experience. Ultimately, by producing some joint behavioural rules and routines based on experience, i.e. by learning, the different organisations created a coupling between rule-like behaviour, thus, making future interaction and learning more predictable and stable. Holmqvist also points out that as a result of inter-organisational learning, produced behavioural coupling between partnering organisations can impede further learning, and result in 'learning myopia' (Levinthal and March, 1993). In this way, unlearning (Hedberg and Jonsson, 1978; Hedberg, 1981) becomes an important aspect of inter-organisational learning. Although, to date, unlearning has not been explored in the literature regarding inter-

organisational collaboration, Holmqvist (2003b) has made some conjectures in this regard, without managing to provide any empirical evidence to substantiate his views.

The research discussed in this section has begun to address the inter-organisational nature of learning in collaborative relationships. Inter-organisational learning is here regarded as a social production and re-production of inter-organisational rules, based on experience that leads to changed organisational behaviour. This research has also started to indicate that the process of inter-organizational learning play an important role in knowledge creation. Knowledge creation effects of collaboration consist of generating new knowledge (e.g. practices, products, etc) that were not available to either of the collaborators previously (Hardy, et al., 2003). Knowledge creation requires that partners act not as either 'student' or 'teacher', but as a 'co-researcher' or 'co-inventor' (Lubatkin, et al., 2001).

Although the research discussed in this section has started to address the shortcomings of previous studies that take 'on-the-spot accounts' of learning processes, empirical studies directly investigating the process of learning in inter-organisational collaborations are still very scarce. It has been emphasised in the literature (Larsson, et al., 1998; Holmqvist, 2003a) that a more long-term perspective on inter-organisational learning is needed. To provide a fuller understanding of inter-organisational learning, the longitudinal context in which learning process unfolds needs consideration, a context in which the partners are

jointly embedded and have historical, as well as possible future relationships. These accounts indicate that learning in an inter-organisational context cannot be considered separately from the collaboration activity taking place over time. In other words, understanding the phenomenon of inter-organisational learning requires one to attend to the process (Pettigrew, 1997) of collaboration. The next section will address the process research on inter-organisational collaboration, and examine its contribution to the understanding of learning in inter-organisational contexts.

2.5 LEARNING AND DEVELOPMENTAL PROCESSES IN INTER-ORGANISATIONAL COLLABORATION

2.5.1 Inter-organisational networks: an overview

Networks are conceptualised by some authors as an intermediate form between markets and hierarchies (Williamson, 1991). Others adopt the view that a network is a 'third type' of organisational arrangement with distinctive characteristics and properties (Powell, 1991). The networks will be understood here as means of organising economic activities implemented through inter-organisational coordination (Grandori and Soda, 1995; Grandori, 1997). Network relationships have been analysed from several concurrent theoretical perspectives. These perspectives use economic, competitive relations, behavioural and sociological arguments to provide explanations for the formation, development, operation, and outcomes of inter-organisational networks.

One approach to understanding inter-organisational formations is transaction cost economics (Williamson, 1991). This theory views inter-organisational collaboration as an instrument for generating efficiency through cost reduction. According to its logic, the coordination modes present in a relationship are determined by the anticipated transaction cost, which arises out of concerns about the opportunistic behaviour of the partners. Transaction cost economics has been widely applied in studies of strategic alliances and R&D collaborations (Osborne and Hagedoorn, 1997), and is a useful framework for explaining a number of aspects of inter-organisational collaborative relationships, although it is increasingly being challenged by other theoretical perspectives.

The common critique of the transaction cost economics approach pertains to its being static and incomplete, failing to embrace the complexity of inter-organisational formations (Eisenhardt and Schoonhoven, 1996; Yamin, 1996; Dyer and Singh, 1998; Tsang, 2000). It overemphasises the prevalence of opportunistic behaviour by ignoring the influence of experience gained from previous interactions in the course of a relationship, and fails to capture many strategic advantages of collaboration, such as the 'learning curve'. These omissions are significant because experience can generate trust among partners, as they learn about each other through ongoing interaction, thereby reducing the transaction cost associated with future arrangements. Consequently, the choice of governance structures depends not only on anticipated transaction cost, but also on the trust that emerges between

organisations over time through repeated ties (Granovetter, 1992; Gulati, 1995). There is a strong cognitive and emotional basis for trust; therefore interaction and cooperation originate at the individual level. Eisenhardt and Schoonven (1996), for example, in their study of collaborative activities among entrepreneurial firms in the semiconductor sector, emphasise the influence of the strong social positions of firms in collaborative activity, in so far as these positions depend on social characteristics such as personal relationships, status and the reputation of firms, as well as upon key individuals within those firms that can identify, attract and engage partners. This argument is well presented in a broader discussion concerning an emerging shift towards alternatives to transaction economics forms of social control in modern knowledge intensive societies (Alter and Hage, 1993; Ring, 1997; Adler, 2001). This literature considers a different set of assumptions about the motives and behaviours of parties involved in inter-organisational relationships and stresses trust (Newell and Swan, 2000; Dirks and Ferrin, 2001) as a key instrument of exchange coordination.

Contractor and Lorange (1988) suggest that inter-organisational relationships perform a wide variety of functions beyond the reduction of transaction costs. The benefit aspect of transactions is considered by the resource-based view (Prahalad and Hamel, 1990; Hamel, 1991). It regards the enhancement of a firm's resources as the main motivation for collaboration, and places emphasis upon organisational learning for the acquirement of skills. This aspect of collaboration is important, as it highlights the need to consider the competitive and profitability objectives of

collaboration, in order to understand the balance between organisations' competitive aims and cooperative means.

The primary focus of analysis in the transaction cost and resource-based views remains on an individual firm, insofar as inter-organisational relationships are conceived as compensating for the lack of internal resources and skills. Alternatively, the relational view of inter-organisational formations considers inter-firm dyads or an entire network as the unit of analysis (Dyer and Singh, 1998), on the basis that a firm's resources span organisational boundaries and are embedded in network processes. This perspective is rooted in the tradition of the inter-organisational relations field, which rather than stressing how one firm achieves competitive success, investigates collective patterns of survival and sustainability. One aspect of this area of study is concerned with adaptation and the need to manage environmental uncertainty (Pfeffer and Salancik, 1978; Powell, et al., 1996; Kraatz, 1998) through network use. Another aspect adopts a structural approach, emphasising the problems of centrality, conflict and ties formation among network actors (Nohria and Eccles, 1992; Ahuja, 2000; Kogut, 2000).

The above review outlined the way different perspectives of inter-organisational networks contribute to the explanation of the emergence and operation of networks. In sum, organisations' mutual adjustment to changing conditions is provided by learning the expertise and sharing the financial resources and risks of partners, and is made possible through exploration of the opportunities to interact that are

determined by the social fabric in which organisations are embedded. Furthermore, the explanation of the duration and stability of the structures requires the study of processes and governance mechanisms in inter-organisational formations. These issues of the way collaborative relationships are actually built and controlled and the potential developmental patterns have received somewhat limited attention in the literature to date (Alter and Hage, 1993; Ebers, 1997). Nevertheless, the emergent stream of studies that address the developmental aspects of collaborative relationship have started to highlight such issues, and will be reviewed in the next section.

2.5.2 Process studies of inter-organisational collaboration

Investigating the developmental processes within inter-organisational collaborative relationships requires understanding of how changes unfold and the ability to identify underlying generative forces and reveal how they contingently operate over time, producing the observed phenomena (Tsoukas, 1989). Process studies of inter-organisational collaborations are diverse and have employed a variety of approaches to explain developmental patterns. The review presented here relies on Van de Ven and Poole's (1995) framework, which assumes that there are four main generative forces responsible for developmental processes in collaboration: life-cycle, evolution, teleology, and dialectics. By employing a framework of four generic generative forces to explain development processes, Van de Ven and Poole (1995) argue that this provides the possibility of integrating different perspectives, thus producing fuller explanations. They assert,

It is the interplay between different perspectives that helps one gain a more comprehensive understanding of organizational life, because any one theoretical perspective invariably offers only a partial account of a complex phenomenon. Moreover, the juxtaposition of different theoretical perspectives brings into focus contrasting worldviews of social change and development. Working out the relationships between such seemingly divergent views provides opportunities to develop new theory that has stronger and broader explanatory power than the initial perspectives. (pp. 510-511)

Employing Van de Ven and Poole's framework for generating explanations of inter-organisational collaborations development offers a fuller understanding of the dynamics within the inter-organisational arrangements than any particular theoretical perspective (e.g. transaction cost (Khanna, et al., 1998), bargaining power (Inkpen and Beamish, 1997), or competitive learning (Hamel, 1991)) can provide alone. As this framework is sufficiently generic and parsimonious, it permits the simultaneous consideration of the elements of a variety of theoretical stands, generating more inclusive explanations. The main elements of the framework are outlined in the next section. The limitations of this framework are addressed in the Chapter 6 Section 6.4.

2.5.2.1 Process theories framework

Van de Ven and Poole (1995) identify four schematic-types of development and change in organisations: life-cycle, evolution, teleology and dialectics. In each type, a different motor, or generative force, governs the developmental process. Thus, the life-cycle theories adopt the metaphor of organic growth to explain development. They regard change as imminent, with natural and institutionalised rules prescribing the course of development. The evolutionary theories focus on cumulative changes. They explain change as a recurrent progression of variation, selection, and retention of organisational entities governed by environmental and competitive forces. According to the teleological approach, development occurs in a process of social construction through convergence to consensus amongst actors. It depicts development as consisting of a sequence of processes, which, through learning and adaptation, facilitates purposeful progression towards intended outcomes. Finally, in the dialectic theories, confrontation and conflict are at the heart of the developmental processes. This approach explores the inherent contradictions that may exist between the entities that compete with each other for domination and control. In this way, development is explained through the balance of power between opposing entities.

Figure 2.1 depicts the classification of the process theories as presented in Van de Ven and Poole (1995). The two analytical dimensions used for this classification are 'unit of change' and 'mode of change'. Developmental processes take place at many organisational levels, from individuals and groups to populations of organisations.

The classification distinguishes whether change occurs in a single entity or among two or more entities. Furthermore, 'prescribed' and 'constructive' modes of change are distinguished in terms of whether the sequence of change events is prescribed a priori, or whether it is constructed and emerges as the developmental process unfolds.

Figure 2.1 Process theories of organisational development

Unit of change	Multiple entities	EVOLUTION	DIALECTICS
	Single entity	LIFE CYCLE	TELEOLOGY
		Prescribed	Constructive
		Mode of change	

Adapted from Van de Ven and Poole (1995)

The authors also highlight the point that the complexity of the developmental process implies that consideration of more than one generative force may be required to explain the patterns of development. Observed processes of organisational change are multilayered and complex and, therefore, may be better

analysed using ‘composite theories’, derived from the combination and interplay between the four basic generative forces identified in the framework (Van de Ven and Poole, 1995).

2.5.2.2 The review of process studies of collaboration

Table 2.1 presents the process studies of inter-organisational collaboration to be reviewed in this section. The studies were identified through examination of the extensive literature on alliances, joint ventures, supplier networks, and inter-organisational relationships more generally, selecting those studies that adopted a processual approach, i.e. focusing on events, actions, and activities unfolding over time in the context of inter-organisational collaborations (Pettigrew, 1997). Table 2.1 classifies these studies, indicating which generative force or forces were employed by each study to explain collaboration development. First, this review considers the approaches emphasising a single generative force as the main driver for collaboration development.

Life-cycle

Early research on the process of inter-organisational collaborations tended to emphasise driving forces at the macro-level, such as life-cycle. Studies such as that of D’Aunno and Zuckerman (1987), and Kogut (1988), describe the development of inter-organisational formations as sequences of creation, maturation and termination stages. D’Aunno and Zuckerman (1987), for instance, propose four developmental

stages in inter-organisational collaborations: emergence, transition, maturity, and critical crossroads. Common to life-cycle models is the assumption that following the establishment, the collaboration may evolve and eventually terminate in many different ways, although effective collaborations move smoothly from one stage to another as a result of rational planning by those in charge.

Evolution

In contrast to life-cycle approaches, the evolutionary perspective emphasises the environment as a principal driver of change, retaining only those entities that best fit their environment. Koza and Lewin (1998), and Zollo, et al. (2002) apply the evolutionary approach to individual collaborations, while Gulati (1995a; 1995b) addresses process at the level of populations. Koza and Lewin's (1998) 'co-evolutionary approach' considers inter-organisational collaborative relationships in the context of adaptation choices of a firm. They view collaboration as embedded in a firm's strategic portfolio, and co-evolving with the firm's strategy, institutional, organisational, and competitive environment. For example, a change in product development strategy may prompt a firm to intensify its R&D collaboration activity.

Table 2.1 Process approaches to inter-organisational collaboration

Authors	Interplay among generative forces			
	Life-Cycle	Evolution	Teleology	Dialectics
D'Aunno and Zuckerman (1987)	√	-	-	-
Kogut (1988)	√	-	-	-
Parkhe (1991)	-	-	√	-
Hamel (1991)	-	-	-	√
Larson (1992)	√	-	√	-
Ring and Van de Ven (1994)	-	-	√	-
Gulati (1995)	-	√	-	-
Doz (1996)	-	-	√	-
Elg and Johansson (1997)	-	-	-	√
Inkpen and Beamish (1997)	-	-	-	√
Makhija and Ganesh (1997)	-	-	-	√
Hardy and Phillips (1998)	-	-	-	√
Kumar and Nti (1998)	-	-	√	-
Arino and de la Torre (1998)	-	√	√	-
Koza and Lewin (1998)	-	√	-	-
Boddy et al (2000)	-	-	√	-
Buchel (2000)	√	-	-	√
Das and Teng (2000)	-	-	-	√
Shenkar and Yan (2002)	√	√	-	√
Zollo, et al (2002)	-	√	-	-
de Rond and Bouchikhi (2004)	-	-	-	√

Zollo et al. (2002) employed evolutionary economics in their cross-sectional study of 145 inter-organisational alliances in the biotechnology sector. They found that partner-specific experience accumulated in the inter-organisational routines underlying the way the partners interacted, which developed over time through partners' engagement in multiple relationships with each other, had a positive effect on the performance of collaborative arrangements. In this way, the development of inter-organisational routines is seen as a contributing mechanism to the adaptation and selection processes of alliance formation and survival.

Furthermore, Gulati (1995a; 1995b) conducted a cross-sectional study of alliance formation, based on multi-industry data on alliances made throughout a 20-year period. They explored the factors that might explain the patterns of formation of inter-organisational collaborations at the level of a population. Gulati found that the accumulation of prior collaborative relationships between organisations created social networks in which organisations were embedded that served as a source of information and opportunities, and shaped the formation of future collaborative relationships. In this way, the evolutionary approaches share the view that the diffusion of inter-organisational collaborative arrangements across sectors is brought about by competition for scarce resources and collective learning by organisations from their own, as well as each other's, experience.

Teleology

Organisational entities in the teleological perspective are considered as purposeful and able to learn and adapt to changing circumstances. Process is thus, typically viewed as 'a repetitive sequence of goal formulation, implementation, evaluation, and modification of goals, based on what was learned or intended by the entity (Van de Ven and Poole, 1995: 516). Ring and Van de Ven (1994) examined process in collaborations, assuming them neither to be fully specifiable, nor controllable by partners prior to their execution. Their process model conceptualises relationships as a recurring sequence of processes of negotiation, commitment, and execution. Each phase is governed by formal, legal, and informal social-psychological processes, and is focused on attaining efficient and equitable outcomes, based on the assessment of efficiency in economic terms, and equity in terms of the developing social relationships.

Doz (1996) proposes a slightly different approach, in which the developmental process is viewed by means of a learning dimension. Based on his empirical longitudinal study of technology-development collaborations, Doz asserts that learning processes mediate the development of inter-organisational relationships by pressing forward towards more sophisticated states of being. The author presents the collaboration process as a sequence of different stages, namely, learning, evaluation and adjustment. He suggests that the learning ability of the partners is crucial to the adjustment of the relationship and entry into the next stage of development.

Furthermore, Kumar and Nti (1998) developed a model encompassing the factors that ought to be considered by alliance partners at the evaluation stage of alliance development. Their model establishes a distinction between the factors pertaining to the contributions made by the partners to the substance of collaboration, such as the commitment of resources and completion of milestones, and those concerning the quality of the relationship. The latter reflect psychological attachments developing at the individual level between partners. According to the authors, the combination of these factors and the ability of the partners to assess and act upon them shape the path of collaboration. Thus, for example, the positive assessment of relational quality could compensate for the poor performance of collaboration in the decision to continue or not with the partnership, and vice versa. However, negative assessment of both could lead to collaboration termination.

Parkhe (1991) and Boddy et al. (2000) also share the concern about the capacity of an inter-organisational collaborative relationship to make the adjustments necessary for a relationship to progress. Parkhe (1991), for example, focuses in particular, on organisational learning and adaptation as critical processes that moderate the impact of the factors present at the formation of a partnership, such as inter-organisational differences, on collaborative relationship longevity and effectiveness. Boddy et al. (2000), in their case study of a computer industry customer-supplier partnership between Sun Microsystems and one of their suppliers of plastic mouldings, depict inter-organisational arrangements as 'negotiated orders', where the convergence to consensus depends on the interactions between parties and the emergence of co-

operative behaviour. In this way, unlike life-cycle approaches, teleology does not postulate a uniform and predictable sequence of prescribed stages. This view recognises that unplanned events, unexpected results, and conflicting interpretations occur and are capable of influencing the course of a relationship.

Dialectics

The dialectical approach adopts a view of collaborative relationships development that explores the inherent contradictions present within the inter-organisational domain. For instance, in a given collaborative relationship, motivation for cooperation and conflict of interests coexist and are mutually interdependent (Zeitz, 1980). These contradictions affect organisational actions in such a way that it may become impossible to accomplish intended goals in a rational manner. Emergent contradictions distort action and generate dialectical processes, which ultimately become manifest in crisis (Van de Ven and Poole, 1995). Tensions can emerge at personal, group or organisational levels.

A number of studies within the dialectical perspective explore a particular aspect of the potential inter-organisational tensions, namely, the balance between competitive and cooperative interests of the partners, as the main source of inter-organisational conflict. Hamel (1991), Inkpen and Beamish (1997), and Makhija and Ganesh (1997) emphasised the opportunistic hazards that could lead to unequal rates of learning among partners. For instance, Hamel, presented empirical findings, based on nine case studies of international alliances in various sectors, that showed how

'learning race' behaviour (Hamel, 1991) could result in the shift in the bargaining power of the partners, disturbing the status quo of the relationship and inhibiting in this way, further knowledge sharing. Makhija and Ganesh (1997), and Inkpen and Beamish (1997), in their conceptual research, developed propositions to capture the effects of unequal learning rates on the inter-organisational collaboration developmental processes. According to their frameworks, the competitive element of an inter-organisational relationship manifested through 'learning races' leads to the unequal exchange of resources and the subsequent development of systems of domination. The partners' perception of bargaining power shifts, introducing instability and conflict in the relationship. Gradually, the dominant partner may achieve its learning objectives, or the less dominant partner may lose motivation to collaborate, both situations leading to the dissolution of the collaboration. Thus, the mutual interdependence upon which inter-organisational collaboration is based provides grounds both for acts of cooperation and acts of conflict and opposition.

Das and Teng (2000) extend the possible set of contradictions emerging in an inter-organisational collaboration. The authors address the issue of inter-organisational arrangement instability, by taking into account three pairs of internal tensions: cooperation versus competition, rigidity versus flexibility, and short-term versus long-term orientations. The authors assume that under conditions of instability, collaborations experience significant change or are terminated. In this way, developmental process is determined by the tendency towards stability when the respective conflicts generated by opposing dialectical forces are resolved. De Rond

and Bouchikhi (2004) propose a further development of the dialectical approach. These authors, unlike Das and Teng (2000), make no normative assumptions as to which states of social phenomena are better or more desirable than others. Rather, they argue that stability should not be privileged over instability, and, moreover, instability should not be regarded as a dysfunctional state. They advocate the view that inter-organisational relationships are inherently heterogeneous phenomena, where 'conflicting forces merely coexist' (de Rond and Bouchikhi, 2004: 66). Based on their detailed case study of an alliance in the biotechnology industry, de Rond and Bouchikhi propose expansion of the list of conflicting forces simultaneously operating in collaboration, postulating that dialectical forces can exhibit themselves at multiple levels, affecting different aspects of a single alliance. Thus, they introduce a variety of potential sources of dialectical tensions, such as trust versus vigilance and control versus autonomy, among others.

Elg and Johansson (1997), and Hardy and Phillips (1998) go further, exploring how the contradictions in partners' interests govern the sequences of confrontation, conflict and synthesis in collaboration development. Instead of assuming the prevalence of the common goals among the partners, these studies examine collaborations from a perspective that implies that the partners' interests may conflict, and the balance of power between them may be unequal. This research explicitly addresses the issues of power in a constitution of inter-organisational domains. Elg and Johansson (1997) drawing upon a case study of the introduction of a computer-based decision aid system in the Swedish food industry, proposed a

model that demonstrated how motives, structural conditions and moves made by powerful as well as more dependent firms interacted in shaping decision processes in collaboration. They argued that the development of collaboration in adopting the new system was influenced by political activities during the decision process. Hardy and Phillips (1998), in their study of the UK refugee system involving the collaboration of a number of different organisations, moved the discussion beyond the simple dichotomy between cooperation versus conflict, and focused attention on the complex dynamics of inter-organisational domains 'below the surface'. They identified four possible strategies of engagement, namely, collaboration, compliance, contention, and contestation that governed an inter-organisational relationship development, and were adopted by the partners either to defend the domain from change, or to influence the direction taken by change. The study suggested that power and politics were inseparable from the developmental processes in the inter-organisational domains.

Multi-force approaches

Although the majority of the process studies of collaborations reviewed here have relied on one generative force to explain the development of inter-organisational relationships, there are a number of studies that have approached the developmental process by explicitly addressing more than one generative mechanism shaping the development.

Larson (1992), in the cases based study of three network dyads in different industries, computer hardware, telephone manufacturing and clothing, identified three phases of dyads development. The first phase, through prior personal relationships and known reputations, reduced uncertainty and provided a basis for future cooperation. The second phase was characterised by an intensive period in which rules and procedures, as well as reciprocity, norms and trust, were established. In sum, it was characterised by the emergence of an inter-organisational environment. In the third phase, through the effective control and coordination mechanisms developed upon the foundations established during the previous phase, the partner organisations were able to integrate their operations and develop the collaborative relationship, governed by the regulatory presence not only of formal agreements, but also of moral obligations and concern for the preserving of reputations. By specifying three phases in the dyads' development, and examining how they progressed from one phase to the next, Larson's analysis of the cases employed two generative forces, namely, life-cycle and teleology, to explain how the network dyads developed over time.

Arino and de la Torre (1998), in their longitudinal case study of a joint venture between two multinational firms in the consumer products industry, depicted collaboration development as a cycle of self-reinforcing loops of learning, evaluation and adjustment, through which collaboration progressed over time. The authors built upon the research by Ring and Van de Ven (1994) and Doz (1996), and explored further the role of social interactions in the development of collaboration.

They examined how the unfolding patterns of social interactions determined the quality of the developing relationship between partners. For instance, Arino and de la Torre's study reported how the establishment of personal bonds during the negotiation stage positively contributed to the building of trust and reciprocity norms, which were crucial at a later stage of evaluation, when good relational quality provided a reserve of goodwill, allowing the collaboration to withstand some setbacks in its actual performance. The authors also included a number of exogenous factors, such as environmental changes (e.g. downturn in the industry) and changes in the organisations' strategies (e.g. refocusing of product portfolio) that served as triggers to propel the collaborative relationship towards the evaluation stages. By considering the role played by the co-evolutionary processes in the joint venture development, Arino and de la Torre included a second generative mechanism, evolutionary force, in addition to teleology, to their analysis.

Buchel (2000; 2002) conducted a detailed study of a collaborative R&D venture created to operate in the emergent market of network management platforms and solutions for telecommunications. In each developmental stage of collaboration, the author identified phases of convergence and divergence taking place around the conflicts arising in the conditions of two different organisations working together. The case illustrates how the collaboration was affected by the emerging conflicts between the two organisations and their divergent interests, and how the dynamics of conflicts emergence and the degree to which they were resolved influenced the developmental stages of collaboration formation, recurrent adjustments and

evaluations, and eventual termination of the venture. In this way, Buchel aggregated life-cycle and dialectical approaches to provide a process model of this particular joint venture development.

Shenkar and Yan (2002) conducted a longitudinal case study of an international joint venture between a Chinese and Australian partnership formed with the objective jointly to build a hotel in mainland China. Over the two years of the joint venture's existence, the authors identified four life-cycle stages: pre-formation, formation, post-formation, and crisis and decline. The analysis of the case revealed two main forces responsible for the short life-span of this joint venture, and the timing of the transitions from one stage of the life-cycle to the next. The first force pertained to the highly unstable political environment in China at the time. The shifts in the government policy regarding tourism and increase in import taxes directly affected the construction of the hotel, making the enterprise less viable commercially. Furthermore, the internal political dynamics within the partnership affected the course of this collaboration. Pursuit of a hidden agenda by the Chinese partner, such as the diversion of resources from the joint venture to its other businesses, created a climate of mistrust between the partners, and resulted in highly politicised and ineffective decision-making. Ultimately, the joint enterprise failed. In this way, this study employed three generative forces to explain the pattern of joint venture development: life-cycle, evolution, and dialectics.

The review of process studies of inter-organisational collaboration has revealed a variety of approaches, indicating that collaborative relationships are complex phenomena that are continually affected by multiple forces. As Van de Ven and Poole (1995) point out, the interplay between these forces defines the collaboration trajectory. However, the existing research has overlooked the diversity of the developmental forces, most of the studies having utilised only one force, with only a few studies having employed more than one generative force to explain the collaboration process. Such approaches can lead to oversimplification and emphasis on one aspect of collaboration at the expense of others, especially considering that the task of process research is 'to identify the variety and mixture of causes of change and to explore through time some of the conditions and contexts under which these mixtures occur' (Pettigrew, 1990:269).

This section has reviewed the process studies of inter-organisational collaboration by applying the framework of process theories developed by Van de Ven and Poole (1995). It has also outlined the limitations of the existing process research with regard to their failure to consider the variety of developmental forces and to examine the interrelations between them. The next section will discuss the contribution of the processual researchers of collaboration to the understanding of inter-organisational learning.

2.5.3 The contribution of the process studies of collaboration to the understanding of inter-organisational learning

This section continues to examine the process research of inter-organisational collaboration, and focuses on the contribution of these studies to the understanding of inter-organisational learning. The life-cycle approaches view inter-organisational learning as a propelling force that can move collaboration to the next stage of its life-cycle. For example, Larson (1992) and Reuer (2000) highlight the way inter-organisational learning during the formation and initial stages of an inter-organisational relationship ensures its progression to maturity and actual implementation of collaboration. With regard to the evolutionary approaches, inter-organisational learning is seen as a cumulative process of the development of inter-organisational routines based on the experience of collaboration with the specific partners (Gulati, 1995a; Zollo, et al., 2002). Inter-organisational learning, in this way, is conceived as a part of the adaptation mechanism that plays a role in the survival of the 'fittest' inter-organisational formations.

The teleological studies focus more closely on the processes through which inter-organisational environments are established, and rules and routines emerge. As argued by Ring and Van de Ven (1994), the uncertainty produced by the complexity of behavioural dynamics in collaboration can be better managed by the controls based on social norms and reciprocity, which are constructed through learning. Inter-partner interactions and the establishment of inter-personal relationships are seen as

means for such processes to occur (Doz, 1996; Arino and de la Torre, 1998). These studies also emphasise the behavioural element of learning (Huber, 1991) in terms of the behaviour change needed 'to make alliance work' (Doz, 1996:74). Learning in terms of changing behaviour is an important part of collaboration because the dynamics of a relationship are strongly influenced by the amount of adaptation occurring between the partners. Behavioural change is needed to introduce adjustments to the relationship.

The studies of collaboration that adopt the dialectical perspective point out that interactions between organisations are often highly problematic, and tend to involve more conflict and explicit compromising and bargaining than interactions within organisations (Hardy and Phillips, 1998; de Rond and Bouchikhi, 2004). This situation is to be expected, due to the lack of a formal structure of authority between organisations (March and Olsen, 1989). The dialectical perspective also notes that inter-organisational learning occurs within particular relations of power (Elg and Johansson, 1997; Inkpen and Beamish, 1997; Hardy and Phillips, 1998).

In the literature on learning in collaboration (see Section 2.4.1.2), the issue of power is also featured when regarding competitive learning and bargaining power (Hamel, 1991; Inkpen and Beamish, 1997; Makhija and Ganesh, 1997; Larsson, et al., 1998). However, these studies of inter-organizational collaborations fail to fully capture the distinctive way in which power is implicated in the unfolding of collaboration and learning processes. By encompassing the competitive learning by the partners and

the consequent shifts in their relative bargaining power they thus focus only on the negative effects of power gained through competitive learning, i.e. how it leads to the dominant position of one partner over another and destabilizes the relationship preventing joint learning. Thus, these studies argue that by having power based on resources (e.g. knowledge) one organization can exercise this power 'over' its partner by controlling the resources (Pfeffer and Salancik, 1978). The perspective that considers only the negative effects of power by concentrating on power 'over' has been criticized in a broader literature on power and politics in organizations (Dougherty and Hardy, 1996; Hardy, 1996), because it excludes the productive side of power that allows achieving outcomes, i.e. power 'to'.

Another limitation of these studies consists of considering only one form of power – power of resources, while the resource-dependency relationship is not the only form of binding in inter-organizational collaborations (Hardy and Phillips, 1998). In their assessment of power in inter-organizational domains, Hardy and Phillips (1998) highlighted three aspects of power: formal authority, critical resources, and discursive legitimacy. Formal authority refers to the recognized, legitimate right to make a decision. In an inter-organizational domain, such power can rest with one particular organization (for example, a governmental body) or be shared between organizations (like in a joint venture). In the case of critical resources, if one organization relies on another for such resources as knowledge, money, equipment, etc., the dependent organization is at a power disadvantage. Finally, discursive legitimacy arises from the ability of one interest group to legitimize their demands

and 'de-legitimize' the demands of others by the management of meaning (Pettigrew, 1979). For instance, having a reputation may afford an organization more influence over decisions than its resource-rich partner. In this way, learning in inter-organisational environments should be seen as involving a range of actors negotiating and bargaining between different perspectives and identities within shifting relations and domains of power.

The research into the process of inter-organisational collaboration provides valuable insights into the nature of inter-organisational learning, and broadens the understanding of inter-organisational learning provided by the literature directly concerned with learning between organisations. It points out that inter-organisational learning goes beyond mere inter-firm knowledge transfer, and can be better studied as a social process embedded in collaboration activity and relations of authority and power particular to the inter-organisational domains. This indicates that the 'situated' perspective on learning and knowledge, outlined in Sections 2.2 and 2.3, can potentially contribute to better understanding of inter-organisational learning processes. Furthermore, this research also reveals the relationship of inter-organisational learning with the developmental processes surrounding the collaboration. Importantly, it suggests that inter-organisational learning can make a positive contribution to collaboration development, because, first, learning and mutual adaptation within a relationship leads to longevity and, ultimately, success (i.e. achieving what was sought as an objective) of collaboration (Parkhe, 1991) and, second, previous inter-organisational relations resulting in inter-organisational

learning and development of inter-organisational routines are also positively related to alliance adaptation and survival (Gulati, 1995a; 1995b; Zollo, et al., 2002). The view that learning contributes only positively to change and development within organisations has been challenged (Levinthal and March, 1993) in the intra-organisation learning literature (see Section 2.3). In this way, inter-organisational learning may be expected to have negative as well as positive effects on collaboration development. This issue, however, has not been addressed to date, by the existing research.

2.6 RESEARCH QUESTIONS

The theoretical background outlined in the previous sections of this chapter informs and guides this study of learning and developmental processes in inter-organisational collaborative relationships. Sections 2.4 and 2.5 reviewed the literature related to inter-organisational learning and the process of collaboration development, and outlined the contributions and limitations of the existing research. Drawing upon that, three main research questions can be posed, as follows:

1. How does collaboration develop over time as a result of the operation of a variety of generative forces, and how do these forces interrelate?
2. What is the nature of the process of inter-organisational learning in collaboration development?

3. Are inter-organisational learning and the process of collaboration development interrelated, and, if so, how do they interrelate?

In this way, the present study aims to address three main areas of research. First, it will longitudinally examine the process of inter-organisational collaboration by focusing on a variety of developmental forces and the interrelation between them. The review of the existing research has shown that it was limited in emphasising only one generative force to explain development, resulting in a fragmented view of the collaboration process.

Second, the present study aims to further develop the concept of inter-organisational learning by viewing it as an inseparable part of collaboration activity. Instead of focusing solely on the outcomes of learning processes and factors affecting those outcomes, this study aims to examine how inter-organisational learning is actually achieved or not achieved, by drawing upon the notion of learning and knowledge as a 'situated' social phenomenon grounded in organisational practices. The process studies of inter-organisational collaborations indicated that the 'situated' perspective could provide better understanding of learning processes in collaboration. In this way, the present study will draw upon the view of inter-organisational learning as an ongoing social accomplishment, where knowledge development depends not on fixed characteristics of collaborating organisations, but rather on situated and on-going practices emerging from people's everyday action.

Finally, this research will examine the interrelation between inter-organisational learning and the developmental process of collaboration. Although the process studies of collaboration reveal that learning could be at the heart of collaboration development, they provide a somewhat limited assessment of the nature of this relationship, by considering only the positive effects of inter-organisational learning on collaboration development. By examining learning processes in the longitudinal context of collaboration development, this study aims to address precisely how inter-organisational learning is interrelated with the developmental dynamics in collaborative relationships.

2.7 CONCLUSIONS

This chapter provided a theoretical background for understanding inter-organisational learning and collaboration. It reviewed the research into organisational knowledge and learning, and examined the studies that directly addressed learning in inter-organisational environments. The latter literature was found to be rather limited, inasmuch as the majority of the studies took a ‘snap-shot’ approach, with little or no consideration for the social nature of learning processes. It also emphasised largely unilateral learning by partners in collaboration, saying little about the inter-organisational nature of learning processes involved. These limitations are significant, first, because the view of knowledge and learning as a social process is being increasingly employed in organisational learning research, and the ‘situated’ perspective is recognised as making important contributions to the

understanding of learning within and between organisations (Cook and Brown, 1999; Brown and Duguid, 2001; Orlikowski, 2002). Second, although it has been recognised that inter-organisational networks, and not only individual organisations, are becoming increasingly important formations for learning and innovation (Powell, et al., 1996; Dyer and Singh, 1998), the challenge of conceptualising how inter-organisational learning differs and relates to intra-organisational learning has not been adequately explored in the existing research.

To provide further insights into the nature of inter-organisational learning, the literature on the developmental process of collaboration was added to the theoretical background of the present study. The process research of inter-organisational collaboration provided valuable contributions to the understanding of inter-organisational learning. First, it highlighted the fact that inter-organisational learning goes beyond mere inter-firm knowledge transfer, and is better regarded as being embedded in collaboration activity. Studies like Doz (1996), Arino and de la Torre (1998), and Buchel (2000; 2002) emphasise the way inter-organisational environments are established through the development of the norms of reciprocal behaviour and mutual adaptation, and how bargaining and negotiation occurring through inter-partner interactions form the basis of these processes.

Second, the process research of collaboration places learning in a context of relations of authority and power particular to the inter-organisational domains. It points out that interactions between organisations tend to involve more conflict than

interactions within organisations (Hardy and Phillips, 1998; de Rond and Bouchikhi, 2004), and highlights the view that inter-organisational learning occurs within shifting relations and domains of power (Elg and Johansson, 1997; Inkpen and Beamish, 1997; Hardy and Phillips, 1998).

Drawing upon these insights into the nature of inter-organisational learning provided by the literature that addresses learning in an inter-organisational context and the process of collaboration itself, this chapter concluded with the outline of the research questions for the present study. First, it proposed the study of the development of inter-organisational collaboration by considering a variety of generative forces. As the review of the literature concluded, inter-organisational relationships are inherently heterogeneous phenomena, where a multitude of conflicting forces, which coexist and interrelate, governs the developmental processes. Second, it proposed the examination of inter-organisational learning from a perspective that considers a longitudinal context in which the partners are jointly entrenched and have historical, as well as possible future, interactions. It was suggested that by employing the view of learning and knowledge as 'situated', social phenomenon grounded in organisational practices could provide a fuller understanding of inter-organisational learning. Having considered that, it finally proposed a more thorough examination of the nature of the interrelation between inter-organisational learning and the process of collaboration development. The existing research indicated that learning could be at the core of collaboration development, but provided a rather limited assessment of

the nature of this relationship, by considering only the positive effects of inter-organisational learning on collaboration development.

CHAPTER 3 METHODOLOGY

3.1 INTRODUCTION

This study adopts a process research approach, where process is understood as a sequence of individual and collective events, actions, and activities unfolding over time in context (Van de Ven and Huber, 1990; Pettigrew, 1997). Furthermore, this study takes the epistemological and ontological approach consistent with the realist perspective, which assumes that most events in the social world take place in open systems, in which they do not invariably follow a determined and recurrent pattern, but are subject to diverse causal variations (Bhaskar, 1978; Tsoukas, 1989). Following these perspectives, an idiographic comparative case study is employed with the aim to collect data which is processual, comparative, pluralist, historical, and contextual (Pettigrew, 1990).

This chapter is structured as follows. The next section discusses outlines of the principles of process research. It also addresses the epistemological and ontological assumptions linking them to the methodology employed. The third section outlines a rationale for case selection and describes in detail how the selection process was performed. The fourth section presents the way in which fieldwork was carried out, focusing on the issues of access negotiation and interview design and procedure. The following two sections address the strategies employed to analyse and theorise from process data and assess reliability and validity of the research findings. The

concluding section summarises the argument developed throughout the chapter and highlights the main issues addressed.

3.2 METHODOLOGICAL APPROACH TAKEN

This study of inter-organisational learning as a social process grounded in organisational practices employs a perspective that considers a longitudinal context in which organisations are jointly embedded and have historical, as well as possible future interactions. This implies a process research approach. In the processual research tradition adopted here, process is understood as a sequence of individual and collective events, actions, and activities unfolding over time in context (Pettigrew, 1990; Van de Ven and Huber, 1990; Pettigrew, 1997; Pettigrew, et al., 2001). This approach regards human conduct as a process of becoming and, therefore, the aims of process analysis is to catch this reality in flight (Pettigrew, 1997: 338). In this way, process research aims to capture the character and the patterns of the process and, ultimately, uncover the underlying mechanisms which shape any patterning in the observed events. It is important to highlight that this particular processual analysis tradition is rooted in contextualism (Pepper, 1942), as it suggests that developmental processes should not be studied as a set of discrete episodes or events somehow separate from the antecedents that give those events form, meaning, and substance.

The advocates of process research emphasise a number of important features. The first is that social processes are deeply embedded in the contexts that produce and are produced by them. In this way, a part of processual analysis is to examine the contexts at different levels, exogenous or endogenous to an organisation, surrounding organisational processes and how they shape these processes. Furthermore, process research should reveal temporal interconnectedness in order to understand the sequence and flow of events over time, leading to understanding of underlying logics. Another assumption of process research is that context is not just a stimulus environment, but a nested arrangement of structures and processes, where subjective interpretations of actors perceiving and learning help shape process. Therefore, organisational processes both shape contexts and are constrained by features of context insofar as they are continuously produced and re-produced through recursive relationship between structure and human agency (Giddens, 1984).

The link between multiple levels of context can only be established by exposing actions and recurrent patterns in the processes under investigation over a period of time. Time can be captured through a combination of retrospective and real time analysis. In this way, the longitudinal comparative case study method has been advocated as the most appropriate approach (Pettigrew, 1990; Pettigrew, et al., 2001). An advantage of case studies over other methods of longitudinal research, such as time series analysis, is the opportunity to explore holistic explanations within and between cases. The assumption of holistic analysis is that causation of

developmental process is neither linear nor singular. In this way, 'the task is to identify the variety and mixture of causes of change and explore through time some of the conditions and contexts under which these mixtures occur' (Pettigrew, 1990: 269).

The choice of methodological approach should be closely linked to, and informed by, the epistemological and ontological assumptions adopted in the research (Morgan, 1983). This study of learning and developmental processes in collaboration is carried out within the realist paradigm (Bhaskar, 1978; Outhwaite, 1983). The realist paradigm rejects a possibility of identification of a causal law with a constant conjunction of events, as assumed by the positivist approach. Instead, it assumes that most events in the social world take place in open systems, in which they do not invariably follow a determined and recurrent pattern, but are subject to diverse causal variations. The realist perspective implies a stratification of reality by defining the domains of the real, the actual, and the empirical (Bhaskar, 1978), where the move from the real to the actual and then to empirical is a contingent accomplishment (Outhwaite, 1983). The following table outlines this view.

Table 3.1 Ontological assumptions of the realist paradigm

	Real Domain	Actual Domain	Empirical Domain
Mechanisms	√		
Events	√	√	
Experiences	√	√	√

Adapted from Bhaskar (1978: 13).

The real domain is the domain in which generative mechanisms, existing independently of, but capable of producing, patterns of events reside. The actual domain is the domain in which observed events or observed patterns of events occur. The empirical domain is the domain of experienced events. Checkmarks indicate the domain of reality in which the generative mechanisms (that produce patterns of events), events (what actually happened), and experiences (the observed events), respectively reside, as well as the domains involved for such a residence to be possible. This means that experiences presuppose the occurrence of events in the actual domain, independently of researchers' taking note of them. Events presuppose the existence of mechanisms in the real domain, which have been responsible for the generation of events. In this way, such a perspective implies the conception of causal relations as tendencies, grounded in the interactions of generative mechanisms, where these interactions may or may not produce events that in turn, may or may not be observed. For example, as will be seen in the present research, the evolutionary force of selection operating at the industry level, under certain circumstances, results in the events (e.g. reduction of the new product development investment or shift to a

new technology) that affect inter-organisational collaboration. In turn, only some of these events and their effects (e.g. change in a product development strategy by one of the partners or change in the scope of collaboration) can be observed by a researcher and registered as empirical evidence.

Adopting this ontological view, the explanatory element of idiographic comparative studies consists of an examination of the specific conditions under which postulated generative mechanisms combine and operate. Similarities between the units of analysis are explained by the generative mechanisms and a similar type of contingencies that have been responsible for the mechanisms' activation. Differences may be due either to the operation of different generative mechanisms or to the dissimilar contingencies within which the operation of a similar set of mechanisms has taken place (Tsoukas, 1989). For example, in the present study, each of the collaborative relationships presented a distinctive pattern of development. These patterns could be compared, based on which of the generative mechanisms (e.g. evolution, life-cycle) were in operation and the characteristics of the contexts surrounding the collaboration at the time (e.g. industrial context, organisational contexts of the partners). Section 5.5.2 of Chapter 5 presents this analysis.

With regard to the epistemological stance, the realist paradigm, in contrast to positivism, builds on the assumption that human understanding and action are based on the interpretation of information and events by the people under investigation.

Understanding and action are derived from meaning assigned to events. Since the development of organisations is typically a subtle process, capturing the organisational member's subjective interpretations of this process is necessary adequately to reveal the nature and sequence of events taking place. In this way, reality is internally experienced and interpreted, meaning that what is known is subjective (Lincoln and Guba, 2003). Although, by accepting the interpretive element of research, the realist perspective does not fall into the 'epistemic fallacy' (Bhaskar, 1978: 36) – a problem of a purely interpretive approach, as it delineates reality and our representation of reality as operating in different domains (as discussed above). In this way, the realist paradigm brings together both interpretive and explanatory understanding by assuming that reality is not just shaped by social actors, but also exists independently.

3.3 SELECTION OF THE RESEARCH SITES

The methodological approach discussed above suggests the employment of a comparative idiographic study of learning and developmental processes in inter-organisational collaborations (Tsoukas, 1989). The comparative element of the study implies consideration of the similarities and differences provided by multiple organisational settings. Idiographic study means conducting concrete and intensive research that permits the encompassing of a wide range of contexts and influences (e.g. case study) (Tsoukas, 1989). In this way, the aim is to collect data which are processual (an emphasis on action as well as structure over time); comparative (a

range of organisational settings); pluralist (description and analysis of the often competing versions of reality seen by actors); historical (the taking into account of the historical evolution of ideas and actions); and contextual (examination of the reciprocal relations between process and contexts at different levels of analysis) (Pettigrew, 1990: 277).

In this way, the decision was made to conduct a collective case study. A collective case study consists of a number of cases selected according to the choice of research topics and questions being posed (Stake, 1995). Therefore, the emphasis of the chosen approach is not on replication of case studies and generalisation of findings, but on the highlighting of similarities and differences across cases, which informs and stimulates the interpretation process and inductive thinking, leading to theory generation.

Various criteria may apply to the selection of sites for a collective case study. Some of them comprise an intentional or design component of the selection process. However, the practicalities of the process of choosing and gaining access to research sites also affect the selection. This process is characterised as ‘planned opportunism’ (Pettigrew, 1990: 274). Above all, the selection of the research sites is shaped by the choice of research topics and questions being posed. Therefore, the selected cases should provide an opportunity to learn about the issues chosen to research (Pettigrew, 1990; Stake, 1995). In this study, emphasis is placed on the process of learning and developmental dynamics in inter-organisational collaborations. The

selected sites should provide an opportunity to learn about these particular phenomena. Another important requirement to process research is an ability to capture both historic and contemporary processes (Pettigrew, 1990). Therefore, the sites selected for the research should provide an opportunity to collect current as well as retrospective data. Furthermore, process-oriented research, especially involving an inductive element, requires a significant number of visits to selected sites. For this reason, it was decided to limit the potential cases to the geographical area of the West Midlands, due to the resource and time constraints.

Finally, the importance of a comparative element of the research implies that the choice of cases should include a variety of collaborative arrangements. The realist perspective requires that the comparison is based on the commonalities and differences in the generative forces and the contexts surrounding collaboration, and not on the specific 'variables' such as the industry sector or a particular type of inter-organisational collaboration (e.g. joint venture, licence agreement, etc.) (Tsoukas, 1989). In this way, of importance in the selection of sites is facilitation of the interpretive task (Alvesson and Skoldberg, 2000) and not the comparison of cases along fixed dimensions (or 'variables'). In light of this, among the cases that comply with the criteria discussed above, final selection should be made of those cases that provide a variety of organisational settings that would present differences as well as commonalities that could facilitate the interpretation of the empirical evidence and stimulate the development of process explanations. Sections 3.3.1 and 3.3.2 describe how this selection strategy was implemented in the present study.

3.3.1 Survey to compile a database of collaborative relationships

In order to be able to make an informed choice of sites according to the considerations discussed above, and increase the probabilities of negotiating access, a low cost mail-survey across different sectors was performed, as suggested by Pettigrew (1990). The aim of the survey was to identify possible candidates for the case studies, and to compile a database of inter-organisational collaborative arrangements and their respective characteristics. In some sectors, such as biotechnology, there are a number of databases of inter-firm alliances available. However, at the time of the research, there were no available databases identified which would contain information about collaborations across other sectors.

An initial sample of 324 companies was generated from the FAME database. FAME is one of the main and fairly representative corporate databases containing detailed financial, descriptive and ownership information about 2.3 million companies in the UK and the Republic of Ireland. The descriptive information covered by FAME includes size in terms of turnover and number of employees, geographical location, industry sector, and a description of the activities performed by the companies. A list of companies for the initial sample was generated according to the geographical location and the nature of activities of the companies (the database classifies companies according to the nature of their activities, e.g. manufacturing, consulting, etc.). First of all, it was necessary for the pre-selected companies to conduct their

main activities in the West Midlands region. The research emphasis on learning implied the selection of those cases where the potential presence of a variety of learning processes would be maximised. In this way, the companies which performed research and development or product design and development, beside other activities, were pre-selected. It was decided by the researcher that those companies were most likely to be involved in collaboration intensive in learning and knowledge development. This decision, however, was biased, as it was based on the classifications attributed to companies by the database. In this way, some companies that performed the activities, for example, considered by the researcher as for product design and development, might be not classified in this way by the database and, consequently, would not be included in the sample.

The survey was based on a short questionnaire (see Appendix 1), asking respondents to identify whether their organisation was involved in any collaborative partnerships with other organisations. Questions were also asked about collaboration characteristics, such as its purpose, the importance of learning through collaboration, the existence of interactions between people at management and operational levels, and the outcomes in terms of success or failure, as judged by the respondents. It was decided to keep the questionnaire short and not to request the disclosure of any specific information about collaborations, in order to obtain better response rates.

The questionnaires, together with covering letters outlining the aims and importance of the study, were sent to the 324 pre-selected companies, addressed to most senior

personnel, usually managing directors. The response rate of 23% was achieved within eight weeks, having sent a reminder letter to non-respondents after four weeks. The respondents included a variety of organisations in terms of size, ownership type, and industry sector. Out of 75 respondents, 34 organisations were involved in collaborations, 34 did not collaborate, and seven stated the company policy not to participate in any research. The database of 34 collaborations was created from the results of the survey and other corporate information, such as size, turnover, number of employees, available through FAME. The created database was used to further select the cases for in-depth process-oriented study.

3.3.2 Pilot interviews

In view of the research emphasis on learning through inter-organisational collaboration, the respondents that attributed great importance to learning were prioritised. This judgement was made based on the responses provided by the questionnaire with regard to the nature of collaboration and the role of learning in it (see Questions 2 and 5 of the questionnaire in Appendix 1). Thus, the collaborations with, for example, purely marketing purposes, such as exploitation of the partner's distribution channels, were disregarded. 30 companies involved in collaborations with such aims as research and development, and the development of new products and services, which attributed major importance to learning, were selected as those to be approached for an initial interview.

The aim of the initial interview was to discuss in detail the nature and history of collaborations, and to identify those collaborations that would satisfy the research criteria. The initial interview was also an opportunity to present the benefits of the research and negotiate potential access for further visits. Out of 30 organisations approached for an initial interview, five did not agree to proceed. The initial interviews within 25 companies were conducted in person or by telephone mostly with the persons originally contacted through the questionnaire, with a few exceptions when the original contact person indicated that there was a more appropriate organisational member to talk to about collaborations. Out of 25 interviewed companies, 12 cases that potentially satisfied the research criteria (i.e. those that provided the opportunity to observe the studied phenomenon – activities that may involve inter-organisational learning; and to collect retrospective as well as current data – duration of collaborations) were identified. For the remainder of the cases, the collaborative projects proved to be inadequate for the research for a variety of reasons, including the fact that they were in the early stages of collaborative projects, which would not allow a sufficient time period for a process study; the remoteness of the location where collaborations were actually carried out by another part of the company; and the nature of interactions between the partners (for example, in some cases, only one person from each partner was involved). Out of 12 potential cases, eight companies directly refused further access, or decided to cease their involvement in the research in its early stages. The most common reasons given were the sensitivity of information (a response frequently met in the aerospace and automotive industries), being over-researched, and difficult current financial

situation (small companies were more reluctant to participate, as the extent of access required commitment of significant man-hours for interviewing).

Out of four companies where it was possible to secure access for the full research period, five cases were selected. As one of the companies performed a wide range of collaborations in a variety of sectors, it was possible to select two collaborative relationships with different partners in different industries. In this way, the selected companies comprised five cases of inter-organisational collaboration in different sectors: pesticides, biotechnology, life sciences, engineering manufacturing, and software development. Although one cannot fully exclude a response-set-bias, the selected collaborative relationships appeared sufficiently diverse in size, partners' nationality, collaboration focus, technology, and experience with collaboration to suggest a reasonably balanced choice of cases that would support the comparative element of the study, as discussed in the beginning of this section.

3.4 FIELDWORK

The selected collaborations consisted of three R&D and two product development partnerships. All of these collaborations had as the principal motivation development of new knowledge in the form of new technologies, processes, products, or services. Moreover, in all five cases, collaboration activity had been taking place for a significant period of time in relation to the overall estimated duration of the

partnership, and was still expected to be on-going during the research period (from 2002 to 2004). This allowed the collection of empirical material, which would provide current as well as retrospective views of the development. Overall, 75 in-depth interviews (25 interviews in the selection phase of the research and 50 interviews amongst the five selected cases) were conducted. In addition to the interviews, extensive documentary evidence, such as exchange of correspondence and e-mails between the partners, contracts, internal and joint reports, schedules, and meeting minutes, were collected during the two-year period in the five collaborative relationships. The key personnel (e.g. senior managers responsible for collaboration and other 'gate keepers', such as leading scientists and engineers participating in the joint projects) were interviewed more than once during this time in order to track on-going collaboration development, and to examine more closely emerging themes. Besides this empirical material, extensive information about the industries and the partner organisations participating in the collaborations was collected through archive data and the Internet. This additional information included such documents as the companies' annual reports, news releases, industry reports and reviews, newspaper and journal articles. The following table provides some initial details about the selected cases of inter-organisational collaborations.

Table 3.2. Summary of the selected cases

Collaboration purpose	Duration (to 2004)	Companies involved and their nationality	Number of interviews in each company	Total number of interviews per case
Research and development of a biopesticide based on nematode worms	20 years	HRI (UK)*	9	13
		Becker Underwood UK division (US)	4	
Research and development into new varieties of vegetables	12 years	HRI (UK)*	10	14
		SeedCo (Denmark)	4	
Research and development of a new corrosion testing method	4 years	Bodycote Material Testing (UK)*	8	11
		TWI (UK)	1	
		Force Institute (Denmark)	2	
Development of services for the pharmaceutical industry	4 years	AnalyticsCo (UK subsidiary of a US company)*	6	6
		BiotechCo (France)	0	
Development of machine control software	8 years	SoftwareCo (UK)*	6	6
		MachineCo (Japan)	0	
Total number of interviews				50

* The company (identified from the database) that provided access to the collaborative relationship

3.4.1 Negotiating access

In all the cases selected, the organisations that provided the initial access to the collaborative relationships agreed to grant the required depth of access with regard to their personnel, documentation, and facilities. In the first three cases (see Table 3.2), access to the partner(s) in collaboration was also negotiated. In the two cases where access to the partners was not granted, the barriers were, in one case, the sensitive nature of biomedical research and the uncertainties associated with the collaborative relationship itself, which implied that the organisation was not comfortable with explicitly involving its partner in the research. In the other case, the secrecy of the collaborative relationship between the partners impeded the possibility of directly approaching the partner firm. In these two cases, the organisations also preferred to remain anonymous, given the sensitive nature of these particular inter-organisational relationships. Although only partial access was negotiated in these collaborations, implying that interviewees were available from only one partner organisation, documentary evidence was available from both sides. Originally, it had been envisaged that both sides of a collaborative relationship would be included throughout the course of the research. However, during the case selection process, it became clear that this would not always be a viable option, due to the nature of the collaborations and confidentiality or intellectual property issues. Access limitations inevitably mean limitations to the quality of the empirical material. The issues of quality assessment and the limitations of the study are discussed in detail in the forthcoming sections.

3.4.2 Interview design and procedure

Part of the empirical material was collected through the semi-structured interview technique. A semi-structured interview means the researcher has a list of issue-oriented questions or fairly specific topics to be covered (Stake, 1995; Bryman, 2001). The questions are used mainly as a guide for an interview, allowing significant flexibility of the interview process. The interview schedule was developed based on the theoretical background of the study. It also partially drew upon the insights gained from the pilot phase, when 25 initial interviews with the potential participants were conducted. This allowed adjustment with regard to the questions to be asked and, more importantly, the way these questions should be asked based on the 'reality' of collaborative relationships. For example, the pilot interviews showed that people attributed a variety of meanings to such words as 'collaboration', 'partnership', or 'alliance'. Another example in this respect was the use of the word 'learning'. This was usually understood by the interviewees as a process of acquiring specific information from the partner organisation or as individual learning, for example, whether the interviewee gained any additional expertise as the result of collaboration.

Interviews always started with the researcher's brief presentation of the purposes of the study, providing an opportunity for the interviewee to ask any additional questions about the research. Also highlighted was the guarantee that all the

information provided would remain anonymous, and that non-attributable quotes would be used. At the beginning of each interview, a certain amount of background information was given by the participants, including their educational background, time with the company, career trajectory in the company, current roles and responsibilities. During the actual interviews, the researcher followed the guidelines provided by Stake (1995) for conducting qualitative interviewing, devoting much time to listening and allowing the interviewee to develop his or her story, and occasionally asking additional questions to direct the interview to the next topic or to clarify what had been said. In the cases where one person was interviewed more than once during the research period, the interviews tended to be less open-ended because, in addition to following up the progress of the collaborations, it was also important to explore in more depth the issues that had started to arise from the analysis of previous interviews and other empirical evidence. The interviews ranged from 40 to 150 minutes, and were all tape-recorded and transcribed by the researcher.

Interview participants were initially indicated by the senior managers involved, and then additional interviewees were selected, based on further recommendations during the interviews. This 'snowballing' approach to interviewing was especially valuable in the cases of the long-standing collaborations. Due to the extensive period of these collaborations, there was a significant turnover of different people involved at different times. Relying on the recommendations of the participants, it was possible to 'track down' the people that had been involved at different points in the

collaboration. Even if these people were no longer with the organisations, their accounts were extremely helpful in reconstructing the development of collaboration in retrospect. In the cases of HRI – SeedCo, Bodycote, TWI and Force, all those involved in collaboration from all partner organisations were interviewed. In the case of AnalyticsCo – BiotechCo, five out of six people, and in the case of SoftwareCo – MachineCo, four out of five people involved in the collaboration from the focal company (i.e. AnalyticsCo and SoftwareCo) were interviewed. In the case of HRI – Becker Underwood, the majority of those involved from both companies was interviewed. However, it was not possible to establish the exact number of people that could have participated in the collaborative projects throughout the 20 years of this relationship, as no particular person had responsibility for the collaboration for the whole period, or indeed, had participated in it from its inception.

The interviews focused on, first, the historical development of collaboration from first contact between the organisations. This means that the initial unit of analysis was not a particular research or development project, but the whole inter-organisational relationship from its initiation. The interviewees were asked to provide their accounts and views of how collaboration developed, who was involved, and the nature of the issues arising as experienced by them. Second, the interviews focused on the activities involving the individual's work within the organisation and also within collaboration. The main emphasis was on identifying and examining the organisational practices leading to new knowledge development,

or to the lack of it. Cook and Brown (1999) defined practice as ‘coordinated activities of individuals and groups in doing their “real work” as it is informed by a particular organisational or group context’ (ibid: 387). For instance, the main achievements leading to the fulfilment of the collaboration’s objectives were enquired about, such as, for example, milestones within a research and development project, and how they were accomplished in terms of who was involved, what needed to be done, how and when it was done. The outline of the actual interview topics that guided the fieldwork is provided below:

- Personal background: education, length of time with the organisation, career trajectory within the organisation, current roles and responsibilities, social network within and outside the organisation (c.f. Ring and Van de Ven (1994), Liebeskind et al (1996));
- Organisational and industry background: sector specifics and tendencies, recent challenges and changes to the organisation (c.f. Koza and Lewin (1998));
- Pre-history and formation of the collaboration. Experience with collaborative projects. Initial scope and objectives (c.f. Doz (1996), Larson (1992));
- The development of collaboration. Changes, achievements, and issues during the period;
- The governance of collaboration. The development of governance mechanisms and rules (c.f. Inkpen and Dinur (1998), Dyer and Nobeoka (2000)). The employment and sources of resources (c.f. Lane and Lubatkin (1998)). The way in which partners ‘learned’ to work together (c.f. Holmqvist (2003b)). Issues of

inter-organisational differences, authority, control of resources and legitimisation of the course of collaboration (c.f. Hardy and Phillips (1998), Elg and Johansson (1997));

- Partners' interactions: means, frequency, participants, purpose, drivers (c.f. Inkpen and Dinur (1998), Dyer and Nobeoka (2000));
- Work activities on a day-to-day basis. Activities related to collaboration (c.f. Orlikowski (2002), Tsoukas and Vladimirou (2001));
- The process of, and practices involved in, the accomplishment of the achieved progress toward fulfilment of collaboration's objectives (c.f. Orlikowski (2002), Tsoukas and Vladimirou (2001));
- Assessment of collaboration in terms of expectations versus 'actual' development (c.f. Kumar and Nti (1998)).

3.5 ANALYSIS OF THE EMPIRICAL MATERIAL

The case studies presented in this study principally draw upon the interviews, other narrative data in the form of published reports and articles, documents and correspondence between the organisations, and additional sources of information such as contracts, annual reports, and industry reviews. In view of the fact that the major part of the empirical evidence is narrative based, it is important to outline the strategies adopted in analysing and theorising from narrative data.

Narrative data is not merely an account of events, nor does it simply mirror the social world. The narrative does not only represent how people make sense of their world in narrative terms, but reveals the way in which people proactively plan and enact narratives that are consistent with their expectations and values (Czarniawska, 1998). For this reason, narrative can be a particularly valuable source of insight into organisations and their contexts. The ultimate purpose of this analysis is to draw process explanations of available empirical material. Thus, the challenge is to understand the underlying pattern of events given some telling of a story and to recover a single account from multiple, partial, subjective, and sometimes conflicting stories.

Pentland (1999) proposed an approach for understanding structural levels in narrative that helps to move from surface observations and descriptions towards explanation. In this way, the approach directly addresses the relationship between narrative, process, and explanation. The following table outlines narrative properties and their meaning in terms of organisational analysis.

The account of the sequence of events is the core of narrative structure, and has been extensively applied in process research (Abbott, 1990; Van de Ven and Poole, 1990). The sequence only approach means that narrative data is coded and reduced to its lowest common denominator: sequences of objectively coded events. No particular effort is made to recover or explore the details of the context that gives the events meaning for the participants. In this way, focusing solely on event sequence

may limit the ability to generate meaningful explanations out of mere descriptions because it systematically excludes the features needed to create such explanations.

Table 3.3 Relationship of narrative properties to organisation theory

Narrative property	Indicator for	Example
Sequence	Patterns of events	Establishment of the formal agreement in collaboration. New person joins the joint project.
Focal actor(s)	Role, social network, and demographics	Age, organisational function. Work relationships.
Voice	Point of view, social relationships, and power	Interpretation of events from a managerial position. Account of collaboration development from a particular partner's position.
Moral context	Cultural values and assumptions	National differences (e.g. Japanese x Western European)
Other indicators	Other aspects of context	Current industry context

Adapted from Pentland (1999)

A purely event-sequence approach (without considering the surrounding contexts) abstracts away from the particular actors. However, it is important to recognise that stories differ according to who is enacting the various events. The identity of the person who performs an action can be a relevant part of a story, as most processes are performed by more than one individual, and the question of who does what is certainly relevant to the participants. Data concerning the identities and relationships of the actors in a process are required if one is to understand the role structure and social networks in which that process is embedded. For example, in the case of HRI

– SeedCo, the development of a new method for selection of a disease resistant plant involved a number of experts in a variety of fields, such as molecular biology, breeding, and pathology, from both organisations. Examining such issues as the way in which these people interacted, who was involved and at what time, was crucial for understanding learning and knowledge development processes.

Furthermore, every story is told from a particular point of view. The way a story is told can provide additional insight into the social world through careful analysis of the same story from multiple, subjective points of view. Narrative voices, for example, can shed light on power and politics issues, and help to trace the differences in perspectives and values of the groups. Taking the example of the same case (HRI – SeedCo), there was one particular event – a decision about resources employment, which was presented differently by each interviewee, resulting in a controversy in the participants’ opinions. The decision involved directing royalty payments generated by one research group to fund the group in another research area. One actor, for whom the decision had been detrimental, presented this particular event as ‘unfair’ and the result of his organisation’s unwillingness to negotiate fiercely enough with the partner organisation. Another actor, whose area eventually benefited from this decision, presented it as having been imposed by the partner organisation, with his own organisation not having had enough bargaining power to do otherwise. The third actor, actually involved in the negotiation, presented the decision as favourable for his organisation, in that more people would get funded and would be able to retain their jobs (this controversy occurred during a

wave of redundancies). Furthermore, a person from the management team presented the view that this decision was controversial simply because this was not the way in which actions were usually taken in the organisation, irrespective of to whom the funds were directed. It was usual for royalties to be spent at the discretion of the management team, who would usually utilise them to repair a particular 'hole in a budget'. Disentangling this episode provided valuable insight into the organisational politics and power relations at that time.

Furthermore, explicit attention to the evaluative dimension of narrative through analysis of the 'moral context' allows an examination of the ways in which particular values and unstated assumptions guide action and can influence apparently 'rational' managerial thought. For example, in the case of HRI – Becker Underwood UK, the participants, when asked to assess the collaboration, presented a variety of evaluations ranging from highly successful, 'happy team', 'exciting times' to 'frustrating experience' and 'it is a surprise they got products out' descriptions. Evaluations of the collaboration as enacted by different actors provided a valuable context for understanding the underlying logic of the events and actions.

Narratives also provide other indicators that can be used to compile case analysis, ranging from demographic characteristics of the participants to descriptions of the contexts. Pettigrew et al. (2001), for instance, emphasise the crucial role of contexts in processual analysis. They see the driving forces behind developmental process originating from the asymmetries between different levels of context. The interviews

provided a substantial amount of contextual information (particularly because questions regarding contexts were included in the interview schedule), which complemented the contextual information gathered through documents and publications.

Pentland (1999) argues that when conducting processual analysis, researchers should pay attention to all aspects of narrative and not simply observe events, but focalise them and create stories to explain them. Furthermore, in accessing the narrative as a mode of theorising from process data, the author proposes a distinction between four levels of structure in narrative that helps the processual analysis to move from particular stories towards revelation of underlying generative mechanisms that produce particular patterns of events. The four levels are depicted in Table 3.3. The first level of narrative structure is the telling of a particular story by a specific narrator. The second level consists of the version(s) of a story from a particular point(s) of view. The next level provides a generic description of a particular set of events and their relationships. This level actually presents the researcher's version of the story, which is essentially a defensible interpretation, produced through 'triangulating' multiple stories and other sources of empirical material. Finally, the 'deepest' level of structure in narrative is indicative of the underlying generative mechanisms, structures and forces that enable or constrain the event sequence as described at the previous level. In this way, the process of explanation involves a gradual transition from actions, through reasons to rules, and finally, to structures and causal powers (Tsoukas, 1989). The first question is why the actions under

investigation have taken place. This will invoke a particular set of rules and reasons. The following question is why these specific rules exist and what the structures and associated causal powers behind them are.

Table 3.4 Levels of structure in narrative

Level	Definition	Example
1. Text	Particular telling of a story by a specific narrator	Actual text: 'When I showed up at the interview...'
2. Story	Version of the story from a specific point of view	A new employee's own version of how he or she was hired
3. Fabula	Generic description of a particular set of events and their relationships	How a particular person was hired: what happened, who did what.
4. Generating mechanism	Underlying structures that enable or constrain the fabula	Overall recruiting process. How people in general are hired.

Adapted from Pentland (1999)

An additional helpful approach to theorising from process data was proposed by Langley (1999). The author draws upon Weick's (1979) notion of 'sensemaking', which implies the possibility that a variety of 'senses' or theoretical understandings may, legitimately, emerge from the same data. In this way, different strategies used for theorising tend to produce different forms of theory that are neither intrinsically better nor worse, but may have different strengths and weaknesses. Langley classified the available strategies for sensemaking while analysing process data, outlining the advantages and disadvantages of each one. The author relies on Weick's (1979) categories of 'accuracy', 'generality', and 'simplicity' to consider

the theoretical forms likely to be developed using different strategies. Accuracy reflects how close explanations 'stick' to the original data by providing sufficient details about the phenomenon being examined and the surrounding contexts. The trade-off of accuracy is that it can act against generality. Generality is related to the potential range of situations to which the theory may be applicable. Simplicity, on the other hand, concerns the number of elements and relationships in a theory. According to Langley, there are seven strategies that can be used for theorising from process data: narrative strategy, quantification strategy, alternative templates strategy, grounded theory, visual mapping, synthetic strategy, and temporal bracketing. The idea is that these strategies could be used in combination, depending on the research question, resulting in various levels of accuracy, simplicity, and generality of the produced explanations. The strategies are depicted in the Table 3.5.

Narrative strategy involves construction of a detailed story from raw data in the manner discussed above (c.f. Pentland (1999)). For example, this is characteristic of the work of process researchers who adopt a contextualist perspective (Pettigrew, 1990; 1997; Pettigrew, et al., 2001). Although almost all process research involves recourse to this strategy at some point, the narrative can serve different purposes, from being merely a preparation for subsequent analysis to playing a more substantial role, incorporating an analytical element (Pentland, 1999). This strategy has the great advantage of remaining 'true' to the data and reproducing the ambiguity that exists in the situations observed. However, when relying on this

strategy alone, one may end up with a highly idiosyncratic story, limiting the possibility of conceptual contribution.

Table 3.5 Strategies for theorising from process data.

Strategy*	Accuracy	Simplicity	Generality**
Narrative	High	Low	Low
Grounded theory			
Temporal bracketing			
Visual mapping			
Synthetic strategy			
Quantification	Low	High	High

* Alternative template strategy is not included in the table, as it can combine both accuracy and simplicity.

** Generality of the emergent theories will also depend on other factors, such as the degree and scope of replication

Adapted from Langley (1999)

Quantification strategy is the opposite extreme of narrative. In this approach, researchers start with in-depth process data, and then systematically list and code qualitative incidents according to predetermined characteristics, gradually reducing the complex mass of information to a set of quantitative time series that can be analysed using statistical methods. The advantage of the quantification approach lies in the systematisation of process analysis, when the sequence of events can be verified, and explicit process theories can be tested rigorously. However, to achieve this result, the approach drastically simplifies the original data, replacing the

ambiguous, rich and specific context by precise, thin and general indicators. To produce more credible explanations, the quantification methods should be applied in combination with other approaches that allow contextualisation of the abstract data, adding nuances of interpretation, and confirming mathematical models with direct evidence.

In the alternative templates strategy, several alternative interpretations of the same events are applied. These are based on different, but internally coherent sets of a priori theoretical premises, followed by an assessment of the extent to which each theoretical template contributes to a satisfactory explanation. For example, Van de Ven and Poole (1995) proposed a process framework based on four generative forces (see Chapter 2, Section 2.5.2). By applying the framework to any particular situation, one can produce virtually accurate explanations of processes from four different perspectives (assuming that the processes observed are generated by one or more of the four generative forces). Because this strategy draws theory from outside the data, it is essentially deductive. It can offer alternative complementary readings that focus on different levels of analysis and reveal different types of dynamics. This strategy combines both richness of description and theoretical simplicity by breaking down the problem. However, it is subject to such limitations as reductionism, generated by employing pre-existing theoretical templates (Van de Ven and Poole, 1995).

Grounded theory (Glaser and Strauss, 1967) represents the other end of the spectrum between deductive and inductive research, and outlines guidelines for inductive theorising. It involves the systematic comparison of small units of data and the gradual construction of a system of 'categories' that describe the phenomena being observed. As the categories are developed, the researcher deliberately selects data that will enable verification of the properties of emerging category systems. The analysis should eventually result in the identification of a small number of 'core categories', which serve to integrate all the theoretical concepts into a coherent 'grounded' in the original evidence theory. This strategy tends to stay very close to the data and therefore, remains very accurate. Nevertheless, the proponents of this approach acknowledge that it can sometimes be difficult to move from a 'substantive' theory of a specific phenomenon to a more general theory (Glaser and Strauss, 1967).

Besides manipulating words and numbers, process data analysis can also manipulate matrix and graphical forms. Such a visual mapping strategy has some advantages over purely narrative approaches, as it allows the presentation of large quantities of information in relatively little space. The visual representations can serve as an intermediate step between the raw data and a more abstract conceptualisation. This approach offers a means of data reduction and synthesis that is less radical and more flexible than that used in the quantification strategy. For example, Arino and de la Torre's (1998) study of the joint venture development between two multinational

firms in the consumer products industry employed a variety of visual representation to assist the case narrative.

Another useful approach is temporal bracketing. In many cases, temporal processes can be broken down into several temporal phases without presuming any progressive or developmental logic to the division. With this strategy, a shapeless mass of process is transformed into a series of more discrete, but connected blocks. Within phases, the data are used to describe the processes, and evidence is also drawn together to examine how the context affects these processes, and what the consequences of these processes are. Beyond its descriptive utility, this type of temporal decomposition also offers opportunities for structuring process analysis and sensemaking. It permits the constitution of comparative units of analysis for the exploration of theoretical ideas.

The final approach as presented by Langley (1999) is synthetic strategy. When this strategy is used, the original process data are transformed from stories composed of 'events to 'variables' that synthesise their critical components, comprising a process model. For example, Doz (1996) and Arino and de la Torre (1998) (see Chapter 2, Section 2.5.2.2) developed the models of collaboration development based on the interconnected stages of goal formulation, learning and adjustment. Such an approach can generate important conclusions, because the causal links are more explicitly traceable. However, as with quantification strategy, it is at risk of losing the detailed temporal and contextual understandings of the processes.

Having outlined a number of strategies that can be used to theorise from process data, Langley emphasises that,

The choice of strategies is more than just a case of desired levels of accuracy, simplicity, and generality and more than just a case of picking logically linked combinations; it is also a question of taste, of research objectives, of the kind of data available, and of imagination. (1999: 707)

The analysis of the empirical material collected in this study aimed to employ a variety of strategies outlined in this section to enhance the reliability and validity of the research. This will be discussed in Section 3.6

The interviews were transcribed, organised, and prepared for analysis using a qualitative data analysis software tool, NVivo. Other narrative material was also inputted into NVivo to aid the analysis. The analysis employed data reduction techniques, as proposed in Miles and Huberman (1994). Strategies such as narrative strategy, grounded theory, template matching, temporal bracketing, and visual mapping were employed to develop the case studies. Thus, the case studies are presented as narratives, although containing analytical and explanatory elements. The case narratives are organised along several logical time periods produced by applying temporal bracketing, which aids the presentation and facilitates

comparative analysis. For example, in the case of HRI - Becker Underwood UK, the narrative is structured around five distinct periods: the pre-history of collaboration, initial product development, the 1st licence agreement and further technology transfer, the cold active nematode based product, the 2nd licence agreement and termination of nematode research.

Visual mapping was also used to aid case narratives. Matrix representations of the events, issues, and time-lines, together with the schemes describing the interplay of generative mechanisms, were employed to reinforce and synthesise the narrative story. Grounded theory and template matching were, respectively, inductive and deductive strategies used to iterate between data and theory. For instance, the templates for process theories as proposed by Van de Ven and Poole (1995) were employed to help generate explanations for the developmental patterns of the collaborations. On the other hand, inductive strategies were essential for the analysis of the inter-organisational learning process and its interrelation with the developmental patterns of collaboration, as there were no ready theoretical explanations for these phenomena available.

3.6 RELIABILITY AND VALIDITY ASSESSMENT

Research findings and theories generated are subject to the assessment of their reliability and validity. Generally, reliability is understood in terms of stability of the results generated in terms of the degree to which a study can be replicated. Validity,

on the other hand, is an assessment of, first, whether there is a good match between researchers' observations and the theoretical ideas they develop (internal validity) and, second, the degree to which findings can be generalised across social settings (external validity) (Bryman, 2001). In the approach adopted in this study, these criteria of the research quality assessment are applied somewhat differently compared to a more positivist inclined position. For example, from the positivist point of view, idiographic research has low external validity and therefore, such research or is not legitimate for general theoretical claims, and should rely on the replication logic to be verified (Yin, 1984). From the realist perspective, which incorporates a stratified conceptualisation of scientific knowledge, idiographic studies can be valid because generality is a property of the necessary relations in real structures and not a feature of the empirical domain. In this way, idiographic research, by increasingly capturing new layers of reality, is capable of producing valid explanations which are concerned with the clarification of structures and their associated generative mechanisms that have been contingently capable of producing the observed phenomena (Tsoukas, 1989).

In this research, the concern with reliability and validity is twofold. First, it can be seen as an effort to identify a generic story, or *fabula* (Pentland, 1999) (see Table 3.4), which is a version constructed by a researcher from multiple subjective accounts. Thus, this concerns the strategies adopted by a researcher when confronted with conflicting indicators. The second issue concerns the question of how the generative mechanisms can be identified, or how one can tell which generative

mechanism is actually running. This involves addressing the strategies employed for producing process theories, and implies understanding the trade-offs among simplicity, accuracy, and generality in theorising from process data (Weick, 1979; Langley, 1999).

The first concern was addressed in this study, first, by applying triangulation (Stake, 1995) to the producing and analysing of the empirical material. A triangulated methodology is used to gather different types of data, which could be used as cross checks. The aim of the triangulated approach is to draw on the particular and different strengths of various data collection methods (Pettigrew, 1990). Thus, the descriptions produced from people's accounts were triangulated with a wide range of documentary evidence to ensure accuracy of the events and time-lines. As described in the fieldwork procedures, most of the people involved in collaborations were interviewed. This kind of triangulation also contributes to the achievement of a certain degree of objectivity in the final account of the events. In the two cases with partial access, the quality of the findings suffered from the inability to interview the members of the partner organisations. However, documentary evidence was available from both sides, which compensated, to some degree, for this disadvantage. The account of the events produced by the researcher was also cross-checked with the participants. Such 'validation' of the researcher's interpretation was extremely useful in the case of HRI – Becker Underwood, where the extent of the collaboration over time and turnover of the people involved at different times made it particularly difficult to reconstruct the whole story sufficiently accurately.

In addition to considering the collection of methods used, producing a 'defensible' version of the events implies addressing the rigour of the interpretation process (Lincoln and Guba, 2003). The interpretation of empirical material, namely, narratives in this study, drew upon the approach proposed by Pentland (1999), described in the previous section, which addresses a wide range of narrative properties and their relation to theory generation. This approach to process theorising goes beyond the use of data only for reconstruction of the event sequence, and seeks to ensure a more balanced and richer interpretation.

The second concern with reliability and validity of the research findings regards how the generative mechanisms (e.g. evolution, life-cycle, etc.) that have been contingently capable of producing the observed phenomena (e.g. change in the scope of collaboration, emergence of conflicts between the organisations involved) can be identified. This study used a combination of a variety of strategies to theorise from the data. Each strategy results in different degrees of accuracy, simplicity, and generality of the explanations produced (Langley, 1999). Thus, narrative strategy and grounded theory are high in accuracy but low in simplicity and generality. Combining these strategies with temporal bracketing and visual mapping, it is possible to increase overall simplicity. Multiple template matching, on the other hand, introduced a deductive element to the study, which, combined with grounded theory, helped in the closing of the 'gap' between data and theory by iteration

between them (Orton, 1997). The use of the template matching strategy in this way, contributed to greater generality of explanations.

The methods used in the present study aimed to enhance the reliability and validity of the research. Nevertheless, the selection of the particular methods implies limitations to the research results produced. This will be discussed in the Chapter 6.

3.7 CONCLUSIONS

This chapter outlined methodological and philosophical approaches taken in this study. It also discussed how these choices shaped the methods and procedures employed for the fieldwork and the strategies used to analyse the empirical material. Furthermore, this chapter provided a detailed account of how the empirical material was collected and analysed. It drew special attention to the issues of theorising from process data, and how this process relates to the quality of the theoretical explanations produced. By assessing the methods used in the research, the rigour of the interpretation process, and the strategies for developing process theories from process data, this chapter aimed to raise confidence in the reliability and validity of the findings.

CHAPTER 4 CASE STUDIES

4.1 INTRODUCTION

This chapter presents five cases selected for this study of inter-organisational learning and the collaboration developmental process. The case narratives are developed following the strategies for theorising from process data, described in the previous chapter. In this way, each case study aims not only to describe the pattern of events and the surrounding contexts, but also to begin to explain the logic underlying the observed patterns of events, actions, and activities. As Pettigrew described this approach to case narrative,

Our analytical chronologies reach towards theory presentation but are prepared to get on top of the data, to clarify sequences across levels of analysis, suggest casual linkages between levels, and establish early analytical themes. (1990: 280)

This chapter is structured as follows. Each of the following five sections contains a case study. The first two parts of each case study are dedicated to describing the particular industrial context and its development over the period of collaboration, and also to examining organisational contexts of the partner firms and their evolution over the same period. The context descriptions are useful for the following case narrative, as it refers to these descriptions while assessing the process of

collaboration. The third part of each case study contains the main body of a case narrative, which is built around the sequence of events, and provides rich description of the surrounding contexts and their evolution over time. The last two parts, following the main narrative, focus specifically on examining the pattern of collaboration development over time and the inter-organisational learning process as the collaboration develops.

In examining the pattern of collaboration development, the case study aims to reach the 'deepest level of the narrative' (Pentland, 1999) and reveal the operation of the underlying generative forces (Tsoukas, 1989). Four generative forces, as developed in Van de Ven and Poole (1995), were employed to provide an explanation of the collaboration development: life-cycle, teleology, dialectics, and co-evolution. This part of the case narrative examines which generative forces were manifested in the observed collaboration dynamics. It examines the surrounding contexts, i.e. specific contingent conditions (Tsoukas, 1989), that enabled these forces to come to foreground. The narrative also addresses the interrelation between different generative forces. In this way, it reveals the way the trajectory of collaboration was shaped by the combination of the different forces coming to the fore and affecting each other.

The examination of inter-organisational learning is informed by the perspective adopted in this research, namely, the 'situated perspective' on learning. This perspective envisions inter-organisational learning as a social process embedded in

organisational practices and unfolding within the relations and domains of power specific to inter-organisational environments (see Chapter 2, Section 2.5.3). In this way, the case narrative focuses on four main issues. The first issue concerns the accepted inter-organisational rules governing collaboration and the way they inform the consequent organisational behaviour within the relationship. The second issue concerns how these rules emerged through the process of bargaining and reconciling of various perspectives among the actors involved in collaboration. This leads to the third issue, which pertains to the way this process is shaped by social forces. This involves consideration of who holds the prevailing authority in the relationship, controls the resources, and, consequently, is most able to manage the legitimacy, i.e. influence what rules are established and what course the collaboration is to take. The fourth issue concerns further inter-organisational learning once the initial set of rules is established. It focuses on whether these rules prevail or change over time.

Chapter 5 will discuss further the findings from the case studies, provide a comparative cross-case analysis, and address the research questions outlined in the beginning of this study, drawing upon the empirical material.

4.2 HORTICULTURE RESEARCH INTERNATIONAL AND BECKER UNDERWOOD

This inter-organisational collaboration, started in 1985, is concerned with the development and commercialisation of products for the biological control of insect pests for the horticultural industry. Biological pest control is achieved by manipulation of naturally occurring organisms (nematode worms, in this case). During the collaboration, a number of nematode-based products was developed and successfully commercialised, including products for several target pests for use in greenhouses, as well as low temperature resistant nematode products. In 1993, Horticulture Research International won the Queen's Award for Environmental Achievement for the commercial development of the nematode products.

4.2.1 Biopesticides - industry background

Biopesticides (insecticides based on host specific pathogens like bacteria, fungi, viruses, and nematodes) are an environmentally friendly alternative to chemical pesticides. However, their agricultural use is quite limited, in comparison with conventional chemical pesticides. Biopesticides capture a scant 1.4% of the US\$ 28 billion global market (Blum, 2002). Most of the bio-control manufacturers are small enterprises with small turnovers and just one or two products aimed at niche markets. The initial enthusiasm for bio-control as an alternative to the intensive use of chemical pesticides has not resulted in a dramatic market growth for

biopesticides, especially in view of recent competition from the biotechnology industry developing transgenic plants resistant to diseases and pests. Thus, for the past 10 years, commercial companies have consistently overestimated the market size for bio-control products (Dent and Waage, 2000). As the product development manager at Becker Underwood outlined,

The companies who develop these products are small and medium enterprises. When they started, they had quite a lot of start up money, there was quite a positive atmosphere, and venture capital funding available. And through a series of changes in the market, there has been less funding available and the companies have rationalised their business... and the product development has been very very slow. A lot of companies have moved from being risk takers, which they were in the early days and they would develop products which would be quite risky. And now they just capitalise on the developed products and try to increase their revenues from there.

4.2.2 Partner organisations' background

Horticulture Research International

Horticulture Research International (HRI) was established in 1990 as a publicly funded research institute. HRI integrated under single management the Institute of Horticulture Research and three Experimental Horticulture Stations of the Agricultural Development and Advisory Service. At present, HRI operates from

several locations in the UK, with its Headquarters in Wellesbourne, Warwickshire. It provides the world's largest single integrated team of horticultural scientists. HRI's main income is derived from governmental agencies, such as the Department for Environment, Food & Rural Affairs (DEFRA), the Biotechnology and Biological Science Research Council, and industry levy bodies, such as the Horticultural Development Council. Another source of income is its commercial customers and partners. For the last few years, HRI has been moving into a loss-making financial situation. It has been unable to increase its commercial income to cover the recent reductions in public sector funding. As a result, since 1999, the organisation has undergone a number of restructuring initiatives. In 2003, HRI merged with the University of Warwick.

The network context in which HRI is embedded can be characterised as typical for a research organisation, which relies on its scientists' social networks for exchange and cross-fertilisation of knowledge in the field. HRI also has a large number of collaborations with other organisations: with customers, with suppliers, and with other research institutes. The latter mainly concerns the sharing of experience and the swapping of biological materials. Formal agreements include confidential agreements for the one-off exchange of confidential information, agreements for biological materials exchange, and license agreements based on royalties. While some of these agreements develop into broader collaborations, others do not. Finally, HRI has a number of collaborative agreements, mainly with its customers (e.g. commercial growers, seed companies).

Becker Underwood UK

This company changed names several times. In 1982, Agricultural Genetics Company Ltd (AGC) was established by a government initiative as a privately funded organisation to be involved in funding and commercialisation of near market research in the agricultural field in the UK. In 1995, AGC became a holding company. One of its subsidiaries, MicroBio Limited, was a developer of natural solutions to pest and disease problems with production plants in Saskatoon, Canada, and Littlehampton, UK.

In 1996, following the sale of other subsidiaries, AGC changed its name to MicroBio Group. In September 2000, Becker Underwood, Inc. announced acquisition of MicroBio Group Ltd., which became Becker Underwood UK. The latest turnover of Becker Underwood (UK) was around £4 m with 23 employees. Founded in 1982 in Ames, Iowa, US, Becker Underwood, Inc. manufactures and markets a variety of speciality colourants and bio-agronomic products. The acquisition included the exclusive production and marketing rights of all MicroBio bio-fertilisers and biopesticides. The biopesticides business is a relatively small part of Becker Underwood worldwide operations. A commercial manager at HRI explained,

Becker Underwood doesn't actually have very much of what is hugely relevant to our areas of work. I think their interest is quite peripheral. [...]

They saw in Microbio some other areas of work that were of interest to

Becker Underwood and they bought Microbio. But in buying Microbio, they almost ‘accidentally’ bought nematode worms. They were not really interested in nematodes. And I think people from Microbio had to work quite hard to convince Becker Underwood’s management boards that they must continue with the nematodes at all.

The General Manager for UK operations at Becker Underwood also stated,

It is a relatively small part of Becker Underwood’s actual turnover, but this is a new area, still a new growing market. So, strategically it is very important for us. In the agricultural sector, there is a very strong move away from chemical pest controls to products like this; and we are trying to build our strategic position.

4.2.3 Collaborative relationship

The following narrative examines the process of collaboration development over almost 20 years. It is structured around five distinct logical time periods: the pre-history of the collaboration, initial product development, the first license agreement and further technology transfer, a cold active nematode based product, the second license agreement and termination of the nematode research. The main events and issues in the course of collaboration development are synthesised in the form of a matrix presented in Figure 4.1.

Pre-history of collaboration (prior to 1986)

Back in the early 80s, a scientist at HRI (at one of the organisations in Littlehampton, which became HRI in 1990) was working in the nematode research area funded by DEFRA. At around the same time, the CEO of AGC visited HRI to discuss the possibility of some research projects being taken on by AGC for further development and commercialisation. HRI was successful in interesting AGC in three such projects, one of which was the nematode research project. This was the beginning of collaborative work to develop a commercially viable bio-pesticide technology based on nematodes. This kind of collaborative development was new at the time, as a commercial manager at HRI recalled,

It was very ground breaking. It was very very new, because in those days the emphasis was on public good and not on commercialisation and all the research results that you had you just gave to farmers, you gave them to the industry, you gave them to government, you gave them to everybody. You published and gave it to other researchers. In those days, everybody did that all around the world. Everybody just shared and gave results away. Gradually people started feeling we should not be giving the results, we should be selling them. So it was only later, with things pointing down, that people started to look much more carefully at these sorts of collaborations; and this was one of the first ones. So before this one, there was really no experience in this sort of collaboration because it was always publicly funded and it was always given into the public domain.

Initial nematode product development (1986-1990)

The development of the technology and first products to be commercialised took four years, from 1986 to 1990. Expertise in several areas had to be developed. First, a technique was researched and developed to measure the degree of activity of the nematodes. Next, the nematodes had to be mass-produced, which involved researching the process in which nematodes killed insects by producing bacteria, and also developing fermentation techniques. Besides developing production technology, the techniques for packaging and storing nematode products had to be developed. In this way, the project required developments in several areas of expertise. AGC funded the work entirely. The commercial manager at HRI explained,

It was quite heavy investment. And they developed formulation, the technique of how we were going to spray it on the crops, where to spray, what (worms or the eggs), the dilution, packaging etc. There was a huge amount of development work to be done. AGC carried out all of that work at its own expense.

The team was compiled partly from HRI's personnel, including the leading scientist from the nematode research area, and other employees occasionally seconded from other departments within HRI. As the leading scientist on the project explained,

What we had to do first for the mass production was to isolate the right bacterium, so you are looking at a lot of microbiology now. So, we had to

get some funding for a very talented microbiologist who we had, but on another project, so we transferred him to my project.

Another aspect of the team consisted of those people that were hired specifically to work on the project. They were formally employed by HRI, but funded entirely by AGC, and reported to AGC's management team. Therefore, they were regarded as 'people from AGC'.

From 1986 to 1988, all the work was carried out on HRI's site in Littlehampton. The collaboration started with HRI's scientists being the only ones with the knowledge of nematodes. During the first two years of collaboration, AGC's personnel, working closely with personnel from HRI, were able to develop their own expertise in the area of nematodes. As the Head of HRI at the time recalled,

Around the period it was a very good time. There were a lot of contacts with AGC, a frequency of contact that was almost as if AGC was a part of our team, you know.

The commercial manager at HRI also commented,

There was a great deal of informal interaction going on, because the people were on the same site, in the same laboratory. So, people from both companies would be chatting over lunch, over coffee, in each other's offices.

The project was conducted in a similar manner to other projects within HRI at that time. Milestones and a time-line were established, although flexibility was required by a research project where there was a degree of uncertainty about outcomes. Regular six-month and annual reports were produced and meetings held. Moreover, AGC's personnel, who were overseeing the project, including the R&D director, visited the HRI site on a regular basis.

From 1988, AGC started to develop its own laboratories in a different location. Most of the people who worked on the project became employed by AGC and eventually were transferred to the new site. The development of the production technology continued within the same team, while HRI were now acting more as consultants performing a number of specific tests needed to complete the development. Regular exchange of information and meetings continued to take place. The Head of HRI at the time recalled,

The interactions were still very intensive, even after AGC took over the responsibility for production. They did it themselves, but AGC project leaders were regular visitors from Cambridge to the Littlehampton site to discuss the project.

By 1990, the first nematode based product was introduced to the market by AGC. From that point, the research and development programme was largely complete,

changing the role of HRI in its involvement with AGC. As the commercial manager at HRI outlined,

By this time, we had more or less done our job. We still had research work going on into nematodes, but really, by about 1990, the technology had been transferred to AGC, and AGC was just commercialising it. So, in a sense we took a back seat then.

First license agreement and further technology transfer (1990-1993)

From 1990 onwards, AGC was responsible for commercialising the product in the UK and from the early 90s, throughout Europe. AGC and HRI entered into a license agreement, with AGC paying royalties on sales to HRI. The commercial success of the nematode product contributed to the continuing public funding of the nematode research at HRI. The leading scientist on the project at HRI explained,

They [funding body] were very pleased; they were absolutely ecstatic, because all of the money they were putting into our project was supporting me. AGC was not paying for me. AGC would pay for the results of the project. [...] So, everybody saw that they were using politically wise money for the research. The whole point of the product was to stop people using chemicals. It was wonderful publicity.

In this way, HRI were able to continue research into the nematode area. The original nematode product, launched by AGC in 1990, provided natural control of the Black

Vine Weevil (the larvae of which damages certain crops). During the course of the next few years, new nematode applications were co-developed by AGC and HRI. The development was based on research conducted at HRI at the time and the market needs identified by AGC. The development of the new product lines did not involve any new production technology, and consisted principally of testing the way nematodes would affect new pests and plants under different conditions. In some cases, the application of nematodes to different plants and pests was successful, and, in other cases, was not. As a result of these developments, more product lines were launched by 1993, which included nematodes for the control of such insects as Sciarid Flies and Mushroom Flies.

During this period, testing for new nematode applications was carried out jointly by both organisations. The style of working between the organisations continued largely in the same vein. There was smooth back and forth flow of information, and HRI continued to be responsible for designing and performing most of the trials funded by AGC. The commercial manager at HRI explained,

On the technology side, HRI would be involved in making decisions about how to plan experiments in the field, and take decisions when start those trials, and how long to run them for. So, all those day-to-day technical issues on trialling and testing in the field, all those decisions would be taken by HRI.

At around the same time, one more research project in the nematode area, carried out at HRI, was finished. It concerned a different type of nematodes which were active

in cold temperatures. The research project was carried out by a Ph.D. student under the supervision of the leading scientist in the nematode area at HRI. The results of this research provided an opportunity to develop biopesticides that could be used outdoors, as well as in colder climates. All the previously developed products were, in general, suitable only for use in glass-houses. It was expected that the outcomes of this research would be tested for commercial application and taken up by AGC for production, as had happened with the previous products. However, it took almost ten years before the commercialisation of the cold active nematodes based product in 2003.

Cold active nematodes (1994-2001)

By the time HRI received the research results on the cold active nematodes, the company had begun the closure of some of its sites, including Littlehampton, as a consequence of the establishment of HRI as an organisation in 1990. Many of the research projects had to be relocated. As the leading scientist recalled,

At about 1995, my project was moved to Warwickshire. [...] I had to do some trials at Littlehampton, and during the winter, move my file to Warwickshire to conduct it up there, which wasn't very easy.

The Ph.D. student who carried out the research at HRI (between 1990 and 1993) and then left the company, gained employment with Microbio later (in 1998) as a product development manager. Later on, she became an independent consultant in

the field. She followed up the developments concerning the cold active nematodes, and recalled the difficulties associated with the period,

By the time they had moved from Littlehampton to Wellesbourn, there was quite a bit of down time. The project did not progress. It has been very discontinuous development and it was often only taken on when somebody had a personal interest in it.

When finally the research team at HRI was able to continue with the cold nematode project AGC (AGC had changed its name to Microbio by that time, following the sale of its other subsidiaries), it did not settle into the work as eagerly as HRI expected. The commercial manager at HRI commented,

We got very frustrated, because we identified the cold-active worm but you need various trials just to demonstrate that this was absolutely the right one. We wanted them to fund us to do the trials, but they were spending ages getting themselves organised. We didn't particularly realise at that time that the reason for that was because Microbio was going through a very difficult time; difficult decisions were being made within Microbio about with what business to continue and what business to discontinue.

The delays in taking on the cold active nematode by Microbio resulted in a series of frustrations on the part of HRI. As the commercial manager of the project at HRI recalled,

We even got to stages when we thought about offering this to somebody else. And we did consider offering it to another company. [...] We came close to doing this. We did investigate a contact from a New Zealand organisation. We did use that as a threat to Microbio to get on with it, otherwise we would withdraw, and we would have been in our rights to go to another organisation. But we knew that it would be better to use it only as a threat.

Finally, by 1996, HRI and Microbio had entered into an agreement to evaluate cold active nematodes for commercial application. The main target was to conduct a series of tests and field trials, in order to ascertain if cold active nematodes would fit into Microbio's existing production system. However, the evaluation programme did not progress as expected. The commercial manager at HRI explained,

We were very dissatisfied because things were moving very slowly on their side. We produced some data and it took them ages to get back to us with their view on it. We thought they needed to do some more trials and they took ages deciding whether to commission them with us or whether with a university in Liverpool or somebody else.

The project recommenced in 1998, when the former Ph.D. student at HRI, who had carried out the cold active nematode research, gained employment with Microbio as a product development manager, and took an interest in the project. She recalled,

I started working for Microbio in 1998 and picked up the project. The contract had already existed, I think, for two years. HRI was saying 'What have you done? You should have got results by now.' But that was a poor collaboration, no one was in charge, no one was pushing it, there wasn't really a very good link there. It remained a low priority for the company. The reason it carried on at all was because I had a personal interest in it. It is quite personal.

The involvement of a new product development manager resulted in renegotiation of the agreement.

When I saw the evaluation programme, I thought that some of the questions they were looking at were research questions and not commercial development questions. Because I worked with the isolate, I knew what issues were critical commercially. So, I changed it to focus it more on the critical questions that needed to be answered.

The new agreement redefined the nature of trials to be performed. This particular issue invoked a great deal of tension between the two organisations. The fact that the former Ph.D. student who had conducted cold active nematode research at HRI was now working at Microbio as a project development manager implied a definite shift in power between the two organisations. As the product development manager at Microbio at the time explained,

As I was working at Microbio at that time, HRI were in a difficult position. They had the isolate but they didn't have the knowledge. I had that. Microbio didn't really want the collaboration. Because I had all the knowledge we needed, we wanted just the isolate to test. HRI was trying to get money from Microbio to fund their research. HRI were always very pushy to have more involvement in the programme. [...] Because I didn't work for HRI anymore, I worked for Microbio, HRI had less value in the isolate. If I were still working for HRI, they probable would have had more work, because the value of the isolate would be in the knowledge that I held. [...] By having me, they had technical knowledge, they didn't need HRI.

In addition to that, the overall relationship between the two organisations was uneasy at the time. The personal links that had developed during earlier stages of collaboration broke down, which also contributed to the deterioration of the situation. Those working on the commercial aspects of the project were the same on both sides, but the researchers who were employed on the initial collaboration with HRI and who then went to work for AGC (later Microbio, and finally, Becker Underwood) had ceased to be involved in the collaboration. At one particular point, the organisation at Becker Underwood was divided into the production side and the trials side. People involved in the original collaboration transferred to the production side. For the cold active nematode development, HRI was involved only with the personnel on the trials side at Becker Underwood and did not have any interaction with the those they had been working with. As the commercial manager at HRI commented,

When we closed the Littlehampton site and came up here, there was a much more arms-length relationship with Microbio. They were still operating down in Littlehampton. We went to be just down the corridor to be a 130 miles away, and that makes quite a big difference over time.

Under these circumstances, the differences in perspectives and views of the people involved that had been moulded by their organisations became evident. The product development manager at Microbio at the time also observed,

Commercial companies need to control their own systems, and the commercial production of the nematodes was confidential and the way you produce the nematodes could influence its ability to kill insects. That part of the work they would not have handed to HRI. Microbio has far better developed production systems than HRI could ever hoped to have. So, they definitely would do that part themselves. As for the field testing, they had their own trial offices and they wanted to do the testing in their own way. They were asking different questions to those that HRI would ask.

In this respect, Microbio had a particular view about the kind of trial that was needed to evaluate the commercial viability of the cold active nematodes, and who should conduct them. At the same time, HRI also had well-defined standards about the nature of the trials to be carried out and their role in it. As the leading scientist on the project at HRI highlighted,

HRI are experts in doing field trials. HRI is a research centre. It employs nothing but top quality scientists. We know what we are doing. We know how to design trials, we know how to statistically analyse them, and we know how to set them up. If you give it to a commercial company, not all of them are qualified scientists, and they also subcontract the work to other people who are not experts at all. For example, they ask growers to do it. Everything starts to go wrong, because the grower couldn't care less sometimes. When you go to the industry, you lose a little bit of quality. We can't do all the trials for them, we have to let them go and do their own trials. And their own trials were not always as good as ours.

There was no shared understanding about how and who should perform the trials. The balance of the involvement of the two organisations and their control over the development had definitely changed from the early years of collaboration. As the product development manager at Microbio at the time explained,

HRI wanted to get paid to do all the work. But it is not how a commercial company works. A commercial company does the work themselves. It was approached completely differently from the way it was done in the early phase and cold active phase. The development of products in the early 90s was much more collaboration. HRI tended to do more academic research and Microbio tended to do more extensive trials with growers. They also paid for some large trials to be done at the HRI site to use their facilities.

Tensions about the trials resulted in frustration and mistrust on both sides, with the differences not being resolved. The product development manager at Microbio at the time commented,

HRI was unrealistic; they wanted to be paid to do all the development work, they wanted Microbio to hand over the money. Microbio wanted to have the isolate and develop it internally. They have never actually changed from these two different views of how it had to be done. So, there was a slight mistrust in the sense that if Microbio had done the trial and it hadn't worked, HRI would think that maybe they had not done something right. There wasn't any good collaboration and they didn't share things about the trials. HRI felt that they should have been able to influence the decisions about the quality of the results from the trials, and they should have been involved in it.

As a result, the relationship between HRI and Microbio became somewhat fragile, with the project relying on a few key people to be continued. Furthermore, the leading scientist on the nematode project left HRI in around 2001, due to the major restructuring of the company taking place at the time. The relationship between the two organisations continued under new circumstances. Eventually, Becker Underwood completed some trials, completing the evaluation programme. However, HRI never fully accepted the way the trials had been conducted. The new leading scientist on the project at HRI commented,

Their attitude to HRI in this respect was that HRI's people were 'lecturing' them. After HRI put one of their specialists to help Becker Underwood conduct experiments, this attitude changed. Becker Underwood found it very helpful and they had an opportunity to learn specifically in the area of statistically designing experiments. Becker Underwood could trust more the information provided by HRI.

Finally, all necessary evaluations were completed, signalling the commercial viability of the cold active nematodes. By 2001, the first license agreement between HRI and Becker Underwood expired and was renegotiated to include the new cold active nematode based product. The negotiations were not easy. The first license agreement, negotiated almost 20 years before, had not generated substantial royalties. At that time, the priority was to get immediate funds to conduct research and the development programme. As the commercial manager at HRI explained,

It was actually a very good agreement, because it provided money for HRI to carry the work on. That was more important than royalties 15 years later. In those days, the research institute was already under heavy pressure financially and was struggling to get enough money. The important thing was 'Do you want a job now or do you want to be made redundant?' And the deal was – research money today. It is like saying 'we are not getting enough jam' and the answer is 'yes, but you had lots of bread, without the bread you would have starved and you would not have lived to have any jam'.

For this reason, under the new agreement, HRI attempted to negotiate higher rates of royalties. However, under the circumstances at that time, HRI had little leverage, and negotiations were difficult, as the commercial manager at HRI described,

It was one of those negotiations where you reach a point when you have to take time out, to have a few minutes in another office to discuss things privately. The guy who came over to negotiate with us was really hard. And we almost got to the point of walking away. It was mostly over the level of royalties; we wanted 6% royalties, and he offered 0.5%.

Second license agreement and termination of nematode research at HRI (2002-2004)

After the trials programme was completed, the 2nd license agreement was negotiated between HRI and Becker Underwood, active from 2002. New products based on cold active nematodes were to be launched in the market in 2003. By this time, neither HRI nor Becker Underwood envisioned any further developments in the nematode area, in the near future, at least. On the one hand, this reflected the tendency in the sector to focus more on the exploitation of the existing technology rather than exploration in new areas. According to the consultant in the area (formally, a Ph.D. student in the nematode area at HRI and later, a product development manager at Becker Underwood),

I think Becker Underwood would probably pay a small license fee to HRI and that would be the end of the relationship. At present, Becker

Underwood is not developing new products. They are modifying the product lines they have, they are repackaging existing products to different markets, but they are not looking at developing new ones.

On the other hand, HRI made a decision to discontinue the nematode research because it had suffered a significant loss in personnel as the result of the latest restructuring. Moreover, it had not been able to secure further DEFRA funding to maintain its nematode programme.

4.2.4 Developmental pattern

Having outlined the overall development of the partnership between HRI and Becker Underwood in the previous section, the present section focuses more closely on examining the developmental pattern of this inter-organisational relationship. It employs the templates proposed by Van de Ven and Poole (1995): life-cycle, teleology, dialectics, and co-evolution. Figure 4.2 schematically represents the operation of the generative mechanisms, as manifested in the observed collaboration dynamics, timing and interrelation between them. The narrative, in contrast, focuses on the contexts' surroundings collaboration development, examining the mediating contingencies that brought the operation of generative forces to the fore.

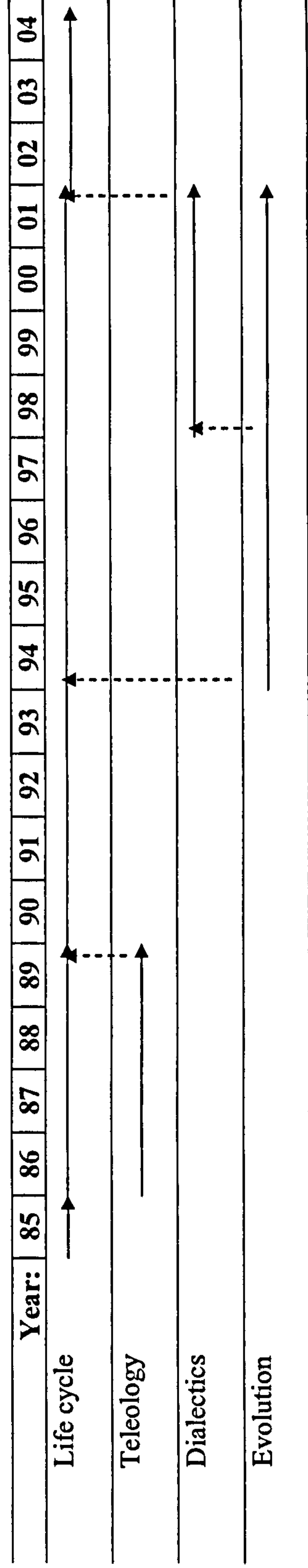
Over 20 years of collaboration, several distinct stages of its development could be observed, which can be seen to be consistent with the linear cumulative changes

prescribed by life-cycle approaches (D'Aunno and Zuckerman, 1987; Kogut, 1988). First, during 1985, the collaboration went through a formative period, where the scope for collaboration was defined and agreements formally signed. Then, it underwent an intensive research and development period from 1986 to 1990, allowing it to mature, starting with the first license agreement in 1990. Following that, the relationship focused more on exploitation of the technologies developed in the earlier stage through relatively straightforward technology transfer. By 2001, there was every indication that the relationship had entered a terminate state (which would probably last until the end of the license agreement), as HRI ended their nematode research programme and Becker Underwood were no longer seeking to invest in new nematode applications development. In this way, the life-cycle force became apparent through the production of four identifiable stages in the course of this particular collaboration development. However, the duration of each stage and the timing of transition from one stage to another are better explained by the contribution of other generative forces and the surrounding contexts, as discussed further in this section.

Figure 4.1 Main events and issues along HRI – Becker Underwood collaboration development

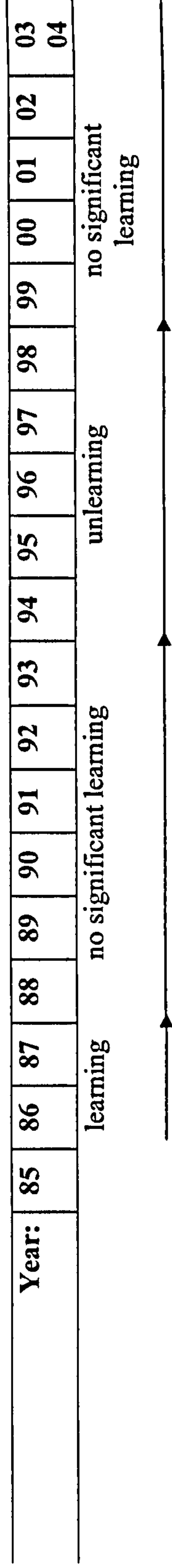
Year:	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03
AGC's CEO visits HRI; Collaboration agreement formed	█																		
Production technology development at HRI's site in Littlehampton;	█	█																	
Production technology development continues at AGC's laboratories			█	█															
First license agreement					█	█													
Nematode product against Vine Weevil launched																			
Trials of new applications for the nematodes						█	█												
New products launched																			
Queen's Award									█										
Closure of HRI's Littlehampton site; Project moves to Warwickshire										█									
HRI tries to persuade AGC to take on the cold active nematodes											█	█							
AGC sells its subsidiaries; Microbio is formed and put up for future sale																			
HRI and Microbio enter in an evaluation agreement for the cold active nematodes																			
No progress on the trials													█						
Former Ph.D. at HRI who developed cold active nematodes is employed by Microbio														█					
Renegotiation of the evaluation agreement															█				
Trials of the cold active nematodes															█	█			
Conflicts over trials															█	█			
Becker Underwood acquires Microbio																█			
Leading scientist leaves HRI; Termination of public funding for nematode research																			
HRI terminate nematode research																			
Second license agreement																			
Cold active nematode product is launched																			█

Figure 4.2 Generative forces shaping HRI – Becker Underwood collaboration development



→ Generative force is manifested through observed collaboration dynamics
 ↑ Interrelation between forces

Figure 4.3 Inter-organisational learning along HRI – Becker Underwood collaboration development



Behaviour informed by inter-organisational rules

Inter-organisational rules

Social context

- straightforward exchange of information
- regular meetings
- regular visits from AGC to HRI
- project is conducted by HRI's template
- HRI make technical decisions
- HRI perform most of the trials with AGC funding them
- inter-organisational team formed from HRI's personnel and newly employed staff funded by AGC
- joint activities at HRI's labs
- AGC hold financial resources. HRI hold all the expertise and physical facilities for the period from 1986 to 1988
- HRI is more influential partner

- existing rules don't work
- inquiry into the existing rules by Microbio

- no agreement over trials
- Microbio/Becker Underwood perform the trials, without HRI fully accepting it
- turn over of people in both organisations
- limited joint activities
- Microbio/Becker Underwood hold financial resources and expertise in producing nematodes
- HRI hold the isolate (rights to use nematodes) and reputation in the area

The period from 1986 to 1990 of intensive research and development activities presents a pattern consistent with the teleological mode of development. The original purpose of collaboration was to develop nematode based biopesticides. The development progressed in the 'usual scientific project' manner, with regular meetings and progress evaluations allowing certain flexibility in result assessments, as it was a new area with a steep learning curve along the way.

The initial development was carried out in close inter-personal interaction, as people from both organisations worked on the same site. Such interactions allowed development of shared meanings and values (Larson, 1992; Ring and Van de Ven, 1994). Furthermore, during those years, the sector context was characterised by investment in the development of new products, as well as a political move from the use of chemicals towards the use of biopesticides. Besides this, the main purpose of AGC as an organisation was to develop and bring to the market technologies available at research institutes such as HRI. In these particular contexts, teleological forces seemed most capable of coming to the fore and producing the observed pattern of collaboration development during this period. The conclusion of the initial product development allowed the collaboration to progress to the next stage. These dynamics are represented in Figure 4.2 by a vertical dotted arrow connecting the teleological and life-cycle forces.

During the period from 1990 to 2001, the scope of collaboration was principally on the exploitation of the production technology and development of new nematode

applications for this technology. The development and commercialisation of new products between 1990 and 1993 were relatively straightforward, with no delays between the identification of suitable nematode isolates, trials and introduction of products to market. However, the period from 1994 to 2001 was characterised by major disruptions that resulted in prolonged delays. One cluster of disruptions was the result of co-evolution (Koza and Lewin, 1998) with the organisational changes occurring in both organisations. Thus, the amalgamation of several organisations to form HRI in 1990 led to the closure of the Littlehampton site (where the nematode project was based) by 1994, and the transfer of operations to Warwickshire. This discontinuity put on hold cold active nematode application development. After this delay, during 1995 and 1996, HRI was unsuccessful in persuading AGC to take on the cold active nematodes project. The lack of interest was due to major restructuring of the company, which had sold all of its subsidiaries to create a stand alone company, Microbio. During this period, the fate of the nematode business was undetermined.

Even when, in 1996, Microbio agreed to evaluate the cold active nematodes for commercial application, the project progressed unsatisfactorily slowly, from HRI's perspective. New nematode application development remained a low priority for Microbio, as the tendency in the sector by that time pointed away from new investments in new product lines towards capitalisation on the existing product lines. When Microbio was acquired by Becker Underwood, in 2000, the nematode business became of peripheral interest to the company. In this way, the pattern of

collaboration development, especially during the period from 1994 to 2001, can be seen to have been co-evolving with industrial and organisational environments (Koza and Lewin, 1998). The effect of the evolutionary force is represented in the Figure 4.2 by a vertical dotted arrow connecting the evolutionary and life-cycle forces.

Since the evaluation agreement was established in 1996, the pattern of the unfolding events revealed the operation of the dialectical force. Due to the emerging conflicts between two organisations (described in Section 4.2.4), the conducting of trials necessary to introduce cold active nematode products to markets took a long time, as did negotiations for the second license agreement. The co-evolution with the sector environment resulted in divergence between the interests of HRI and Becker Underwood. HRI, on the one hand, sought additional resources to fund their research to compensate for the reduction in public funding. Becker Underwood, on the other hand, was not interested in investing heavily into new product lines development. This introduced further conflicts with regard to the amount of work and involvement of HRI in the project. A vertical dotted arrow connecting the evolutionary and dialectical forces in Figure 4.2 represents these dynamics. These dialectical tensions contributed to the deterioration of the relationship between the two organisations. In this way, the dialectical force, brought to the fore by the particular organisational and industrial contexts at the time, propelled collaboration development into the latest stage of its life (starting in 2002), which would lead to an eventual termination of the relationship.

This section examined the underlying generative forces that came to the fore and shaped the development of collaboration. It also addressed the surrounding contexts, providing the circumstances that enabled these forces to become operative, and examined the interaction between these forces. The next section explores further the dynamics of this collaborative relationship by focusing on the inter-organisational learning processes involved.

4.2.5 Inter-organisational learning

This section begins to examine inter-organisational learning processes in the context of collaboration development. The following narrative focuses on four main issues concerning inter-organisational learning (as discussed in Section 2.5.3 of Chapter 2): the accepted inter-organisational rules governing collaboration, and the consequent patterns of organisational behaviour within the relationship; the way in which these rules emerged; how this process was shaped by social forces; and, once established, whether these rules and behaviours changed or prevailed over time. Figure 4.3 schematically represents the periods of inter-organisational learning along the collaboration development.

At the beginning of the collaboration, the team for this particular research and development project was formed around the leading scientist at HRI, who was conducting research into the nematode area by ‘pulling in’ researchers from other

departments at HRI, as well as hiring new people funded by AGC. The commercial side of the project was supervised by R&D management at AGC and commercial managers at HRI. Although new people were formally employed by HRI, they reported to AGC managers, rendering it possible to regard this team as inter-organisational (Liebeskind, et al., 1996).

The period between 1986 and 1988 was the time when the inter-organisational team worked intensively to establish modes of operation. Newly employed staff went to work directly within HRI. In this sense, these actors were more immediately affected by the local context of this organisation than by that of HRI's partner, AGC. However, the differences in the perspectives brought by the partners with regard to the priorities of the project (scientific outcomes in terms of publications versus commercial outcomes), inter-personal issues, and the novelty of collaboration for HRI implied that people from both organisations had to learn together how to conduct this specific project.

A particular social context shaped the process of the emergence of inter-organisational rules and behaviours. At that time, AGC held the financial resources. HRI, on the other hand, held all the expertise in the area of nematodes, and also had at their disposal the physical facilities and installations to perform necessary experiments and trials. Consequently, HRI had greater influence over the project development, especially with regard to technical issues. This was further reinforced

by the fact that the whole purpose of AGC's existence as an organisation was to help to bring to market technologies developed at the research institutes.

During this period, a set of inter-organisational rules emerged in this particular social context and within current organisational practices. Because individuals from both organisations worked at the same site, and AGC's research staff was newly hired and worked directly within HRI's laboratories, people naturally engaged in the research practices that were established at HRI. Thus, this collaborative project was to be conducted on HRI's terms. Furthermore, HRI had responsibility for all technical decisions regarding, for instance, the type of experiments to be performed and the way in which they should be conducted. HRI were also to perform all the necessary field trials, with AGC funding them. These informal rules (Ring and Van de Ven, 1994), emerged working together, influenced to a certain extent the patterns of behaviour within the collaboration. Close inter-personal interactions and the intensity of new inter-disciplinary knowledge development implied the establishment of a straightforward and open style of information sharing. Regular meetings, six-monthly and annual, were introduced to review the progress. In addition, regular visits from AGC's project leaders became a part of the collaboration routine.

In this way, the period between 1986 and 1988 can be characterised by the presence of inter-organisational learning. By engaging in organisational practices, such as research activities within HRI's laboratories, the actors were able to develop shared

understanding of how the project should progress, and appreciation of the attributes of each partner in this process. These understandings, or inter-organisational rules (Holmqvist, 2003b), were shaped and legitimated by the particular social context characterised by the circumstances under which the collaborative relationship was conceived (the strong focus of AGC on bringing the technology to the market), with HRI acting as the more influential party.

During the next few years of the collaborative relationship, between 1989 and 1993, there was no significant inter-organisational learning. By 1989, the team had become geographically separated when AGC's personnel were transferred to their own laboratory facilities on a different site. During 1989 and 1990, the development work continued largely within AGC's laboratories, with HRI continuing to perform specific technical services, and adopting more of a consultancy role. Between 1990 and 1993, new applications for nematodes were also developed in collaboration. HRI would study nematodes under new conditions and perform the necessary tests. During this period, collaboration was governed by the existing set of inter-organisational rules that created behavioural coupling between the two organisations (Holmqvist, 2003b). HRI maintained responsibility for technical decisions, and performed most of the experiments and field trials, with AGC financing these services. The actors involved in collaboration also continued the activities concerning the project in the same manner. Thus, regular visits from AGC to HRI continued, as did the open sharing of information between the two organisations.

The next period, from 1994 to 1998, was characterised by a series of disruptions to collaboration, caused by restructuring periods and changes in both organisations. When, in 1998, the collaboration finally resumed, the previous inter-organisational routines were no longer in place. For example, when HRI were sending tests results to Microbio (AGC had become Microbio by that time) to evaluate and provide feedback, there was frequently no response for long periods of time. The existing inter-organisational rules seemed no longer to function. Moreover, those rules started to be challenged by Microbio's personnel in the changed industrial and organisational context. For instance, it was no longer acceptable for HRI to make the decisions about trials in the way they had before. The product development manager at Microbio commented,

When I saw the evaluation programme, I thought that some of the questions they were looking at were research questions and not commercial development questions. Because I worked with the isolate, I knew what issues were critical commercially. So, I changed it to focus it more on the critical questions that needed to be answered.

As a consequence, there was little collaborative progress in terms of bringing new cold active nematode based technology to the market. New inter-organisational rules and routines had to be developed if the collaboration was to continue. The period from 1994 to 1998 can be characterised as a period of unlearning (Hedberg, 1981), when the existing inter-organisational routines were destroyed by major organisational changes (Holmqvist, 2003b), and an inquiry into the existing inter-

organisational rules was initiated by organisational members (Schon, 1983). This aspect of inter-organisational learning dynamics will be further addressed in Chapter 5, Section 5.5.1.

The next period, from 1998 to 2002, was characterised by a particular social context. The personnel from both organisations now involved in the cold active nematode project were not the same as those who had been involved at the inception of the collaboration. Furthermore, Microbio now employed the former Ph.D. student at HRI who had been involved in the cold active nematode development. Microbio were also significantly more experienced in the area of nematodes and their production. In this way, Microbio were able to influence the decisions concerning technical issues to the same extent as HRI. However, Microbio failed both to legitimate their interests and to establish a new way of working within the relationship. From their reputable position as experts in the field, personnel from HRI, would not accept Microbio's proposed method of conducting the evaluation programme. In these circumstances, characterised by high levels of conflict, the lack of formal means to regulate the learning (because of the inter-organisational nature of the project) (Holmqvist, 2003b), and disappearance of the previous inter-personal bonds that had provided the basis for shared understanding, the partners became entrenched in unproductive discussions, and any general agreement about how to progress was hard to establish. The partners had different experiences as well as different interpretations of the situation. The product development manager at Microbio at the time commented,

HRI was unrealistic; they wanted to be paid to do all the development work; they wanted Microbio to hand over the money. Microbio wanted to have the isolate and develop it internally. They have never actually changed from these two different views of how it had to be done. So, there was a slight mistrust in the sense that if Microbio had done the trial and it hadn't worked, HRI would think that maybe they hadn't done something right. There wasn't a good collaboration and they didn't share things about the trials. HRI felt that they should have been able to influence the decisions about the quality of the results from the trials, and they should have been involved in it.

From the point of view of a scientist at HRI involved in the collaboration,

The contribution of HRI was crucial because of its scientific expertise. Becker Underwood [Microbio were bought by Becker Underwood in 2000] didn't have sufficient capabilities or expertise; they were unable to conduct the experiments properly - not enough money, time, facilities and people to design and conduct experiments with proper scientific rigour.

In this particular context, there was no significant inter-organisational learning. There were no joint activities taking place between the partners, and without personal interaction and shared practices, it was difficult for new inter-organisational rules to emerge.

4.3 HORTICULTURE RESEARCH INTERNATIONAL AND SEEDCO

This collaboration between a research institute and a commercial seed company started in 1992 as a license agreement for the transfer of biological material. Since then, it has developed into a full-scale joint research and development programme concerned with the development of selection methods for breeding new disease resistant lines of a certain crop (here referred to as the Crop because of the confidentiality of the agreement) and, ultimately, producing a disease resistant line using these methods. This involves application of an innovative technology, made available only recently, Marker Assisted Breeding. The application of genetic markers in the breeding process employs both molecular biotechnology and plant breeding, and seeks to improve the existing selection process and design superior breeding lines. Besides the increase in reliability and efficiency and reduction in costs, this new technology makes possible the introduction of new traits that could not or could only be obtained with great difficulty through classical breeding.

4.3.1 Vegetable seeds - industry background

The vegetable growing industry is an intensive, innovative, high value agricultural sector. Vegetable seed production is part of a larger seed industry, which is becoming increasingly consolidated around a small number of global players. In 1998, the top 10 seed companies controlled approximately 33% of the US\$23 billion

seed trade worldwide, and the top three seed companies (DuPont, Monsanto, Novartis) accounted for 20% of the global seed trade.

The vegetable sector requires the supply of a large range of markets, which implies that an extensive portfolio of products is essential. Various growing areas, growing seasons, market segments and destinations require specific and sophisticated vegetable hybrids and varieties. In the last few years, the rapid expansion of knowledge in the fields of molecular biology and genomics has brought substantial benefits in the area of crop improvement. In this way, investment in plant biotechnology is seen as a key driver for exploiting new growth opportunities.

4.3.2 Partner organisations' background

Horticulture Research International

Please refer to Section 4.2.2 of this chapter.

SeedCo

SeedCo is among the world's leading vegetable seed companies. The company, founded in the Netherlands at the beginning of the last century, has become a major global player through acquisitions in North America, Europe and Asia. SeedCo is a business unit of a larger global holding company, with a turnover of around 60m Euro and approximately 900 employees worldwide, responsible for vegetable crops within one of the top ten seed companies in the world.

In total, SeedCo and its sister companies market 850 varieties in 25 species through their crop oriented and specialised crop teams. These 25 crops are not equally important in terms of contribution to turnover, and the company focuses on a few key high value crops such as tomato and leeks. Through acquisitions worldwide, SeedCo was able to improve its global position in a number of crops. For example, through a recent acquisition, the company became one of the largest breeding programmes in the Crop area (on which SeedCo is collaborating with HRI) in the world.

The SeedCo's research and development strategies include centralisation of discovery research, decentralisation of applied research and breeding, and collaboration with universities and research institutes. The company regularly participates in research meetings with other seed producers and research institutes, and conferences related to this area of agriculture.

4.3.3 Collaborative relationship

The following narrative examines the developmental process of collaboration over the last 12 years. It is structured around four distinct logical time periods: the pre-history of collaboration, the license agreement to produce uniform hybrid leeks, renegotiation of the license agreement, and the research and development project pertaining to the selection methods for breeding. The main events and issues along

collaboration development are synthesised in the form of a matrix presented in Figure 4.4.

Pre-history of collaboration

In the beginning of the '90s, HRI completed a research project into the production of a certain type of hybrid leeks, funded by DEFRA. These hybrid leeks had superior characteristics as they were uniformly sized, making them more attractive commercially. As the leading scientist on leeks at HRI explained,

Hybrid vegetables in some other crops were known for quite a period of time, but none of them in leeks before, partly because of their complicated genetics. We developed a system for breeding new varieties of hybrid leeks that were about 50% better than anything else on the market. And at that point, DEFRA told us to stop: 'You solved the scientific problem, you developed it to the point where in theory it could be taken to private sector.

With the research project finished, HRI started to look for a seed company to commercialise the technology. To that end, a number of field demonstrations were set up across the UK. The process was largely informal, relying on the personal network of the leading scientist. He recalled,

It went on the bush telegraph to various growers mainly through intermediaries that I knew. All the material that we developed was grown in the field trials around the country. At that point, through a series of

coincidences, as I would describe it, [SeedCo] was a first seed company to register interest. The reason why they were particularly interested is purely by chance. The material that I sent out through an intermediary ended up in the same field in East Anglia as [SeedCo] own field trials, and our stuff was nearly 50% better than their own stuff, and so they said 'We must have it.'

Despite SeedCo being the first to register their interest in the new technology, HRI had to go through a formal tender process to select the commercial company. Approximately ten companies submitted applications. SeedCo made the most attractive offer, as they were particularly eager to license this technology after being able to compare it first hand with their own crops. SeedCo was selected as a licensee.

License agreement to produce uniform hybrid leeks (1992 – 1999)

In 1992, a license agreement was negotiated. It provided exclusivity for SeedCo for five years, starting from the beginning of sales, which meant that HRI could not sell this material to any other commercial company during this period. The first two years were spent by SeedCo making crosses and producing commercially good hybrids. After that, SeedCo commenced sales and royalty payments.

The licence agreement specified in detail the actual practical mechanisms for handing over plants and seeds from HRI to SeedCo. It also specified when and what information should be exchanged between the organisations. Thus, for example, HRI would provide SeedCo with the information on demand regarding the technology,

and SeedCo would provide HRI annually with the information about sales forecast and revenues. The commercial manager at HRI outlined,

During these years, we did very little. We were answering any questions they might have, taking notes of the reports they sent. Basically, as soon as the licence agreement was signed, it cost us absolutely nothing. We packaged the material and they collected it and got on with it. From this point of view, the cost benefit was absolutely incredible for HRI, because policing the licence wasn't necessary and everything ran like clock work. They did all the running, we haven't had to do anything, except if they needed to be consulted on anything, and they hardly needed to at all.

Renegotiation of the license agreement (1999 – 2002)

By 1999, the exclusivity agreement had expired. However, there was a loophole in it, as the agreement did not explicitly prohibit SeedCo from continuing to sell hybrid leeks on a non-exclusive basis. This meant that SeedCo could have continued selling the leeks without paying any royalties to HRI. The commercial manager at HRI attempted to recover the situation by negotiating the extension of the license agreement. As he explained,

I went to them, OK, slightly 'cap in hand', and said 'Look, although the agreement doesn't specifically prohibit you from doing it, the agreement is an enabling agreement which gave you permission to do it, and when the agreement finishes, implicitly you don't any longer have permission. I think

really, we need to renegotiate a new licence for you to continue to have these leeks'. And they saw the point.

The technology that SeedCo licensed from HRI was highly successful in the market place, and the first seven years of the agreement went extremely smoothly. Besides that, SeedCo took more long-term interest in HRI's activities. As the commercial manager at HRI recalled,

Certainly, they have taken a long standing interest in what was going on at HRI and they would send technical staff along to our open technical meetings and conferences and so on. So, when something like hybrid leeks came along, they were immediately there ready to make an offer and work with us.

In this way, even though SeedCo did not have to continue to pay royalties, they agreed to extend the license agreement. The commercial manager at HRI responsible for the negotiations explained,

They could have said that it was our fault to have this lapse in the draft of the agreement. I would not have resisted that much. But they felt that they got such a good deal from us that they felt a sort of moral obligation to HRI to share their massive good fortune with HRI.

The concession that HRI had to make to SeedCo in return for their good will to extend the license was that the royalties were to be reinvested in the research areas of interest to SeedCo. This was a controversial decision within HRI, provoking certain discontent among senior management, because this was not the way in which royalties from licensing were usually used. The commercial manager at HRI explained how this agreement was to be different,

On the first part of the licence agreement, the royalties just went to a black hole if you like. It went against deficits that HRI was making elsewhere, and helped HRI to keep head above water generally.

The extension of the license agreement was established on the condition that royalties would be reinvested into the projects relevant to SeedCo. However, at that particular time, the agreement was not project specific. When, a year later, the partners had to decide into which projects to put royalties, even more controversy was generated in this collaboration within HRI. When the extension of the license agreement was negotiated, it was implicit that the resources would go to the research group within HRI which had generated the royalties in the first place, the leek research group. However, the decision was taken to redirect the money into a group conducting research into a different crop. This provoked a sense of unfairness amongst HRI's researchers. As the leading scientist on leeks at HRI commented,

HRI insisted that it was non-crop specific. I don't know who at HRI, but it wasn't me. And what [SeedCo] then has done, they decided that the money

was to be spent on [the Crop] and not leeks, and I have no responsibility for [the Crop]. I regard that as really bad; it is one of the reasons that made me volunteer for redundancy. I am pretty upset about it. I don't blame [SeedCo], but I do blame HRI.

The decision to choose a different crop seemed to have been made principally by SeedCo. As the commercial manager at HRI conducting negotiations recalled,

It was awkward, the decision between the Crop and leeks. And at the end, [the commercial manager at the SeedCo side] said 'It is up to me to decide that.' He had discussions within [SeedCo], and that was the company decision.

The leading scientist responsible for the research group on the Crop at HRI was also involved in the negotiations. He commented,

HRI's position was that money should go to leeks, because that programme has generated the projects, so we wanted that money to go into that programme. But we did not get the bargaining power to insure that would happen. That didn't happen because [SeedCo] said 'No, we want a programme on [the Crop]'. They were in the driving seat, they had the money and it was where they wanted to spend it.

The decision to change collaboration from leeks to the Crop seemed to follow the commercial interests of SeedCo at the time. The commercial manager at HRI explained,

The development of leeks was at the stage where the product was so excellent and doing so well in the market place that there wasn't really any great need to do more work on leeks. Spending more money on leeks which are already brilliant doesn't make a lot of sense. [SeedCo] were also working on [the Crop] themselves and they knew that we had some very exciting, very interesting material related to [the Crop], and they saw more to be gained from joining in with the programme that we had on [the Crop] than to put more money into leeks.

During almost two years of negotiations before the extension of the license agreement was put in place, a form of 'gentlemen's agreement' between the organisations was in operation. This meant that SeedCo continued to sell hybrid leeks and that HRI did not reveal officially to others that the exclusivity of the license had ended. In this way, despite the prolonged and 'awkward' negotiations, the partners maintained a good spirit of trust in their relationship. As the commercial manager at HRI recalled,

A good feeling and good will on both parties was maintained throughout that frustrating period. People were very helpful, very friendly, and very professional to deal with.

Research and development project concerning the selection methods for breeding (2002 – 2004)

The agreed new research programme on the Crop was concerned with the development of the selection methods for breeding disease resistant plants. The programme would initially take five years and be financed by the royalties plus additional annual down payments by SeedCo. It involved achieving disease resistance based on several genes. Previously, such disease resistance had been achieved by working with one gene, but it proved to be inefficient, as it tended to break down rapidly, requiring the selection of another resistance carrying gene. This innovative method was to be developed with the help of the application of genetic markers in the breeding process, which implied the combination of various areas of expertise, such as molecular biology, plant breeding and pathology. This research programme built upon the results of previous research conducted at HRI and funded by DEFRA, which provided an extensive genetic study of the Crop.

The project had a head start due to the previous experience of collaboration between the two organisations. As the commercial manager at HRI commented,

It wasn't a project starting from zero. We knew at the personal level and also at the professional level that we could work together. And they also knew HRI from the leek project where we had a reasonably good relationship with [SeedCo]. It probably laid the ground work and the foundation for a truly collaborative project that is going to start now.

In addition to that, the relationship between HRI and SeedCo relied on personal connections between personnel in the organisations and the research reputation of HRI. The commercial manager at SeedCo explained,

I know that the relationship with HRI goes back and is based on personal relationships. My boss used to work in another place as a researcher and he used to have contact with some quite famous researchers of HRI. [...] HRI is associated with horticultural research. So, even without the personal contacts, we would have projects with HRI in one way or another. HRI is one of the last research institutes that are really doing applicable research for breeding companies. Many other institutes are going into high tech, which is too far away from our breeding reality. HRI is still using an approach which delivers output useful for breeding companies.

The two organisations were also well aware of each other's role in, and contribution to, the collaboration. HRI was leading in this particular area of research, but the input from SeedCo was essential for the application of new technology to actual plant breeding. The leading scientist on the Crop at HRI explained,

Because of the government funded research project we had produced [the Crop] population nobody had done before. We are 4-5 years ahead. They [SeedCo] are collaborating with a university in Holland, as well looking for a different type of resistance; but for this particular resistance, they would have come to us.

We are interested in this type of resistance from a scientific view-point, but the value of this scientific knowledge is limited to how it can be applied. The application comes out of the collaboration with [SeedCo]. There are a lot of other bits of information that you need for that, not in terms of scientific study, but in terms of breeding; and for that, a lot comes out of the discussions with [SeedCo].

More specifically, HRI and SeedCo had the expertise in different areas that was needed for the development of new breeding methods. According to the commercial manager at SeedCo,

What they have is genetic knowledge, a different kind, I would say, on the more theoretical part. And we have a more pragmatic practical breeding genetic type of knowledge. There is some overlap that provides mutual understanding for people.

A molecular biologist involved in the project at HRI explained further the nature of interdependency between the partners,

Within HRI, we have access to plant lines that may be in a public domain, but you have to know the characteristics of these plants, and we have been working with them for a long time. [SeedCo] have got a lot of expertise in breeding, selecting plants and lines. They have a good eye for important characteristics. They have their own breeding programme for disease

resistance, so they independently developed those resistant lines. By putting those two together, we have two different sources of resistance that come from independent backgrounds.

In this way, in contrast to the first case study, the collaboration between HRI and Becker Underwood, the partners in this collaboration relied heavily on each other's complementary knowledge and other resources to conduct the joint project. Furthermore, this project was different from other collaborations that both partners had embarked upon before with other organisations. The leading scientist on the Crop at HRI commented,

It is different from all our other projects based on a contract where HRI does all of the work. In this, [SeedCo] will actually be doing some of the work, because there are some things in which they are more efficient. I have never had a project like this before. It is new to me how to integrate research and get it more quickly to the end users. That is why I am so excited about this. It is more difficult for me to manage because there are things that will change. It is going to be more dynamic, which is going to be interesting.

Prior to starting the research, the partners engaged in joint project planning activities to define the way the project should be conducted. A number of personnel from SeedCo visited HRI for joint meetings, first, in 2002 and, then, at the beginning of 2003. A molecular biologist from the team at HRI involved in the planning meetings recalled,

At these meetings, we had brainstorming sessions to look at what we thought were the key objectives of the project. We discussed how to organise it in work packages and have an idea of what partner would be doing what. From there, we came out with a draft of the project plan. [The leading scientist on the Crop at HRI] took a lead and tried to put it in an actual project format. I wouldn't say it comes all from [SeedCo]'s side or all from our side. It is about this specific project.

The leading scientist on the Crop at HRI also outlined,

We both agreed that we had to have written actions with the dates against them so we could mark when they delivered and when we had to interact. It was very useful.

At these meetings, an initial draft of the project plan was developed. It defined the objectives for each year and the way the work was to be carried out. Deadlines, responsibilities, annual review meeting dates, and work packages assigned to particular people were defined. It took the form of an action list containing work packages, combined with a time-line for interdependent activities. Thus, the partners developed a specific way in which collaboration was to be conducted. The commercial manager at SeedCo, comparing this project with the way in which work usually was conducted at his company, explained,

We don't elaborate exactly like this with work packages. We have timelines, we have action lists and then we go. We have a more informal way to do things. It is particular to this project. Because you have to adapt to the specific needs of your partner, you develop a solution specific to that.

The molecular biologist from the team at HRI also commented about the specific nature of the project,

In some way it is tailored slightly towards the needs of the customer. Other projects we do differently, but we have the same basic methodology like trying to keep everybody in contact and in communication and to have regular meetings. The key thing is to have a good project plan before you even start. It is a very useful tool, because we break a very complex project down to the discrete packages and you can identify who is responsible for each part of the project.

The main objectives for the first year of the project (2003) were set as follows. A collection of the plants known to be resistant to the disease was to be identified, combining contributions from both partners. Then, the plants were to be tested by both HRI and SeedCo. Based on the results of the trials, it had to be decided which of the plants would comprise a final collection, which would serve as the base for further genetic work and new breeding strategies development.

Along the implementation of this plan, the partners had to reconcile differences between their approaches and perspectives derived from their particular experiences. For instance, HRI and SeedCo had different ways of performing trials. The leading scientist on the Crop at HRI explained,

How they do things is different from how we do things. Sometimes, we come up with a compromise. For example, it surprised me how few plants they actually grow to make a selection. They grow a very small number of plants and decide what to consider and what to get rid of. While when we do ours, we have a lot more replications, a lot more plants per line but fewer lines. And they grow a lot of lines with a few plants per line. So, sometimes they base decisions on the fact that the line looks good. It is very empirical work really. We are trying to combine the two ways.

As the project was essentially interdisciplinary, it also involved reconciling differences in the approaches taken by the breeders and by the molecular biologists. The breeders most actively involved in the project were predominately from SeedCo, while the molecular biologists were from both HRI and SeedCo. The molecular biologist at HRI explained how these differences impacted the work,

Sometimes, we find that breeders, especially at [SeedCo] who have to worry about commercialising the product, would have different ideas. They would have larger views than just resistance. They tend to look at other characteristics as well, because it doesn't matter if your plant is resistant or not, if it's got brown spots on the leaves, you will never be able to sell it.

They were very useful to the project, as they would add criteria to choose from resistant plants. For example, you would choose a plant that may be slightly less resistant, but would have more attractive characteristics. So, while we are interested in the best possible resistance, actual breeders would be interested in other things as well. Our agreement is to try to provide a tool that they can use. We are not giving them a final solution.

At the end of the first year of the project, an annual review meeting took place. The leading scientist on the Crop and the molecular biologist at HRI visited SeedCo at the beginning of 2004. From SeedCo, commercial managers, breeders and molecular biologists were involved. The meeting consisted of the discussions of the progress achieved during the first year, and also detailed planning for the next year of the research. The outcome was another action list with objectives and detailed work packages. At this time, once again, compromise had to be reached between the different perspectives of the partners. For example, cost considerations from SeedCo had to be incorporated into the assessment of the breeding strategies by HRI because it constrained the number of sets of molecular markers that could be used to mark genes. Furthermore, the approach taken by the breeders had to be balanced with the overall aims of the research. The leading scientist on the Crop at HRI recalled,

At the project meeting in October, and then again at the last meeting, there were a lot of discussions while agreeing on the strategy that it was not a breeding strategy, it was not what a breeder would do. He [the breeder from SeedCo] had some difficulty in accepting the strategy because it is not how

he would breed. But the strategy is for how to choose the best breeding programme and not to do it.

In this way, the variety of experiences of the people involved in the collaboration implied that the partners had to reach a joint understanding, reach agreements, and decide upon clear criteria for decisions, in order to conduct this project. The commercial manager at SeedCo observed, while talking about the discussions during the meetings,

The decisions are made through mutual understanding, I would say. HRI take any opinions from the breeding companies very seriously. So, it is not like we impose something.

4.3.4 Developmental pattern

After outlining the overall development of the collaboration between HRI and SeedCo in the preceding section, the present section focuses more closely on examining the developmental pattern of this inter-organisational relationship. It employs the templates proposed by Van de Ven and Poole (1995): life-cycle, teleology, dialectics, and co-evolution. Figure 4.5 schematically represents the operation of the generative mechanisms as manifested in the observed collaboration dynamics, timing and interrelation between them. The narrative, in contrast, focuses on the contexts surrounding collaboration development, examining the mediating contingencies that brought the operation of generative forces to the fore.

Figure 4.4 Main events and issues along HRI – SeedCo collaboration development

Year: Semester:	92	93	94	95	96	97	98	99	00	01	02	03		04	
												1	2	1	2
Field demonstration of a new leek variety to growers. SeedCo are present.															
License agreement for transfer of biological material (to produce uniform hybrid leeks) runs															
SeedCo's acquisition in the Crop area															
New stage of restructuring starts at HRI															
Exclusivity period of the license ends															
'Gentlemen's agreement' in place															
Renegotiations of the license agreement															
Extension of the license agreement is signed (royalties reinvestment in the areas of SeedCo's interest)															
Negotiations start about the area in which to reinvest royalties															
SeedCo visit HRI to discuss in which area to reinvest royalties															
Decision to reinvest royalties in the project for developing breeding methods for disease resistance in the Crop															
1 st joint project planning meeting at HRI (people from both organisations are present)															
Collaborative agreement is signed															
2 nd joint project planning meeting at HRI (people from both organisations are present)															
SeedCo's visit to HRI															
HRI's visit to SeedCo															
1 st annual review meeting															
HRI's visit to SeedCo															

Figure 4.5 Generative forces shaping HRI – SeedCo collaboration development

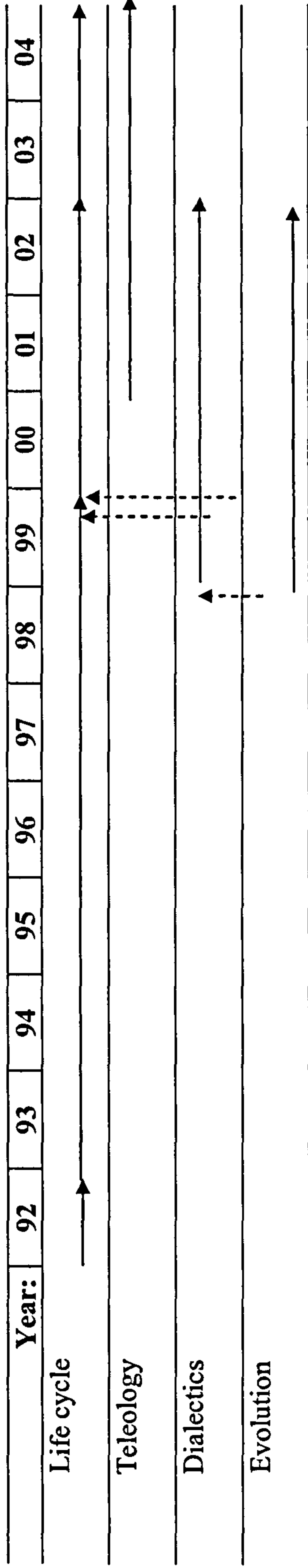


Figure 4.6 Inter-organisational learning along HRI – SeedCo collaboration development

Period:	1992-1998	1999-2000	2001-2004
	no significant learning	unlearning	learning
Behaviour informed by inter-organisational rules	<ul style="list-style-type: none"> interactions limited to formal exchange of information and occasional visits from HRI to SeedCo 	<ul style="list-style-type: none"> inquiry into the existing ways of collaboration by SeedCo and HRI 	<ul style="list-style-type: none"> inter-partner interactions are governed by the project plan (meetings, exchange of information, communication patterns) decisions taken based on the defined criteria (e.g. final plant collection)
Inter-organisational rules	<ul style="list-style-type: none"> HRI is not involved in any decision-making concerning hybrid leeks production protocols for material hand over and information swap are defined in the license agreement 	<ul style="list-style-type: none"> politics at HRI: project's high profile with DEFRA, discontent of senior management, redundancies SeedCo hold financial resources SeedCo 'good will' to continue to pay royalties SeedCo is more influential partner 	<ul style="list-style-type: none"> royalties to be reinvested in the areas of SeedCo's interest, namely, the Crop SeedCo is going to have control over research project through more integrated development how to conduct the project (action lists, work packages, timelines) criteria for decisions (how select plants, how assess alternative breeding strategies)
Social context	<ul style="list-style-type: none"> licensing of hybrid leeks breeding technology implies simple transfers of biological materials no joint activities beyond the actual license agreement negotiations 	<ul style="list-style-type: none"> HRI hold essential expertise; SeedCo hold financial resources and additional expertise HRI and SeedCo have different perspectives on the project inter-disciplinary differences (breeders, etc) joint practice: meetings, regular inter-partner visits 	

During the first seven years of the collaboration, two distinct stages of development could be observed: formation and operation of the license agreement. This pattern is consistent with the life-cycle force operation (D'Aunno and Zuckerman, 1987; Kogut, 1988). When the exclusivity period of the license ended, the agreement was to be terminated. The unexpected extension of the license agreement was a result of the convergence between HRI's attempt to repair a loophole in the original contract and SeedCo's long-term interest in HRI's research. While the first seven years of collaboration seemed to have a developmental pattern of the life-cycle type, the unplanned, unfolding of events by the end of the license agreement period was not consistent with the orderly sequence of managerial decisions suggested by the life-cycle mode of development. Such an unforeseen pattern of events is more consistent with the operation of the dialectical force (de Rond and Bouchikhi, 2004).

The refocusing of the collaboration towards a new research area and a different approach to conduct joint projects originated from SeedCo's desire to strengthen their position in the area of a specific crop. The recent acquisition by SeedCo of a company specialising in this crop reinforced this new direction of SeedCo's growth strategy. The co-evolution with SeedCo's strategy (Koza and Lewin, 1998) evoked a number of dialectical processes within collaboration. This is indicated in Figure 4.5 by a dotted vertical line connecting the evolutionary and dialectical forces. This particular pattern of development is similar to the previous case, the HRI – Becker Underwood collaboration, as it resulted from the interrelation between evolutionary and dialectical generative forces.

The dialectical forces in the form of emerging conflicts of interests were made manifest during the transition period between the license agreement and the new research and development programme. Politics within HRI relating to the way the royalties should be used, and the unequal bargaining power (Inkpen and Beamish, 1997) of the partners, with SeedCo being the more influential partner, resulted in prolonged and 'awkward' negotiations. These dynamics were similar to the findings presented by Shenkar and Yan (2002) (see Chapter 2, Section 2.5.2.2), which demonstrated the effects of partner politics on the development of collaboration. This development is indicated in Figure 4.5 by a vertical dotted line connecting the dialectical and life-cycle forces. The refocusing of the collaboration meant the beginning of a new life-cycle. During the period covered by this research, the stage of formation (negotiations relating to the area of research in which to reinvest royalties) and the beginning of the implementation stage (when the new R&D project formally began) could be identified in the pattern of the collaboration development.

Ending the transition period, the final decision was taken to reinvest royalties in the specific crop area, with SeedCo having significant control over the future research and development project. The process by which these decisions were made will be explored further in Section 4.3.5. This case study covers only the first year and a half of the latest joint project between HRI and SeedCo, which initially was planned to continue for five years. During this initial period, the pattern of collaboration

development was consistent with the operation of the teleological force. The leading scientist on the Crop at HRI commented about the developmental pattern of the project during this period,

It's flexible. We can change what needs to be done within the agreement. We or [SeedCo] can renegotiate the content of what is being done. The whole idea is to be as flexible as possible and to work with them and respond to what is actually happening in the market.

It presented cumulative learning and adaptation cycles implied by teleological models (Parkhe, 1991; Ring and Van de Ven, 1994), which also will be addressed in the next Section 4.3.5. This latest period of collaboration presented a similar pattern of development to the initial product development period (1986-1988) in the HRI – Becker Underwood case. The particular context, in which the latest collaborative project between HRI and SeedCo was being developed, favoured the teleological mode of development, as repeatedly stressed by the commercial manager at SeedCo,:

I see the relationship with HRI as a very professional one, where there is respect for intellectual property issues, but still I have a feeling that we can be very open with the researchers because there is no doubt whatsoever that they will maintain confidentiality, which is very important to us, of course.

In the development of the latest project, which is starting this year, we were able to discuss even sensitive issues without signing secrecy agreements and those kind of things, which proves that there is a lot of confidence between the two.

We trust [the leading scientist at HRI] and his group. Of course, we have written it in the contract. You can write many things but if there is no basic trust, then forget about it; You will behave differently to what the contract allow you. We have a contract but we also trust people very much.

This section examined the underlying generative forces that were able to come to the fore and shape the development of collaboration. It also addressed the surrounding contexts providing the circumstances that enabled these forces to become manifest, and examined the interaction between these forces. The next section examines further the dynamics of this collaborative relationship by focusing on the inter-organisational learning processes involved.

4.3.5 Inter-organisational learning

This section starts to examine inter-organisational learning processes in the course of collaboration development. The following narrative focuses on four main issues concerning inter-organisational learning (as discussed in Section 2.5.3 of Chapter 2): the nature of the accepted inter-organisational rules governing collaboration and the consequent patterns of organisational behaviour within the relationship; how these

rules emerged; how this process was shaped by social forces; and, once established, whether these rules and behaviours changed or prevailed over time. Figure 4.15 schematically represents the inter-organisational learning processes in the development of collaboration.

During the first seven years of the relationship, from 1992 to 1999, the interactions between the partners were principally formal, based on the terms specified in the license agreement. Licensing of the hybrid leeks technology involved the simple transfer of biological materials and the underlying intellectual property, and did not require any joint activities beyond actual negotiations of the license agreement. In this way, HRI were not involved in any decision making with regard to the use of the technology. The license agreement outlined the exact protocol for the material transfer and information exchange. As the leading scientist on the leeks at HRI recalled at the time regarding the interactions between the partners,

They would tell us what they were doing and occasionally we would visit to check if things were going OK; but we didn't have much input in how they marketed varieties or which varieties they chose to market. That was all decided in house by [SeedCo].

We had to send a lot of documentation across, because breeding involves a lot of documentation: lists of seeds, performance related data associated with a particular variety or line, all that sort of material. For the first couple

of years there was a relatively large volume of requests for further information. After that, it had to be fed less continuously.

During this period, there was no significant inter-organisational learning, as the partners had very limited interactions between them. During the transition period from license agreement to a full joint research programme, between 1999 and 2002, with the end of the license agreement, formal rules were no longer in place. The organisations had to change the way they were interacting. This period was characterised by a specific social context. The decision about how to use royalties generated by the leeks programme was influenced by HRI's organisational politics at the time, as well as the wave of redundancies associated with organisational restructuring taking place in the background. The complications of reinvesting royalties into a specific project and, furthermore, into a different crop prompted discontent from the senior management at HRI. However, this project had a high profile because it was an exemplary case in which the technology developed with public money was directly adopted by the industry. As the leading scientist on the Crop at HRI explained,

This project is high profile as far as DEFRA is concerned, because it is a clear demonstration of technology transfer. It is a good project for HRI to be able to say 'DEFRA gave us this amount of money, we've done this piece of research, but then we are actually taking these results and working with a company to actually get this information out'.

So, it was desirable to seal further collaboration with SeedCo, even if it demanded acceptance of their conditions. In addition, placing royalties in the Crop research group also seemed favourable in the current organisational context at HRI. The commercial manager at HRI commented,

The impression I got is that it was [SeedCo]'s decision. HRI, responding to that, realised that putting money in [the Crop] was better for HRI as well, because it would imply employing more long-term scientists. In any case, the key person on leeks was very close to retirement. If he was made redundant, the package would be extremely good for him and it wouldn't have been so hard for him as for some other scientist in other areas. It wasn't the basis on which the decision was made, however.

During this transition period, SeedCo clearly had more bargaining power (Inkpen and Beamish, 1997) in the negotiations to impose their conditions, as they held all the financial resources and also were acting on 'good will' in continuing to pay royalties, even when there was no compulsion to do so. Through negotiations within HRI and with SeedCo, the partners reassessed the existing mode of collaboration. Meanwhile, the 'gentlemen's agreement', an informal understanding that during the two years of negotiations, HRI would not disclose the end of exclusivity and SeedCo would pay royalties retrospectively for this period after the formal agreement was established, was upheld. The new collaboration agreement formally defined where the royalties would be reinvested, which was no longer HRI's area of responsibility. SeedCo also sought more control over the related research programme with HRI

through a more integrated approach. The commercial manager at SeedCo commented,

I want them to think with us and have a much more interactive type of project. [...] Instead of having the researchers on their own deciding things, we would like to do it in a much more interactive way to avoid wrong decisions being taken and, on the other hand, to get much better flow of information from both sides of the project. The project that we will have is not like something 'OK, HRI, you have a task, do it.' But we have a lot more interaction on the operational level, like we will do certain parts of the project in the field, because we feel we are stronger in that one, HRI will do the things they are stronger in.

In this way, the old modes of collaboration were reassessed by the partners in order to make a new collaborative project possible. This indicates that a process of unlearning (Hedberg and Jonsson, 1978; Hedberg, 1981) took place through reassessment of the existing inter-organisational rules by the partners (Schon, 1983). Similar dynamics were observed in the HRI – Becker Underwood case, when Becker Underwood started questioning the existing roles concerning the dominance of HRI in terms of the making of technological decisions. The issue of unlearning will be further discussed in the Chapter 5, Section 5.5.1.

With the new research programme in place and starting to take form from 2003 onwards, the partners had to learn how to conduct research together. At the

beginning of the project, the partners commenced on relatively equal terms, insofar as there was mutual interdependence, as both held the complementary expertise necessary for the research to progress. SeedCo had financial resources and practical breeding experience, and HRI had extensive experience and intellectual property in the area of genetics, developed through their previous research. This diversity of experience, as well as the multidisciplinary nature of the project implied inter-organisational and inter-disciplinary differences in perspectives and approaches that would be adopted by the members of the inter-organisational team.

Joint activities such as meetings and inter-partner visits were essential for the process of translating their organisation specific experiences into collective rules which would inform behaviours and concomitant knowledge development in the collaboration. The commercial manager at SeedCo described the activities during the meetings,

We meet twice a year altogether. The progress report is, first, circulated to everybody from the different fields. Then we split up and discuss specific issues, identify areas of overlap, and then come together again, discuss those areas of overlap and try to align everything. At the end of the meetings, the experience is that everything is aligned and the discussion points are taken away. For example, in the last meeting, from the molecular point of view, you can decide on different populations to those from the breeding point of view because the objectives are not always the same. In both groups, certain ideas came up and there was no agreement. Then you put all the arguments

together and at the end, you get to the conclusion about a particular population. Dealing with these issues is important and we try to cover as many arguments from both groups as possible, having the final goal in mind.

The molecular biologist at HRI also highlighted the importance of joint meetings for the project,

For some things you have to meet personally. You have to sit across a table and discuss it, let the ideas flow out of that. At the review meetings, when you put everything together, everyone will see it from a different angle. You can put some things forward and you may get interesting perspectives on the problem or piece of data. For example, [SeedCo] molecular biology people had some ideas about how I could get closer on my markers to the genes. They have some experience how to do that. It would be more difficult via e-mail because it was a spontaneous exchange of ideas, things just occur to you. At the end, in these meetings, everybody contributes. For other bits of information, like specific questions, e-mail is quite an efficient way of interaction.

Inter-partner visits were also crucial for joint experiences, which would serve as a base for developing joint understandings. The leading scientist on the Crop at HRI gave an example of this,

Often what happens is that you get a set of results and you look at the results and it stimulates your thinking. For example, when [a pathologist at HRI] was doing the laboratory experiments, the tests didn't show exactly what was expected. Then we reported it to [SeedCo] and they wanted to come here to see what he was doing. You could send information, but many times it is a lot easier to watch somebody doing it and actually look at the tests. When you write something down, even when you write all steps down, you still have left out something. It is easier to learn by looking at things than from reading a protocol. It is easier when you are shown how to do things, and then you ask questions, and you learn it. It is important to see the way they do their trials, because when you get the data set you can actually know that, when we put it in our analysis and there are problems you can actually say 'They are doing it this way, would it affect data or no?' So it is always useful to see how they do things.

The pathologist at HRI also recalled his joint experiences with SeedCo,

When I first started last year, my contact was via [the leading scientist on the Crop and the molecular biologist at HRI]. Before the last review meeting, I produced a report summarising my results. After that meeting it was decided that it would be good to establish face-to-face contact with people at [SeedCo], and I did. [The breeder at SeedCo] is a very practical person. He didn't sit down in his office, he went straight out to the facilities where they do all the screening. We were talking while he was showing how they were doing it and explained all the issues that were coming up. That was quite useful. You get a lot of new ideas when you see how it is

practically implemented. If you just present everything on paper you get less new ideas than we actually see the situation itself. It is only when you see by your eye.... The way the human brain works, your imagination works better when you see things, when it is visual, especially in a situation when you've got collaboration with a company in a different country. It is important to see how they operate, how they work. You can have a better view putting it in context.

In this way, the diversity in the partners' experiences was essential for the ability to learn together and for the overall learning outcomes of the collaboration. In the previous case of the HRI – Becker Underwood collaboration, the balance between the partners' expertise was different in the sense that Becker Underwood no longer relied on HRI's knowledge, which certainly contributed to the difficulties experienced in the latter stages of that collaboration. In this case, combining their experiences in ways they were unable to do through individual effort alone, the partners managed to produce new ideas and develop common rules which governed collaboration. These rules comprised jointly developed project plans, including action lists, work packages and schedules, as well as a set of clear criteria for decision-making, such as criteria for plant selection and selection strategies assessment. This set of rules informed and governed the interactions between the partners and the decision-making process during the first year and a half of the project covered in this case study. The molecular biologist at HRI recalled how the activities were carried out during this period,

What happens quite often is work package is done by one person and the next is by another. For example, we are screening a set of plants for resistance markers. Once we confirm that plants have got the resistance marker, we pass this on to the breeders, so they can choose from those plants. This is the case when information from one part of the project affects another part of the project. Sometimes, we get just a query about different aspects of work, some additional information, so we have to send it to them. Once we agree packages and the schedule, there will be exchange of information.

The leading scientist on the Crop at HRI gave an illustration of how the decisions were taken,

After the literature review, [SeedCo] looked and got the information from their gene bank, I also went to our gene bank, and we identified what varieties to use. So, I came up with the list, [a breeder from SeedCo] came up with the list and we agreed between us which lines to use. It was done by the exchange of e-mails. It was a smooth decision because we had already agreed at the initial meetings. So, that was an implementation of that action plan.

In the latest year of the project (2004), a number of new people became involved with the collaboration. They also readily recognised, and acted in accord with, the inter-organisational rules that had developed by that time. Another molecular biologist at HRI outlined his understanding of the project,

There is more overall management in the project. There is more interest in keeping it to the targets, more detailed reports, compared to DEFRA projects. This demand is implicit. It is probably driven largely by [SeedCo], but it is implicit in our agreement. It is just a question of them having more input into details, how we are going to do the project, and review stages. More control generally, which is acceptable, because they are paying the money. We are happy to go along with that.

The pathologist who became involved recently with the collaboration also commented,

You get a lot of freedom in DEFRA projects. As long as you achieve you milestones, you are OK. And here, because there is a direct uptake of anything you produce, it will be taken up directly by the company. I actually prefer this way. If there is something useful coming out, then this is quite a reward.

In this way, the period from 2001 to 2004, can be characterised as continuous inter-organisational learning, when behavioural coupling between the two organisations was being established (Holmqvist, 2003b), allowing the implementation of the joint project to progress.

4.4 BODYCOTE, TWI, AND FORCE

The collaboration between a multinational company and two non-profit research and technology services oriented organisations, one in the UK and another in Denmark, concerning the development of a new testing method in the area of corrosion, started to form in 2000. A research and development project was established to research a new method of assessing materials' susceptibility/resistance to a certain type of cracking. This method would be used in corrosion assessment of line pipe and pressure vessel steels in the oil and gas industry. Such research and development initiatives are usually financed through sponsorship from companies in the oil and gas industry (such as Shell, Texaco, etc). An R&D project of this kind can be launched, only if enough sponsors join the agreement to provide necessary financial resources.

4.4.1 Servicing Oil & Gas companies - industry background

Specialist services to the oil and gas industry, such as materials testing and metallurgical consulting, are provided by a variety of companies, ranging from large multinational companies to national research and technology institutes. These service providers are dependent on the oil and gas industry's cyclical peaks and troughs. They also rely on the R&D resources available in the industry. Due to mergers in the sector, for the last 20 years, the tendency in the industry has been towards consolidation around a small number of global players. In terms of the

impact on the research and development initiatives such as those described above, this means that it has gradually become more difficult to attract sponsors because there are fewer companies available from which to seek sponsorship.

4.4.2 Partner organisations' background

Bodycote Materials Testing

Bodycote Group is a world-leading supplier of special metallurgical services, spanning over 22 countries. Bodycote Materials Testing Group is one of its five international divisions, responsible for independent materials laboratory testing. It has an annual turnover of around £19m and approximately 400 employees. It provides services to a range of industries, from automotive and aerospace to oil and gas and petrochemicals. Its business mainly comes from Europe and the Middle East.

In 1998, a new addition to Bodycote Material Testing, a Corrosion Centre (where the research and development project regarded in this case study originates) was established in Dudley, West Midlands, UK. This new corrosion testing laboratory is headed by a new director, head hunted from a competitor organisation, who is recognised as an international authority in the corrosion testing field. The Corrosion Centre director commented,

I have always been a member of certain societies and institutions in metallurgy and corrosion. Bodycote wanted obviously that to continue and

progress, and to fully back that sort of networking and marketing role. I just became an international director of NACE¹ in America. It has 15,000 members, mainly professionals. They write national and international standards for the oil industry.

Membership and participation in the activities promoted by such bodies as NACE and European Pressure Research Council are of crucial importance for generating business in this industry. The principal corrosion engineer at Bodycote explained,

We don't rely on sales people to generate business. We generate it ourselves by attending the conferences and exhibitions, generally, by having quite a high profile. I and [the director] are quite heavily associated with NACE.

TWI – World Centre for Materials Joining Technology

TWI is a non-profit distributing company owned by its members (member organisations pay annual fees and have access to full consultancy and R&D services and facilities). It is based near Cambridge, UK, employs approximately 450 staff, and provides a wide range of services in joining technology for engineering materials. It serves a number of industrial sectors. For the last few years, due partly to the recent growth in the oil and gas industry, particularly in the Caspian region and South America, there has been a notable growth in the number of TWI's members from this particular sector.

¹ NACE (The National Association of Corrosion Engineers) is a membership organization comprised of engineers, scientists, managers, consultants and other professionals alike in the field of corrosion. It oversees technical committees which recommend state-of-the-art corrosion technologies and establish industry standards.

FORCE Technology

FORCE Technology is the product of a series of mergers between a number of Danish research institutions (such as the Danish Welding Institute, Danish Corrosion Centre and Danish Maritime Institute) and acquisitions of companies with expertise in the particular technological areas (such as materials testing and welding) across Scandinavia over the past 10-15 years, and is now a non-profit private technological service institute affiliated with the Danish Academy of Technical Sciences. It employs over 800 people in Denmark and Sweden. Over the years, government funding for these institutions has been in decline. This means that the organisation has had to seek commercially based work. Now, approximately 40% of its turnover is generated through the providing of services abroad, with Scandinavia and the rest of Europe as its largest markets.

4.4.3 Collaborative relationship

The following narrative examines the process of collaboration development over the last four years. It consists of two parts: Collaboration Formation and Project Implementation. The main events and issues pertaining to collaboration development are synthesised in a form of a matrix presented in Figure 4.7.

Collaboration Formation

This inter-organisational collaboration originates from inter-personal links between the participants established a number of years ago. The director of the Corrosion Centre at Bodycote, together with a small number of other experts in the field, had been involved with this particular research area for some time. He recalled,

It is something I have been working on since 1992. In fact, I was in the group of people first to determine this type of cracking. [Collaborator from FORCE] and I, we actually set down in Alberta Airport after our plane was cancelled after a conference. It was six or seven years ago. We drafted out and discussed a few things about how we could look at it. And he said 'It sounds sensible. Let's try.' I then moved from my previous company to here, still with those ideas in my notebook. And once we moved here, I had more freedom to do what I wanted to do.

So, we set down one evening and put some notes together and said 'Let's do a joint project. Let's combine resources and say these are two guys who know most about it. These are the benefits. And we will try to get some sponsorship'.

It was essential to have more than one reputable organisation involved in collaboration to attract sponsors. As Bodycote Materials Testing had no experience of working in collaboration with other organisations, the director of the Corrosion Centre had to rely on his personal network to seek out possible partners. He outlined,

Bodycote hasn't done much collaboration. This is a departure for them. The whole Corrosion Centre is a completely different venture for them anyway. That is what we have set up to do, to use knowledge and contacts to network with people.

FORCE was an obvious partner because of the personal relationship involved from the beginning. However, it was more of a personal than organisational matter to the collaborator from FORCE. He explained,

I am interested more at the personal than organisational level. I have been working in this area for more than 25 years, and it is something I would like to see progress.

By 2000, the director of the Corrosion Centre at Bodycote and the collaborator from FORCE had developed the initial project proposal and started to circulate it in order to seek sponsorship. Shortly after circulating the proposal, they were approached by a person from TWI working in the same area, whom they knew well, asking to join the project as the third partner. As the community of experts in this particular area of corrosion is relatively small, by joining these three people and the associated organisations, the project would be conducted by some of the leading experts in the field. Moreover, TWI wished to join to be associated with the new development in the area and consequently, were happy to be seen collaborating with a major organisation such as Bodycote. Although Bodycote had had no previous interactions

with FORCE or TWI, the director of the Corrosion Centre knew them well and had worked previously with these organisations. He recalled,

I've run some big tests at FORCE Institute and I had TWI do some work for me three or four times in the past five years. Before we set up the Corrosion Centre, Bodycote had no involvement with them.

He also used his personal network to attract sponsors to the project,

Before this project started, there were at least three of the sponsors that would never have thought of Bodycote. On the other hand, they sponsored other projects that I ran with another company. It was the methodology of contacting my old connections. I brought them with me.

Another important aspect of this collaboration formation was that, besides developing a new testing method, it was very important to develop a reputation associated with it. As the director of the Corrosion Centre at Bodycote explained,

Let's assume that it is successful. The oil and gas manufacturers would have a test method that they can use to select reliable materials. There is a big commercial and health and safety advantage. We would publish the test method, because the UK Health and Safety Executive is also a sponsor. We would publish the method and we would provide that service as would the other two collaborators. And eventually, the method could be published by NACE, etc. In the past, the documents were accepted by certain companies

and put into the specifications. You can't patent the test method. You can protect it only by the reputation that we have developed it and we know how to do it better. This type of project, if it is successful, contributes a lot towards the name of the company. It is extraordinarily good marketing, good networking; it adds to the standing of Bodycote within the oil and gas industry. It is purely about reputation.

In this way, it was important to join a number of reputable people and their associated organisations to collaborate on the development of this method, not only to attract sponsors more easily, but also to further enhance the reputation of the people and organisations involved. The participants, by being involved in the new technological developments in the field, and by having actually developed the new method, would generate new business for their companies, and would even be able to establish new standards in the industry. As the director of the Corrosion Centre commented,

It was very important that we got the UK Health and Safety Executive to join [as a sponsor], and they have done. If this test method is validated, they will insist on the procedure to be published.

The pattern of this collaboration formation was quite different from the previous two cases, the HRI – Becker Underwood and HRI – SeedCo collaborations, as it did not demonstrate any systematic search for the partner or well-defined formation period.

Instead, it presented a more 'ad hoc' approach to collaboration formation, based on informal inter-personal links (Kreiner and Schultz, 1993; Liebeskind, et al., 1996).

Project Implementation

Once the partnership was established among the three organisations (there was no formal contract; the project proposal stated three organisations as participants), a pre-launch meeting was arranged with the potential sponsors interested in the project. After discussions during this meeting, the initial proposal was adjusted. The adjustments did not relate to the test design itself, but to the need to sharpen the focus of the project, dividing it into two phases: one to develop a test method, and the other to study its mechanism. The initial project was to focus only on the first phase. The director of the Corrosion Centre outlined the modifications to the proposal made during the meeting,

A few modifications were made, but not to the test design. It is up to us. We had to try to focus on that, that was a test method project and not test mechanism project. That comes later. This was a part of the input.

The final project proposal and a contract (specifying the joining conditions for sponsors) were sent out to potential sponsors by the end of 2000. During the next year, the partners were in constant communication with the potential sponsors to secure funds. By the beginning of 2002, a sufficient number of sponsors had joined the project, making it possible to start the actual work. The project started with nine paying sponsors (oil companies and pipeline manufacturers and constructors). The

contract specified that Bodycote should be the 'front man', with the other two partners being sub-contractors that Bodycote would pay for undertaking work on its behalf.

The proposal outlined the scope of the project: to conduct a literature review in the related areas, develop a rig that would produce the kind of cracking necessary for the trials of the test design, and then perform corrosion testing, which included interlab confirmation of reproducibility (all three partner organisations would perform trials independently to confirm the results). Before the project took shape, the scope of the project and the details of the design had been determined by the director of the Corrosion Centre and his collaborator at FORCE, through their discussions years earlier.

The major body of work on the project was to be carried out at Bodycote. The other two partners had their functions to perform, for example, TWI conducted the literature review (principally because they had a large electronic library) and were going to perform some tests after the rig was developed; all three partners would have to perform validation tests at the end. However, the input from the two other organisations was not essential to the actual completion of the work. As the director of the Corrosion Centre commented,

The literature survey had naturally settled at TWI. I could have done it over there. Bodycote are now members of TWI, so we had access to the library. [...] FORCE is involved or it isn't... It is another reputable organisation.

We could do it all ourselves as a Bodycote project, but it is better to have other organisations involved.

In this way, this particular collaboration was different from the previous two case studies (HRI – Becker Underwood and HRI – SeedCo), in the sense that the implementation of the joint project did not rely on the combination of the partners' expertise. Each organisation was able to conduct the research and development on its own. What was important in this case was the enhancement of the overall impact of the new test method to be developed by combining the reputations of three partner organisations. The effect of these differences across the cases on the process of learning and collaboration will be further explored in Chapter 5.

Since the project officially had started in the beginning of 2002, little work was actually done during the first year and a half. As the collaborator from FORCE commented,

My main concern with this collaboration is the slow start up. It could be more dynamic.

The main reason for that was insufficiency of resources in terms of personnel at Bodycote to actually start the work. Only when a new corrosion engineer joined the Corrosion Centre in mid-2003, did the project gather momentum again. This engineer explained,

Before I joined in, they didn't have much time to work on the job, so nothing much happened. Projects of this nature are usually fitted around more urgent work, so sometimes it gets shelved for a while.

The first review meeting with the sponsors was set up in July 2003 at Bodycote. Before the meeting, Bodycote and FORCE reviewed the literature review prepared by TWI, and Bodycote developed a prototype of the rig needed for testing. These results were presented to the sponsors at the meeting, discussed, and a work plan was drawn up.

For the next year, further work was carried out at Bodycote. During this period, there were a few unexpected developments. First, the prototype rig failed to work. As the principal corrosion engineer at Bodycote explained,

We developed a prototype rig and did mechanical tests on it. It didn't work because the twisting and bending it was producing didn't produce the required cracking. It was a good idea and looked very promising. It would probably work under certain circumstances, but the idea was to develop a more general test that could be applied to different materials. [...] The development of the new rig then took some time.

After a new rig design was produced, further unexpected findings followed. As the director of the Corrosion Centre at Bodycote explained,

We designed a new test rig. The old concept was good, but it was a miserable failure. We spent a long time trying to sort it out and eventually, we redesigned the rig completely, and we now have got the rig that works. We have now done the first trials. But then we came up with something technical, which is even more unusual. During loading the samples, we found that material behaves quite differently depending upon the direction the sample was machined from the plate. That metallurgically is very important because it might be something about the problem we are looking at.

It was necessary to resolve this metallurgical problem before the project could progress any further. The director stressed at the time,

It is very important that we understand the metallurgical side completely before we do corrosion tests. If not we'll get results we cannot explain.

During this time, the interactions between the partners were occasional and mainly informal as they met at conferences and other events. As the director of the Corrosion Centre recalled,

[Collaborator from FORCE, Collaborator from TWI] and I are members of European Pressure Research Council. So we meet three times a year on that. There is some work we are doing at TWI. I suppose I saw [Collaborator from TWI] about five times, [Collaborator from FORCE] three or four. Naturally, it turns to what we are doing, how it should be changed. When

we meet, it comes up in the conversation. Normally, three of us end up together somewhere over coffee, we chat things around.

The second review meeting with the sponsors (not all of the sponsors were present; neither was the collaborator from FORCE) took place during one of the NACE conferences at the beginning of 2004. The results, including the setbacks with the rig and unexpected findings, were presented and discussed with the sponsors. In the light of these new developments, the original deadlines agreed at the previous meeting were pushed back. Bodycote were to continue work on the test design during 2004. The next meeting with the sponsors was planned for the second half of the year.

4.4.4 Developmental pattern

After the outline of the overall development of the collaboration between Bodycote, TWI and FORCE in the previous section, the present section focuses more closely on examining the developmental pattern of this inter-organisational relationship. It employs the templates proposed by Van de Ven and Poole (1995): life-cycle, teleology, dialectics, and co-evolution. Thus, Figure 4.8 schematically represents the operation of the generative mechanisms as manifested in the collaboration development. The narrative, on the other hand, focuses on the contexts surrounding collaboration development, examining, in this way, the mediating contingencies that brought the operation of the generative forces to the fore.

The content of this R&D project undertaken by three organisations was conceived and outlined in the project proposal by two experts in the field of corrosion, the Director of the Corrosion Centre at Bodycote and his colleague from FORCE. The way in which project implementation unfolded over time was mainly governed by the overall objective of implementing the ideas that had been developed earlier. The concrete goals during project implementation, such as the scope and the particular problems for investigation, as well as time-lines, were adjusted several times, in light of what had been learnt in the process. For example, when an unexpected metallurgical phenomenon was discovered, the project was refocused and time-lines were changed accordingly.

Another characteristic of this collaboration is that it was clear from the beginning that it could not be fully planned and specified in advance because of its exploratory nature. As the director of the Corrosion Centre explained,

Figure 4.7 Main events and issues throughout the Bodycote, TWI and FORCE collaboration development

Year: Semester:	2000		2001		2002		2003		2004	
	1	2	1	2	1	2	1	2	1	2
Bodycote and FORCE prepare the initial project proposal and start circulating it to the potential sponsors. TWI joins as a partner.										
Pre-launch meeting with the potential sponsors. After the discussions during the meeting, the proposal is reshaped.										
Final proposal and a contract are sent out to the potential sponsors.										
Communications with the potential sponsors persuading them to join.										
Enough sponsors joined. Project officially starts.										
The collaborator from TWI conducts the literature review.										
TWI is formally subcontracted by Bodycote and paid fees.										
Slow progress of the project.										
New corrosion engineer joins Bodycote.										
The literature review prepared by TWI is reviewed by Bodycote and FORCE.										
Bodycote prepares a prototype of the rig needed for testing.										
1 st meeting with sponsors and partners takes place at Bodycote. The results and the work plan for the next semester are presented, followed by discussion.										
Further work is carried out at Bodycote: the rig prototype doesn't work, unexpected phenomenon in the metallurgical area, corrosion tests put on hold until it is resolved.										
2 nd meeting with sponsors and partners takes place at NACE conference in US. The results are presented and discussed. The deadlines are extended.										
Further work is carried out at Bodycote: the metallurgical phenomenon is resolved, further corrosion tests resume.										

Figure 4.8 Generative forces shaping Bodycote, TWI and FORCE collaboration development

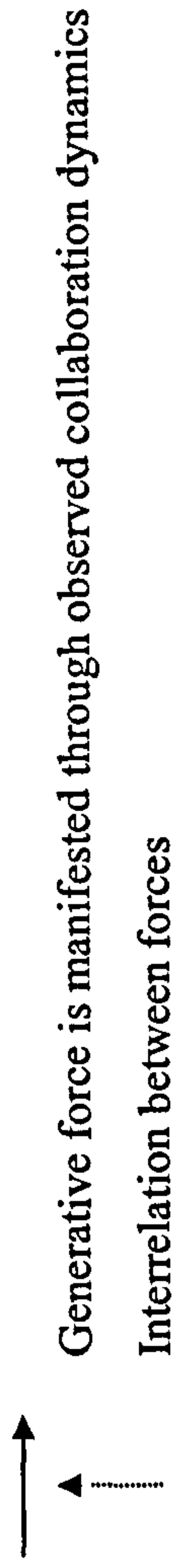
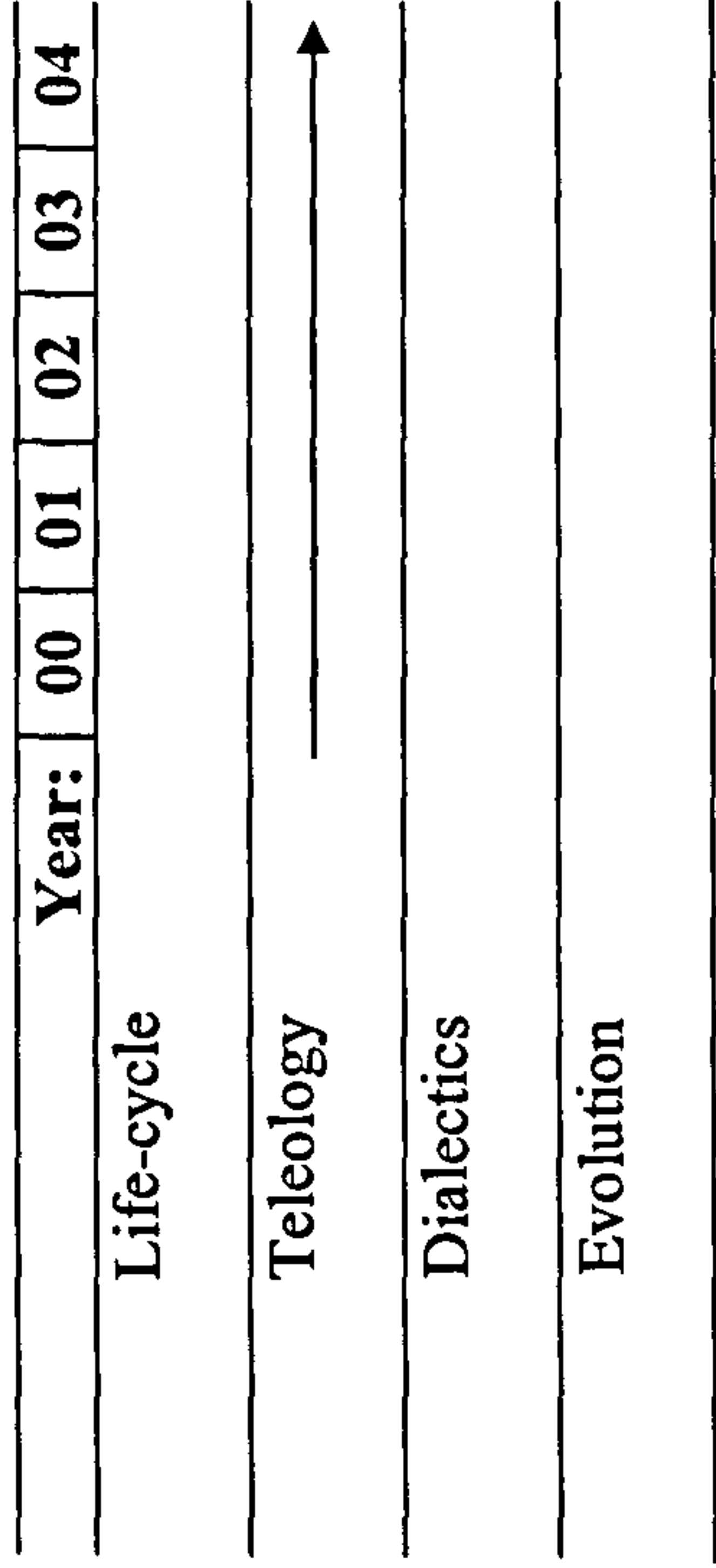
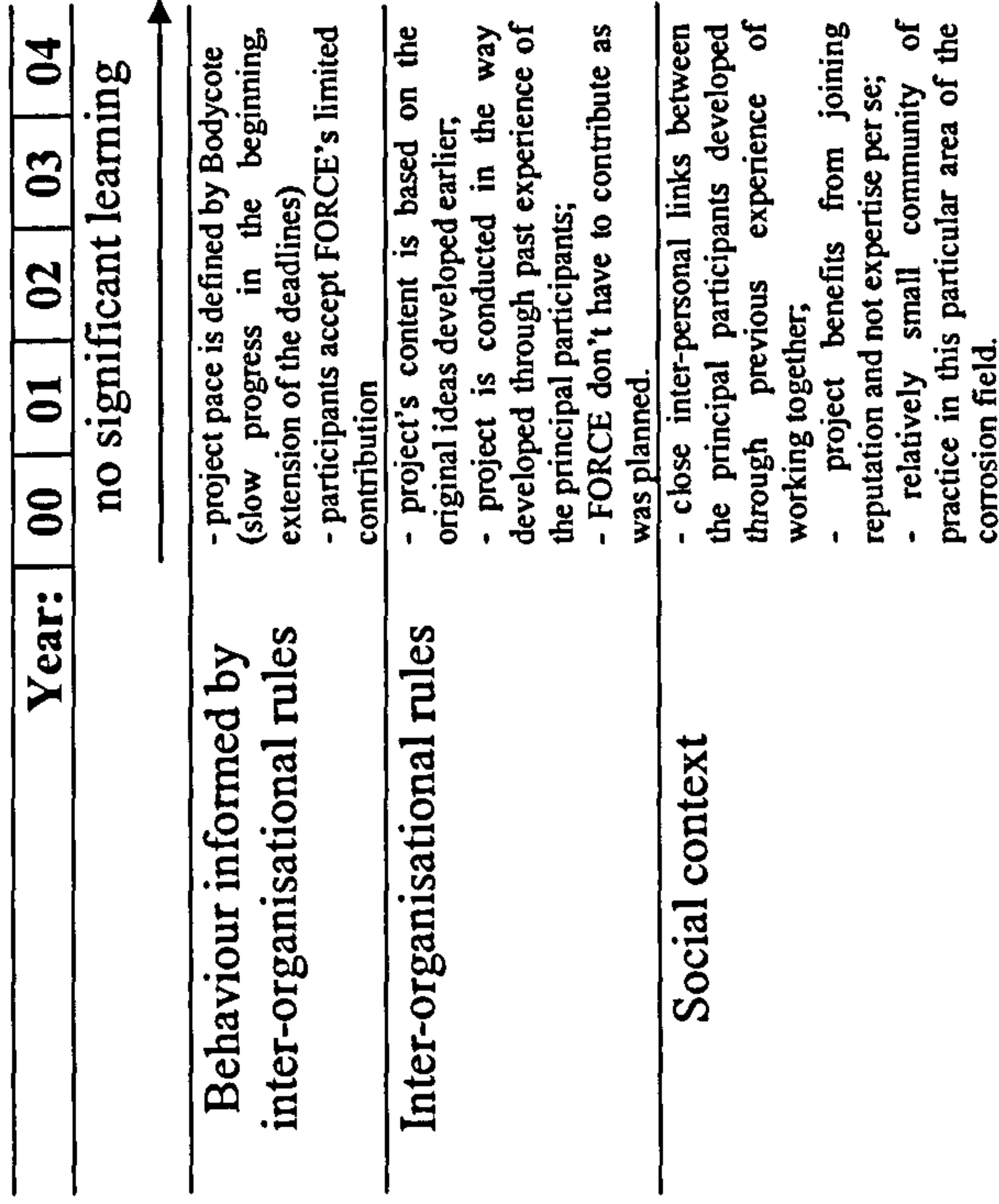


Figure 4.9 Inter-organisational learning through Bodycote, TWI and FORCE collaboration development



This is one of the projects where you set upon a path and you are not quite sure where you are going to end up, depending upon the results. Sometimes you turn left, sometimes you turn right, and sometimes you keep going. Research projects are like that. What you need is a group of sponsors who understand what is going to happen. And we are lucky in this sense. They do understand that we are doing a research project. We are not saying which of these materials is better, we are trying to develop a test method and there will be hiccups on the way. And the first one we had was that the rig design was useless. It was a big one.

Indeed, until the very latest stages of the project, there were no detailed schedules agreed, the goals were reformulated according to the new findings, and deadlines were repeatedly pushed back to accommodate the research process. Such observed developments in this inter-organisational collaboration indicate that the main force at the fore was the teleological, defining the unfolding pattern of the relationship. Ring and Van de Ven's (1994) teleological model of collaboration development predicts this kind of dynamics. Although unexpected developments, such as the failure of the first rig design and the unexplained metallurgical phenomenon, affected the collaboration to a significant extent, the managerial agency (principally of the director of the Corrosion Centre) also played an important role in driving the implementation of the project. It was due to his personal interest and initiative that the project was started initially and implemented. For instance, he secured the necessary resources (new corrosion engineer, sponsors from the previous projects he had conducted) and the support of the company (Bodycote Group) for the project.

Manifestation of the managerial agency as an important driving force for development in this case also indicates the prevalence of the teleological force during the period (Van de Ven and Poole, 1995).

This case presented a relatively simple pattern of development, compared to the previous cases of HRI – Becker Underwood and HRI – SeedCo, as only one generative force seems to have been responsible for producing the observed events. The particular nature of this collaboration implied that there were not many activities of an inter-organisational nature involved, because there was no real need for that. Furthermore, the project was conducted in the background of other activities at Bodycote. It was mentioned by the participants that the project was shelved when more urgent day-to-day activities demanded attention and resources. In this way, at least during the period covered by this research, the project was not affected either by events within the organisation or wider contexts. In addition, this collaboration demonstrated less complexity in its operation because it was driven mainly by personal interests and not by objectives set by the partners' organisations. This implied a more 'relaxed' approach. In Chapter 5, the particularities of each case will be explored further.

This section examined which of the underlying generative forces was able to come to the fore and shape the development of the collaboration. It also addressed the surrounding contexts providing the circumstances that enabled this force to become

manifest. The next section examines further the dynamics of this collaborative relationship by focusing on the inter-organisational learning processes involved.

4.4.5 Inter-organisational learning

This section addresses the question as to whether any inter-organisational learning took place in the collaboration development. It focuses on an examination of the inter-organisational rules governing collaboration and the patterns of organisational behaviour informed by them. It then examines how these rules emerged and whether they changed or prevailed over time. Figure 4.9 depicts the issues related to inter-organisational learning in the collaboration development.

Although three organisations were involved in the collaboration as partners and nine as sponsors, it was implicitly understood that Bodycote was the leading partner, and that the project was to be conducted in the way it was intended by its originators, the director of the Corrosion Centre at Bodycote and his colleague from FORCE, based on their previous experience of conducting projects of this kind. The director of the Corrosion Centre explained,

We put the schedule together, we put ideas together, we discuss them and the group will either agree or disagree. If they disagree, we will discuss it until we get an agreement. But we are leading the project, we had the idea, and they joined and said yes we liked it. So, all are already kind of

converging to the same point, otherwise we wouldn't have been running the project. So, decisions are made hopefully by discussion, but if necessary, votes can be taken. TWI are subcontractors, they are not strictly collaborators. That was done because we will make the final decisions. They will do as we want them to do.

Another implicit understanding concerned the degree of FORCE's involvement in the project. The director of the Corrosion Centre commented,

[The collaborator from FORCE] effectively has gone to sleep. Last time he said to me 'I am happy that the project is running, fine, carry on'. I don't think he really wants to do much. I had the ideas, he had the ideas, and this has to be done. It is being done, and he is sitting on the outside advising.

The fact that FORCE was not contributing to collaboration to the degree planned in the project proposal was not the cause of any problems. TWI did accept that, as did the members of the team at the Corrosion Centre at Bodycote. The principal corrosion engineer at Bodycote recalled,

The FORCE Institute didn't contribute much, if anything, during this period. It wasn't necessarily intended to be like this, but our contact at FORCE is thinking of retirement. He doesn't work as hard as he used to. He's got a very laid back attitude. He hasn't really done much and at this

minute, I am not sure how much he does intend to do. It is not really a problem.

The implicit understandings of, first, a certain established way the project was to be carried out and, second, the limited contribution from FORCE, were already in place when the collaboration started. The participants' behaviour was informed by these implicit rules, and there were no instances of these rules being contested during project implementation. The director of the Corrosion Centre at Bodycote explained why this did not result in any conflict,

I think it is because we know each other so well. I discussed it a little bit with [the collaborator from TWI], 'Don't expect an urgent response from [the collaborator from FORCE]. He only looks through his e-mails on Friday.' You have to accept this. We work together and we've known each other so long we know what sort of response you are going to get. I know for a fact if I ask [the collaborator from TWI] a question, I will have a detailed response back within an hour of him reading it. If he is in the office, he reads it and gets back to me straight away. If I send something to [the collaborator from FORCE], I will not get a response for a week. It is just we know each other very well; we've worked together for so long...

In this way, close inter-personal relationships, which could even be called friendships, between the principal participants implied an existing common framework that defined the content of the project and the way in which the project

should be conducted. The director of the Corrosion Centre at Bodycote repeatedly stated,

We've shared a few beers around the world together... We've got to trust each other otherwise we would not run the project. And it has got to be technically correct. I haven't considered it an issue.

Furthermore, the work was mainly carried out by one organisation, as there was no real necessity for joint knowledge development, which prevented any inter-organisational differences surfacing and the existing rules being contested.

Thus, the way in which the project was conceived and was being implemented meant that there was no learning of an inter-organisational nature during the initial four years. The rules that governed project implementation and informed the participants' behaviours were based on the experience of the principal participants of working with each other in previous years, and developed prior the commencement of the inter-organisational collaboration. The accumulation of prior collaborative relationships has been recognised as an important mechanism for creating social networks that serve as a source of information and opportunities and shape the formation of future collaborative relationships (Gulati, 1995; 1995). Prior relationships between the participants in this case shaped to a great extent the way this collaboration was formed and developed over time. This previous experience

meant that there was previously created coupling between the participants' behaviours, making inter-organisational interactions more predictable and stable. This indicates that no significant inter-organisational learning took place during actual collaborative relationship (Holmqvist, 1999; 2003a; 2003b).

4.5 ANALYTICSCO AND BIOTECHCO

This collaboration involves two service providers to the pharmaceutical industry. One is a US based company, and the other is a French company, called here AnalyticsCo and BiotechCo, respectively. The collaboration, started in 2000, concerns the developing and providing of joint services in the area of analytical chemistry, and represents the combining of the complementary fields of expertise in which each partner operates. The collaboration also involves sales of the equipment produced by the US partner by BiotechCo. The collaboration is mainly motivated by AnalyticsCo's intent to expand their European presence. The interactions between the partners with regard to equipment sales take place directly between BiotechCo and AnalyticsCo's US headquarters, while collaboration on joint service provision is between the AnalyticsCo's UK division and the French partner.

4.5.1 Pharmaceuticals - industry background

Pharmaceutical companies have recently undertaken extensive mergers and acquisitions activity. Consolidation in the pharmaceutical industry has occurred in two historical waves of activity. The third wave has just begun with a number of different high profile mergers (Reuters, 2001), a general downward trend in the levels of profitability within the industry having been identified as the catalyst for this third wave. The reasons for this trend include such factors as the aging of the overall industry product profile (the result of a combination of the increasing cost of

developing a new drug and declining exclusivity horizons for patented products) and recent competition from generics entering the market place when products lose exclusivity protection (DiMasi, 2001). As a result, in order to be able to continue to generate return on capital employed, the pharmaceutical industry has turned to outsourcing in such areas as R&D, sales, and marketing, activities traditionally considered as core competencies of the pharmaceutical companies. The business development manager at AnalyticsCo UK outlined the impact of these developments in the pharmaceutical industry for the service providers,

In the pharmaceutical industry, timelines have shortened. They have to deliver new drugs to the market quickly. A few years ago, they had 10 years on patented drugs and they could get millions of dollars on that. Now they get only one or two years of patent life, so they have to make a lot of money very quickly. We provide a service regarding analytical chemistry and we have to make sure that we meet their needs. Their time lines are shortening, so our time lines have shortened as well. We work in clinical trials, and, therefore, there is a defined time that a clinical trial can take. A clinical trial takes as long as it takes. So, we are under extreme pressure to analyse samples very quickly.

AnalyticsCo's CEO outlined more generally, how the situation has been changing in the sector,

In general, in our business space, the arrogant vertically integrated "egosystem" of the past is replaced by an "ecosystem" of cooperative companies, consultants, universities working for a common purpose.

4.5.2 Partner organisations' background

AnalyticsCo

The company began as an outgrowth of academic research at one of the US universities, and was incorporated in 1975. Since then, it has experienced growth primarily through internal expansion, supplemented by strategic acquisitions. Consistently over the years, starting in the late 80s, AnalyticsCo acquired a number of companies in the US and the UK. By 2003, it employed around 350 people across five laboratory sites, and had an annual turnover of approximately US\$25m. The laboratory in the UK, involved in the collaboration with BiotechCo, employs around 50 staff. In 2003, AnalyticsCo was ranked by Fortune Small Business as one of the US's top 100 fastest-growing small companies.

The company supports the pharmaceutical industry by focusing on development services for biomedical research. It operates in two principal segments: analytical services and analytical products, which contribute approximately 60% and 40% respectively to the company's total revenue. The analytical products are sold primarily to pharmaceutical companies, universities, and medical research institutions. Around a quarter of revenue is derived from customers located outside the US. Due to the recent developments in the global pharmaceutical industry,

presence in the European markets has been becoming increasingly important for service providers such as AnalyticsCo. As their CEO stressed,

The planet is very small. The pharmaceutical industry makes EU important due to all the North Atlantic combinations of pharmas via mergers... GSK, Pfizer, Merck, AstraZeneca, etc etc. These are global. We serve them globally.

BiotechCo

BiotechCo is a small, privately owned business in France, founded by two scientists and employing around 30 staff. It provides research and development services in a number of areas to the pharmaceutical industry across the EU. These areas are mostly complementary to those of AnalyticsCo UK. The company also has good links with clinics in France. For the past few years, the owners of the company have been looking to sell in order to retire. In this way, the alliance has the outlook of a possible future acquisition of BiotechCo by AnalyticsCo.

4.5.3 Collaborative relationship

The following narrative examines how the collaboration has developed over the last four years. It is structured in two sections: Collaboration formation and Collaboration development. The main events and issues are synthesised in the form of a matrix presented in Figure 4.10.

Collaboration formation

In 2000, AnalyticsCo sought to acquire a company in continental Europe. The search for suitable candidates was conducted through agencies such as 'Invest in France' or 'Invest in Switzerland'. Based on the information provided by 'Invest in France', the business development manager at AnalyticsCo UK generated a list of companies interested in being taken over and suitable for a possible acquisition in terms of size, areas of activities and ownership. BiotechCo were the first company on the list. After an initial visit to BiotechCo, it was decided that they might be a suitable candidate, because they were small, privately owned, well connected on the continent, and had demonstrated interest in being taken over. In addition, BiotechCo provided a good range of services in the areas mostly complementary to AnalyticsCo. In view of their interest in this candidate for acquisition, AnalyticsCo did not approach any of the other companies on the list.

Despite the initial intention to acquire, the relationship developed in the direction of an alliance. Having made a small number of acquisitions in the US, AnalyticsCo temporarily shelved plans for acquisition in Europe. The business development manager at AnalyticsCo UK outlined the company's approach to acquisitions,

It depends. You have to go and talk to people at the site. If you like what you see and you think they have got a lot of business, then you can just go and acquire them. We would have done this with the French company but, as I said, the money wasn't available. We would buy. To form a partnership at the beginning is useful, because you hope to build a relationship where

we get work from them in analytical chemistry and they sell pieces of equipment.

Although AnalyticsCo were unable to proceed with the acquisition, they decided to establish an alliance-type relationship with BiotechCo. The business development manager explained the potential of this collaboration for AnalyticsCo's operations in Europe,

Another side of my job is to look for partners in terms of providing complementary services to what we do, because we are so specialised to the niche of analytical chemistry. There is so much more to the pharmaceutical industry: manufacturing, discovery, etc. We don't do any of that and it is useful to have partners to complement those services. When I am visiting clients, what you can do is say 'We can do this part, but if you are interested, we have partners, true alliances, and they can do these parts, so together we can offer you a better service.' Many of our competitors are really large companies which offer what you call a 'one stop shop'. They are not very efficient in doing that, but they get a lot of business because people like to place the whole project with one company.

A year after BiotechCo's directors visited AnalyticsCo's US headquarters, a formal collaborative agreement was established between the two companies. The agreement specified the partnership mainly in terms of equipment sales; nevertheless, there were certain expectations regarding generation of joint analytical projects. The expectations were that the partners would develop joint services, combining their

areas of expertise for the customers in continental Europe, where the French partner operated.

The pattern of this collaboration formation is similar to the first two cases, HRI – Becker Underwood and HRI – SeedCo, in the sense that it involved a systematic search for partners and a period of ‘courtship’ (D'Aunno and Zuckerman, 1987; Kogut, 1988).

Collaboration development

The first year after the establishment of formal collaboration consisted of the installation and setting up of the equipment provided by AnalyticsCo at BiotechCo to start demonstrations and sales to customers in the EU. By the beginning of 2002, sales had started, as had joint analytical projects.

During 2002, AnalyticsCo participated in three joint analytical projects with BiotechCo. However, the projects brought by BiotechCo to AnalyticsCo failed to live up to the AnalyticsCo's expectations of joint business. It appeared that BiotechCo were reluctant to rely on their new partner and to allow them immediately to participate in large projects for their customers. The business development manager at AnalyticsCo explained,

Ordinarily, we would deal with the client directly. But they subcontracted to us the analytical part. They have clients that come to them. We never spoke to their clients directly. We completed three projects. Each project was two

to four months. They weren't the best projects. Whether they gave us projects that they didn't like, I am not sure. From our side, those were very small projects. These things happen I am afraid. I would prefer that they had contracted a big study to us.

Although the projects were relatively small, providing joint services was not as straightforward as it might have seemed initially. As the laboratory technician at AnalyticsCo who worked on one of the projects explained,

The full project involved several sites. [AnalyticsCo] did only one part of it. Then the results were recombined by the French partner for the end client. Different compounds were analysed by different companies and then put together. We had problems with the report formats. The reports were sent back and forward several times until [AnalyticsCo] got it right.

The business development manager at AnalyticsCo explained further the difficulties of coordinating joint projects,

One of the most challenging parts of such collaboration is learning the report format. It can sound quite trivial, but... The client at the other end wanted a particular format and this wasn't passed on to us in good time. When we wrote the report in our own format, we found out it was wrong, so we had to go back and redo it. It creates problems.

While the first two projects presented problems with the report formats, the last project did not go well in terms of delivering analytical results. The laboratory technician involved in the third project recalled,

The method that [AnalyticsCo] had didn't fit very well the samples. The compound was not stable. The parts were not completed because of the nature of the analysis. The chemistry was difficult, which was unexpected. We hit the deadline.

To resolve the situation, AnalyticsCo attempted to extend the deadlines and asked for additional payment to continue work. However, this was not acceptable to the French partner. The business development manager at AnalyticsCo highlighted the differences in the way his company usually dealt with the customers and BiotechCo's approach,

At the end of the study, they just finalised it and sent it off to the client. To complete the project, we would need more money because time is money, we charge on a daily rate. Therefore if it takes longer, we need more money. But our French partner's view was that if the initial price is the buying price, you can't go back to the client to ask for more money. If the project takes longer, if it is challenging, then you have to get more money from the client. They didn't think so. They said no on that particular project.

Besides the reporting, the management aspects were different for this client from what we were used to. So, we had to learn that and I guess we didn't do it very well.

In this way, AnalyticsCo did not get the opportunity to complete the work. After this incident, the relationship between AnalyticsCo UK and BiotechCo broke down in that AnalyticsCo neither received accurate information about the outcomes of the project, nor feedback from the client. Moreover, AnalyticsCo stopped receiving joint projects from the French partner. The business development manager recalled the uncertainty of the situation at the time,

Because we didn't meet the timelines, they allegedly lost one of the clients. It is always third party information. Because I never talk to the client, I never actually know what the client was thinking. It is bit of a strange kind of relationship, but...

Communications also broke down for a while. The partners never actually discussed the experience. The same manager recalled,

This particular one hasn't been resolved. I guess it went cold for a few months. There was little communication, sort of sulking in a corner, I guess. In a business relationship, if the business doesn't work out, in the worst case, it could break the relationship. Maybe it is just that we behave like children... But the best thing is just cool off, not communicate. Let people just to get over it. That is all you can do.

The relationship went 'static' for almost a year, with no joint projects undertaken and limited interactions between the partners. The business development manager at AnalyticsCo commented on the progress or more precisely, the lack of progress, of the collaboration during the period,

We haven't had another analytical chemistry project. And those are what we need. That is where we earn our money from. We need to establish the relationship again, so they trust us. Right now, I guess, they don't trust us. Sadly, it has been too static. They have sold quite a lot of pieces of equipment but, again, in the great scheme of things, it is not very many. And we certainly didn't make further moves to acquire them; they are still a partner.

By the end of 2003, the relationship had started to improve. AnalyticsCo organised a meeting to promote collaboration, in which a number of their partners participated, including BiotechCo. The meeting involved around twelve companies. AnalyticsCo had loose, unformalised collaborations with the majority of those companies and full alliances, as in the case of BiotechCo, with a small number of them (separate unrelated partnerships with three companies at the time). The meeting presented an opportunity to 'get face-to-face' with the directors from BiotechCo. The business development manager at AnalyticsCo commented about the impact of the meeting on this particular collaboration,

It has gone a lot better recently, because we had a meeting earlier this year with a number of partners. It sort of accelerated and renewed the partnership.

As a result, by the beginning of 2004, AnalyticsCo UK had restored their interactions with the French partner. BiotechCo commissioned some small pieces of work to AnalyticsCo such as report translating from French to English for some of their clients. Nevertheless, there were still no joint analytical projects. Throughout the period from 2002 to 2004, BiotechCo continued selling equipment for their US partner. AnalyticsCo made no further moves to acquire BiotechCo. AnalyticsCo's CEO described them as a definite candidate for acquisition, but stated that there were no concrete plans regarding acquisition at that time.

4.5.4 Developmental pattern

After outlining the overall development of the collaboration between AnalyticsCo and BiotechCo in the previous section, the present section focuses more closely on examining the developmental pattern of this inter-organisational relationship. It employs the templates proposed by Van de Ven and Poole (1995): life-cycle, teleology, dialectics, and co-evolution. Figure 4.11 schematically represents the operation of the generative mechanisms as manifested in the observed collaboration dynamics, timing and interrelation between them. The narrative, in contrast, focuses on the contexts surrounding collaboration development, examining the mediating contingencies that brought the operation of generative forces to the fore.

During the five years of collaboration, two distinct stages of development could be identified: the formation and pre-acquisition periods. Although acquisition was the initial intent, the development of this collaboration indicated that it would be an undetermined period of time before AnalyticsCo acquired BiotechCo. The main reason for AnalyticsCo's not acquiring BiotechCo immediately, and for the relationship between the two companies being established as an alliance, was a series of acquisitions by AnalyticsCo in the US during the period under discussion. This diverted financial resources from the possible acquisition of the French company, allowing the relationship to develop as an alliance. This development is consistent with Koza and Lewin's (1998) propositions regarding a co-evolutionary approach to alliances. These authors postulated that inter-organisational collaborations were embedded in a firm's strategic portfolio and would co-evolve with the firm's overall strategy. The examination of AnalyticsCo's Annual Reports for the preceding six years showed that strategic acquisitions constituted an important element of the overall growth strategy of the company. Furthermore, AnalyticsCo's CEO highlighted the opportunistic nature of this activity while outlining the acquisition strategy of the company,

Figure 4.10 Main events and issues in AnalyticsCo – BiotechCo collaboration development

	Year:		2000		2001		2002		2003		2004	
	Semester:		1	2	1	2	1	2	1	2	1	2
AnalyticsCo screen for potential acquisitions in EU												
Series of acquisitions by AnalyticsCo in US												
AnalyticsCo visit BiotechCo in France (as they are the first on the list of the companies suitable for acquisition)												
BiotechCo visit AnalyticsCo US Head Quarters												
Collaboration agreement established												
Equipment installation and set up at BiotechCo												
Sales and joint analytical projects start												
3 joint analytical projects are undertaken; difficulties in integrating activities												
AnalyticsCo do not deliver the third joint project as expected; BiotechCo are not satisfied; communications break down; relationship deteriorates												
Collaboration goes 'static': no further joint projects, limited communication												
General meeting among AnalyticsCo's partners, including BiotechCo, takes place; opportunity for face-to-face interaction between the two organisations												
Communications are restored; small joint projects (AnalyticsCo undertakes reports' translation for BiotechCo, still no joint analytical projects)												

Figure 4.11 Generative forces shaping AnalyticsCo – BiotechCo collaboration development

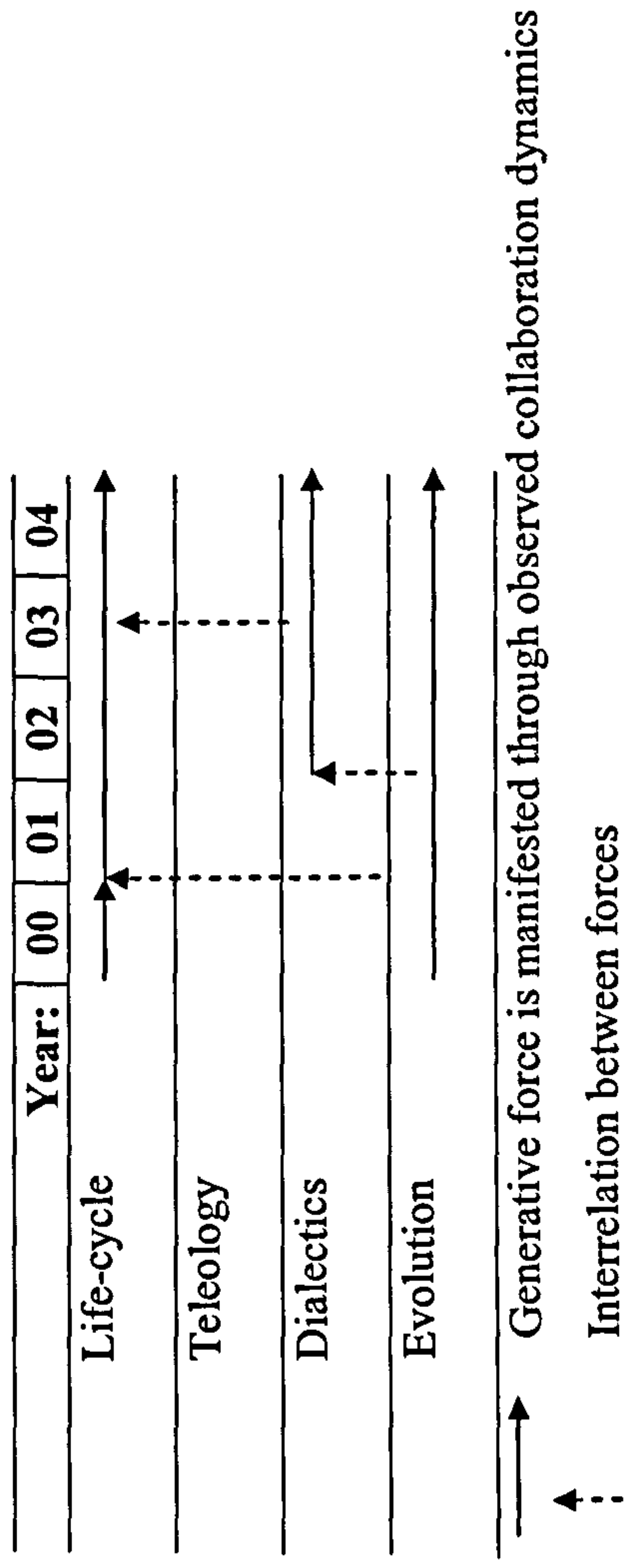
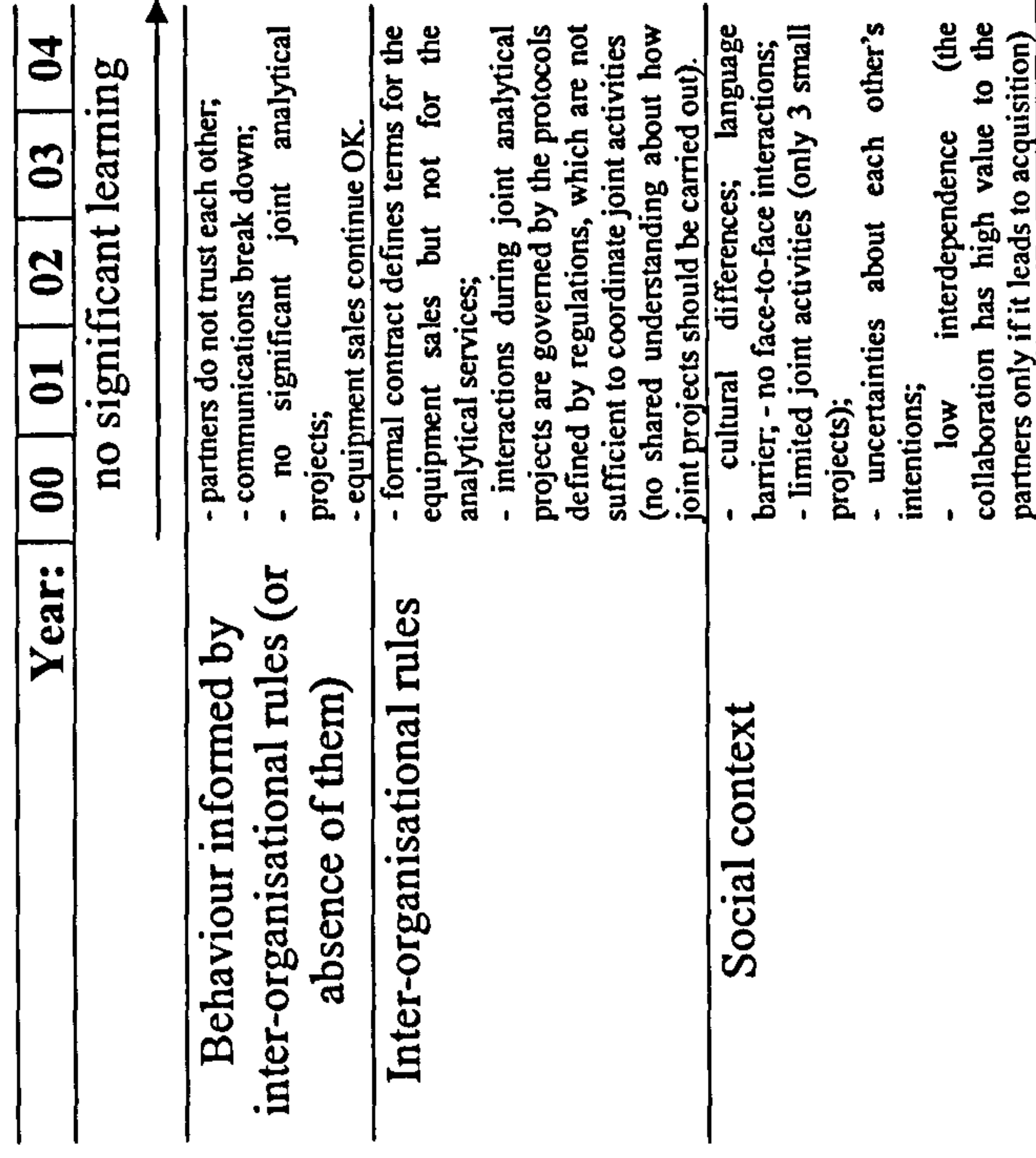


Figure 4.12 Inter-organisational learning along AnalyticsCo – BiotechCo collaboration development



We make acquisitions for a defined purpose: to gain a position in an area of technology we are interested in, or to gain a foothold in a new geographic area where there is good access to clients and potential customers of our products. Opportunities can come up for us when (1) a private company gets sick financially, (2) a company falls behind in technology and can't see a way to catch up without being bought or merged into something larger. A couple of the companies we acquired were very sick financially and we've had the challenge of fixing them... that's ongoing today even.

In this way, the acquisition opportunities elsewhere at the time prevented the acquisition of BiotechCo immediately after the formation stage, and resulted in the prolonged period of pre-acquisition relationship. This development is indicated by a vertical dotted arrow connecting the evolutionary and life-cycle forces in Figure 4.11.

The circumstances introduced by AnalyticsCo's recent acquisition activity implied a high level of uncertainty with respect to the course of the collaboration. On the one hand, BiotechCo's main interests were in being acquired by AnalyticsCo. On the other hand, AnalyticsCo did not present any concrete propositions besides their general intention to take over the partner company at some indefinite point in time. As the business development manager at AnalyticsCo UK commented,

They certainly can find another buyer. I'm sure they are talking to other people. You know, in their situation I would be too. You never stick only with one option; you always have multiple options. Their goal is to be acquired. They get their money; they can retire. This is their aim in all this. Now we don't have the money to purchase them. I have no idea what their feelings are about being purchased by [AnalyticsCo]. They may even be talking with other companies. But, again, we wouldn't get to know about that. It is a part of the business world.

The uncertain outlook for the future in this relationship also meant uncertainty felt by the partners with regard to each other's intentions. Joint analytical projects were expected to be an important part of collaboration; however, AnalyticsCo were uncertain as to why BiotechCo did not provide them with appropriate projects. Was it because there were no opportunities arising, or was BiotechCo simply not interested in letting the partner participate in the significant projects? From BiotechCo's point of view, AnalyticsCo's intentions about the final outcome of the partnership were also not clear, which was not desirable, in view of BiotechCo's desire to sell. As the business development manager at AnalyticsCo UK confirmed,

There are plenty of possible circumstances why we may end up not acquiring them. The immediate one would be someone else coming and buying them in the meantime. Or they stop selling [our equipment], or relationships break down again...

Uncertainty of this nature resulted in the lack of transparency between the partners. For example, as described in the previous section, AnalyticsCo never learned of the outcome of the third joint project that went wrong. In this way, the co-evolution with the AnalyticsCo's acquisition activities resulted in a set of circumstances characterised by high levels of uncertainty and little transparency between the partners with regard to each other's intentions. This established a context in which dialectical forces were able to come to the fore. This development is indicated in Figure 4.11 by the dotted vertical arrow that represents the interrelation between the evolutionary and dialectical forces. This kind of interrelation between evolutionary and dialectical forces observed during this collaborative relationship is similar to the dynamics found in the first two cases, HRI – Becker Underwood and HRI – SeedCo, in which, evolutionary dynamics also prompted the dialectical forces to come to the fore of developments, manifesting in inter-partner conflicts.

Consequently, besides the co-evolutionary forces, the last two years of collaboration, captured in this case study, were also shaped by forces of a dialectical nature. When the partners finally started to work together on the joint projects, a number of conflicts emerged. For instance, the partners obviously had divergent interests in the area of analytical projects, more specifically concerning the number and kind of analytical projects they should be undertaking jointly. While AnalyticsCo expected large and more frequent joint projects, BiotechCo seemed reluctant to bring any analytical work to their partner. Furthermore, the partners had different approaches with regard to dealings with the end customer. While AnalyticsCo would ask for the

extension of the deadlines and extra funding for additional work, in the case study, the chemistry between the two partners turned out to be more complicated than expected, for BiotechCo considered these points non-negotiable.

Conflicts of this nature resulted in the crisis manifested in a whole year of 'static' relationship and virtually no inter-partner communications. This pattern of development is consistent with the view taken by de Rond and Bouchikhi (2004) in their assessment of the dialectical forces in the biotechnology alliances they studied. These authors outlined a variety of potential sources of dialectical tension in inter-organisational relationships, such as trust versus vigilance, and control versus autonomy. Tensions in terms of trust versus vigilance were definitely present in this collaboration. Besides that, the dialectical tensions that emerged in this case can also be expressed in terms of convergence versus divergence of interests, and alignment versus misalignment of working practices.

This kind development, in which tensions of a dialectical nature affect the course of collaboration, constraining the realisation of joint projects, is somewhat similar to those observed in the latter stages of the HRI – Becker Underwood collaboration. In that case, the differences between the partners dominated the relationship and significantly delayed the development of the new product. These cross-case dynamics will be explored further in the Chapter 5, Section 5.2.1.

This section examined which of the underlying generative forces were able to come to the fore and shape the development of collaboration. It also addressed the surrounding contexts providing the circumstances that enabled these forces to manifest themselves, and examined the interaction between these forces. The next section examines further the dynamics of this collaborative relationship by focusing on the inter-organisational learning processes involved.

4.5.5 Inter-organisational learning

This section begins to examine inter-organisational learning processes in collaboration development. The following narrative focuses on four main issues concerning inter-organisational learning (as discussed in Section 2.5.3 of Chapter 2): the nature of the accepted inter-organisational rules governing collaboration and what the consequent patterns of organisational behaviour within the relationship are; how these rules emerged; how this process was shaped by social forces; and, once established, whether these rules and behaviours changed or prevailed over time. Figure 4.12 schematically represents the inter-organisational learning processes in the collaboration development.

The existing inter-organisational rules governing this collaboration were partly defined by the formal contract of the relationship, and partly by regulations in the pharmaceutical industry. While the contract specified terms and conditions with regard to equipment sale, it did not address the area of analytical projects. The way

in which the joint analytical projects should be coordinated was governed by the protocols defined by the industry regulations. As the technician at AnalyticsCo UK, involved in the joint projects with BiotechCo, explained,

They [BiotechCo] would receive analytical details from the client and then pass to us. There would be a clinical protocol that would have to be passed to us. The regulations govern that. In return, once we validated the method, we would send back to them [BiotechCo] the details of our validated method and all the steps to analyse the sample.

The rules defined in the contract were sufficient to ensure straightforward interactions between the partners regarding equipment sale. As the business development manager at AnalyticsCo UK commented,

They [BiotechCo] can sell this equipment and they don't need us at all.
They invite people in; they sell it. It is as simple as that.

Nevertheless the protocols defined by the regulations were not sufficient to govern joint analytical projects. The nature of the services provided by the partners to the pharmaceutical industry implied difficulties in coordinating testing activities. The business development manager at AnalyticsCo UK explained,

Because we are in the service industry, we often don't find out what the results mean to the client. It is all intellectual property. They do the tests and we analyse the samples. The pharmaceutical companies rarely involve us in the whole project.

In this way, the two organisations would have to learn how to coordinate their sequential testing activities, the execution of which was assigned to each one, depending on their areas of specialisation. Because of the partial information service providers receive from the end customer, inefficiencies in the swapping of the testing activity may occur. In this collaboration, as the partners did not know how the other operated, they would need to establish models of communication and interaction to ensure that joint projects ran smoothly, or, in other words, inter-organisational rules to inform one another of the way this part of the collaborative activity had to be developed. The business development manager at AnalyticsCo UK outlined this need,

In every single project, it is always down to communication in some form or another. Either they haven't communicated time lines adequately (partner companies do that all the time), or they haven't given you enough details of the project. They guess how much information we need. We need all the information, not just pieces of it.

The three joint projects, even though they were small, presented an opportunity for the partners to develop a template for joint service provision, and to learn how to

operate together. However, from the inception of the joint analytical projects, there was no inter-organisational learning of this kind. Each time differences arose (e.g. the approach used with regard to the end customer), these differences continued unresolved. Even after the unsuccessful third joint project, the partners were not able to address the problems. The business development manager at AnalyticsCo UK described the attempts to reconcile the differences,

We tried to approach the problem with dialogue, generally by e-mail because over the 'phone we talk in English and they are trying to translate that. So, you get a communication problem. If we were sitting at the table, it would have been easier because you can see facial expressions. E-mail wasn't working, apparently.

They sent e-mails to us, supposedly, which we never received. With our Internet provider, you get a message back... If an e-mail comes back for some reason, you should get a message. But of course, that message would come back in English. They can't interpret that message correctly, they can't translate it, and they will not understand it correctly. I get messages from them in French saying 'Your e-mail has been received' that will come back in French to me. I would know what it says. So, it is simple things like this, maybe e-mail had been blocked for some reason... So, e-mails failed to arrive.

Cultural differences and the language barrier made the communication process extremely difficult. The same manager stressed,

It comes down to language and cultural differences. It seems small, but it is a big issue. If you want to be able to communicate, if you have a problem, you want to communicate in a language they can understand. If things are going well, who cares? But if things are going badly, you want to be able to communicate.

We are more trustful between ourselves in the UK than between us and the French. It may be differences in cultures. I don't like to act as the middleman. If a client comes and wants me to do a piece of work that I can't do but my partner can do, I will send them to talk to the client. Our UK partner would do the same. Our French partner wishes to maintain us as a middleman. So, the client interfaces with them and they interface with me. It actually doesn't work. It may be cultural. What happens is that clients may not want to talk to us directly. A lot of the clients they bring in speak French and you find that you don't speak the language they are comfortable with. If there is a problem, they just want to call and shout in their own language.

It seemed that without face-to-face communications, it was almost impossible to resolve difficulties. The manager at AnalyticsCo UK continued,

You can phone these people up, and they can phone us up, and you can have a conversation, but you are never really sure that the person on the other end of the 'phone has understood. And certainly he would have spoken to me in

French... They can understand English much better than I can understand French, so... In terms of business relationships, it is a big problem.

The communication problems contributed further to the lack of transparency between the partners, creating a context in which any inter-organisational learning appeared to be difficult. The business development manager at AnalyticsCo UK described the lack of clarity between the partners,

You know when something is going wrong and you need a lot of communication. We have no communication. I had no communication with the scientific director. You know that something has gone wrong. There is no friendly e-mail, so you just know that something is going wrong.

Inter-partner differences, including those concerning their national cultures and contexts, have been depicted in the literature as having an important impact on learning in inter-organisational collaborations (Parkhe, 1991; Barkema, et al., 1997; Lane and Lubatkin, 1998). Parkhe (1991), for instance, indicated that, in the alliances with greater inter-partner differences, the partners might be expected to undergo more learning in order for the relationship to progress. However, in the case of AnalyticsCo and BiotechCo, the overall social context in which the alliance unfolded implied limitations for possible inter-organisational learning. The uncertainties related to the future outlook of the collaboration, and the lack of transparency regarding the intentions of each partner meant that there was a low

degree of interdependency between them. The relationship between the two companies was 'loose' to a certain extent, as it would be of high value to both only if acquisition occurred. BiotechCo could find another company interested in acquiring them, as could AnalyticsCo. The business development manager at AnalyticsCo UK commented,

I can find another company who would be interested in being acquired. We can start again. This one is going on for three years, if we don't acquire the company, it is a waste of three years.

Despite a difficult relationship, AnalyticsCo were eager to continue the alliance. However, both partners seemed reluctant to make significant investments in the relationship in terms of effort put into resolving communication problems and working out their differences. This prevented them from developing common understandings and norms of reciprocal relationship needed to govern and coordinate inter-partner interactions, the process highlighted in the literature as crucial for collaboration to progress (Ring and Van de Ven, 1994; Arino and de la Torre, 1998; Buchel, 2000). Ultimately, the partners failed to develop the capability of joint service provision.

4.6 SOFTWARECO AND MACHINECO

This collaboration, started in 1995, involves a small UK based software company and a large Japanese machine manufacturer, called here SoftwareCo and MachineCo, respectively. SoftwareCo supplies CAM (Computer Aided Manufacturing) software systems for controlling the industrial machinery manufactured by MachineCo. Although the contractual agreement between the two companies is a license selling agreement (MachineCo buys a license from SoftwareCo for each copy of the software they sell with the machines to the end customers), the relationship is a collaboration. The development of the software is closely interlinked with the product development (machine tools) at MachineCo, with the Japanese partner having a major input in the specification and design of the software.

The CAM software is a programme that controls machines. Its main purpose is to provide a capability to reprogramme a machine offline, so it can perform a different operation, and simulate the operation of a new programme on the computer before actually inputting it to a machine. This reduces dramatically the idle time of a machine, reducing costs to the end customer who uses the machine tools. This particular software is specifically developed and sold only to the Japanese machine manufacturer, although it is based on SoftwareCo's core technology. The Managing Director (MD) at SoftwareCo explained,

The product for the Japanese company is based on our general software. You have to use the core technology from our own products, but there are special applications written around it. So, it is presented as a different product. And it has technology in it specific to their own machine tools that is not sold to other people. It is only sold to them. The product design is very much under their control.

4.6.1 Machine manufacturing - industry background

In the last few years, the world of manufacturing has taken a large fall, a drop of around 30-40% in the number of machine tools being purchased worldwide, the main reasons for this being the slow down in the Japanese economy for a number of years, as well as the recent slow down in the US economy. In view of this, one way for the manufacturing companies to gain more sales, particularly very technically advanced companies, is by innovating their products, introducing new technology and new functionality, which would make their machines more attractive for customers than standard machines. By adopting this approach, large machine manufacturers are able also to withstand competition from places such as Korea and Taiwan, which produce standard machines more cheaply. In this way, the current strategy adopted by large Japanese manufacturers is to develop high value machines with complex components that increase production or manufacture a wider variety of products on one machine tool.

4.6.2 Partner organisations' background

SoftwareCo

SoftwareCo is a small UK based company that employs around 30 people and has an annual turnover of approximately £2m. The company was founded 20 years ago. One of the original founders is still working as a technical director. The company has very low staff turnover, with most of the employees having been with the company for significant periods of time. The majority of the company's staff consists of computer programmers and engineers.

SoftwareCo's main business is the development and sales of CAM software. They are one of a very small number, 4-5, of CAM companies in the UK. Most of the company's business comes from large machine manufactures around the world. 80% of the revenue is generated from markets abroad. The company's products are used worldwide in over 60 countries, and are sold through a network of machine tool manufacturers and distribution partners.

MachineCo

MachineCo, founded in Japan in the 1920s, is one of the world's largest machine manufacturers, which produces a wide range of machine tools used across many industries. It employs over 4000 employees worldwide. The company has manufacturing facilities in Japan, the US, the UK, and Singapore, allowing the machines to be produced close to the markets. The UK factory was completed in the

late 80s. It has over 400 employees and an annual turnover of around £165m. 85% of the UK based production is exported to mainland Europe.

In the company's publicly available reports and web-based information, MachineCo emphasise their capacity to produce innovative, high performance machines that can provide their customers with tangible, value-added benefits through advancements in machine tool technology, such as the use of CAM software programmes for engineering development.

4.6.3 Collaborative relationship

The following narrative examines how the relationship between SoftwareCo and MachineCo has developed over the last eight years. The main events and issues are synthesised in the form of a matrix presented in Figure 4.13.

At the end of 1995, MachineCo approached SoftwareCo and a number of other UK based CAM companies, looking for a possible software provider. MachineCo's UK operations' location is very close to SoftwareCo's base. The contact between the two companies started with SoftwareCo's Technical Director and the MD. The initial discussions were very successful, and an agreement for software development was drawn up shortly after that. As the MD at SoftwareCo recalled,

They approached not just us, but our competitors as well, looking to see who could do the job. There was a good feeling between the two companies.

It is quite important to have a good feeling just generally.

The way in which this collaboration was formed is similar to the Bodycote, TWI and FORCE case. The choice of partners relied more on informal relationships, personal feelings, and accidental proximity of the locations from which the partner organisations operated in the UK than on a systematic search and evaluation of the available options. The role of such factors in inter-organisational relations formation was addressed previously in the literature (Kreiner and Schultz, 1993; de Rond and Bouchikhi, 2004). The initial scope of the agreement was to develop software for a specific type of machine, milling machines for cutting materials, the type of machines being manufactured by MachineCo at the time. The development of the software took 2-2.5 years before it was first sold with the machines to the end customers.

The design and development of the software involved quite close interaction between the two companies, not only during the initial two years, but throughout the duration of this inter-organisational relationship. SoftwareCo have a dedicated project team for this project, initially consisting of two people, with two more joining later. The project is mainly controlled from Japan, but the UK division is also involved. There are a number of engineers allocated specifically to this project. The project team at SoftwareCo has regular weekly meetings with the engineers from MachineCo's UK division. There is also a regular exchange of personnel

between Japanese headquarters and SoftwareCo. MachineCo's engineers come from Japan several times a year to spend two-three months in the UK. The Technical Director and the project manager at SoftwareCo also go to Japan several times a year for a number of weeks. These visits usually intensify towards the end of the major milestones or beginning of the new developments. In addition to that, there are annual review meetings held in Japan involving the very senior management at MachineCo overseeing the project. The project manager at SoftwareCo outlined,

Generally we discuss most of it face to face directly in Japan. We communicate mainly by e-mail with Japan (telephone is not appropriate because of the time difference) but we have personal contact regularly, either us going there or them coming to us. For the decisions for large-scale things, like where the project is going for the next few months, we discuss it face to face in Japan.

After the initial two years of the agreement, MachineCo started to introduce a new generation of controls into the machines they manufactured. The MD at SoftwareCo commented,

Because of this recession in manufacturing, big companies are changing their focus from high numbers of machine tools to smaller number of machine tools but with more flexibility. The multi-axis laser machines, for example, are becoming very popular but they are very complex, because they have to be able to cut in a lot of different ways. To do this, they need

the software to be able to make programmes. So, the pressure comes to us with these new functions and new controls on the machines.

This placed new pressure on SoftwareCo's team, because, in addition to maintaining the software, they had to develop new functionalities to attend to MachineCo's new demands. Initially, the project was organised around schedules and rigid time-lines agreed between SoftwareCo's team and MachineCo. However, the nature of software programming activity meant that it was not always possible to deliver according to the timelines. As the MD at SoftwareCo explained,

We have to agree schedules when we start and finish various parts of the project. And we have to work towards meeting these schedules. Sometimes it is very difficult because of the complexity. And for some of the new technologies, it is very difficult to estimate very accurately how long the new technology will take to be incorporated into the software product. You don't have experience in it. You look at it and maybe you estimate six months to incorporate this technology. But, as you start working on it, it becomes apparent that there is much more you can do with this. We have to constantly review process with this company and look at the schedule and reschedule. Speaking of software development generally, it usually takes longer than people initially estimate. And because you are bringing new technologies, the unknown to enhance your product, it is very difficult.

Besides the uncertainties involved in software programming, the specifications for new developments provided by the Japanese partner were quite 'loose', allowing

SoftwareCo's team certain flexibility in designing it. As the project manager outlined,

What they gave us at the beginning was, in a nutshell, to do what the controls were doing. That was it. Of course, we have discussed it with them in detail, but what we didn't have in the specifications was up to us. Because we had that responsibility, we wanted to make a really user-friendly piece of software. Because we were doing that, they thought 'Oh, it would be nice if you could do this and do that...' So, we were getting new requirements. It snowballed the project a little bit. It was a little bit frustrating. In that sort of scenario, it took a little bit longer to do things than we had estimated. And that caused a bit of pressure on us from them... On my side, I would like to have a more rigid specification that would stop us being 'overcreative' and it would stop them asking for new requirements.

While the Japanese partner placed heavy emphasis on keeping to schedules, SoftwareCo was unable always to estimate exactly how long new developments might take, and to deliver according to the timelines. This provoked conflict between the partners during the period in which new machine controls were being introduced. The MD at SoftwareCo commented,

There are periods when customer expectations can be slightly different from our ability to deliver. The customer normally wants things very quickly. And we want to supply it very quickly, but the nature of the work, which must be very accurate, very complex and very technical, so... We get

periods when the customer wants things to be very quick, and we say 'It will take a little longer.' It causes an amount of conflict. We do have highs and lows. Sometimes the situation gets a little bit tense, because there is a little bit of conflict between supply and demand.

The conflict over time-lines was usually resolved by discussions during face-to-face meetings. However, there were a few instances of conflicts erupting, which affected project implementation. The project manager at SoftwareCo gave an example of such an instance,

It was about a dead line. They stopped payments. So, we said 'Until you get this matter resolved, we stop working on it.' They got it resolved pretty quickly. It was like 'Oh, my God? What will we do?' And nobody would take the responsibility for that and it went to the top very quickly. And once it was at the top, it was managed very quickly.

The emergence of conflicts of this nature was also due to the particular national and organisational characteristics of MachineCo, which will be explored in Sections 4.6.4 and 4.6.5. For a number of years, the partners were able to adjust their joint working practices, making it possible largely to prevent tensions over schedules from erupting into explicit conflicts. The project manager at SoftwareCo explained,

They were generally complaining about things being late. And, as a part of the discussions about new controls and new developments, we said 'We are not going to put any time scales on that because we don't know what we've

got to do.' So, then we started to say that we would acknowledge what the target was but we would not agree that it was what we would be able to do.

The MD also commented on the change in the Japanese partner's attitudes over time,

Now they are a little bit more realistic and understanding that it is all we can do really. We have actually spoken to them about changing working practices. We had to say to them things like 'We can put more developers on this, but then you will have to pay for the extra development costs. If you want things done quicker, then you will have to help finance that.' And they sat back and said 'No, we don't want to do that.' So, we said 'OK. Then you have to accept our situation.' So, they are a little bit more accepting now.

In 2000, two new people joined SoftwareCo's team dedicated to the project with MachineCo. They were newly employed to work specifically on this project. As the scope of the project extended with the arrival of the new generation machine controls, the original team was unable to cope with the volume of the demand. However, it took almost six months before the new team members were able to fully participate in the development. First, they underwent training at the MachineCo UK division to familiarise themselves with the machines and with the way in which the Japanese partner operated. Then, they started working on small parts of the project that would not affect the overall development. The project manager explained,

The problem with software is that it takes a lot of time to get new people up to speed. It took at least three months before they could do anything. We got them to implement some new features which were not urgent at the time. We let them work it out by themselves. It would not interfere with any other existing codes, so it would not cause any problems. After that, they got used to dealing with the customer themselves. When they finished the features, the customer would come back to them instead of going to me. And then they just got involved with the same things we are doing.

After the expansion of the team, a new wave of developments occurred. First, there was a major technological shift in the field of CAM programming. In the old technology, the machine part models were visualised and manipulated, using wire frame geometry. The new technology involved solid body geometry, bringing a number of advantages in the use of the programmes. From 2001, SoftwareCo started incorporating this new technology into their products. One year later, MachineCo started developing another generation of machine controls. This meant that new functionalities had to be added to the software, triggering a number of new developments. By 2004, the partners were working along several parallel developments, ensuring maintenance of the core product, incorporating new solid modelling technology, and adding new generation control modules to the software.

4.6.4 Developmental pattern

After outlining the overall development of the partnership between SoftwareCo and MachineCo in the previous section, the present section focuses more closely on examining the developmental pattern of this inter-organisational relationship. It employs the templates proposed by Van de Ven and Poole (1995): life-cycle, teleology, dialectics, and co-evolution. Figure 4.14 schematically represents the operation of the generative mechanisms as manifested in the observed collaboration dynamics, timing and interrelation between them. The narrative, in contrast, focuses on the contexts surrounding collaboration development, examining the mediating contingencies that brought the operation of generative forces to the fore.

The nature of the project rendered it difficult to plan fully and specify in advance. The partners had to start with quite general specifications, and then plan ahead in a manner that would allow for time-line adjustment, depending on the problems arising and new ideas. As the MD at SoftwareCo explained,

For some of the new technologies, it is very difficult to estimate very accurately how long the new technology will take to be incorporated into the software product.

Figure 4.13 Main events and issues in SoftwareCo – MachineCo collaboration development

	Year:	95	96	97	98	99	00	01	02	03	04
Collaboration formation											
Frequent face-to-face interaction: weekly meetings with MachineCo UK, regular visits to/from Japan, annual review meetings											
Development of the initial software for milling machines											
Developments for a new generation of machine controls											
Conflicts over deadlines											
SoftwareCo contracts two more people to join the project											
Incorporation of the new technology, solid modelling, into software											
Developments for the new generation of machine controls											

Figure 4.14 Generative forces shaping SoftwareCo – MachineCo collaboration development

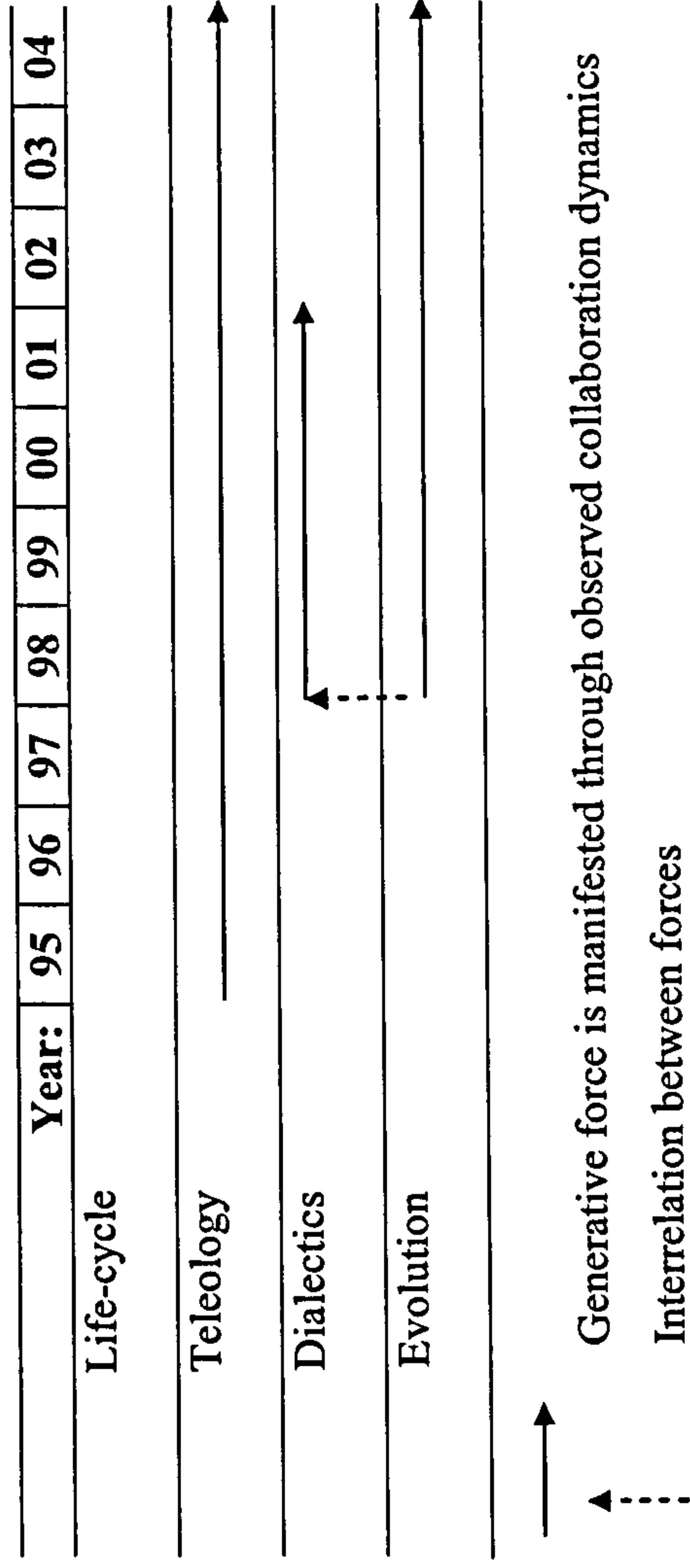
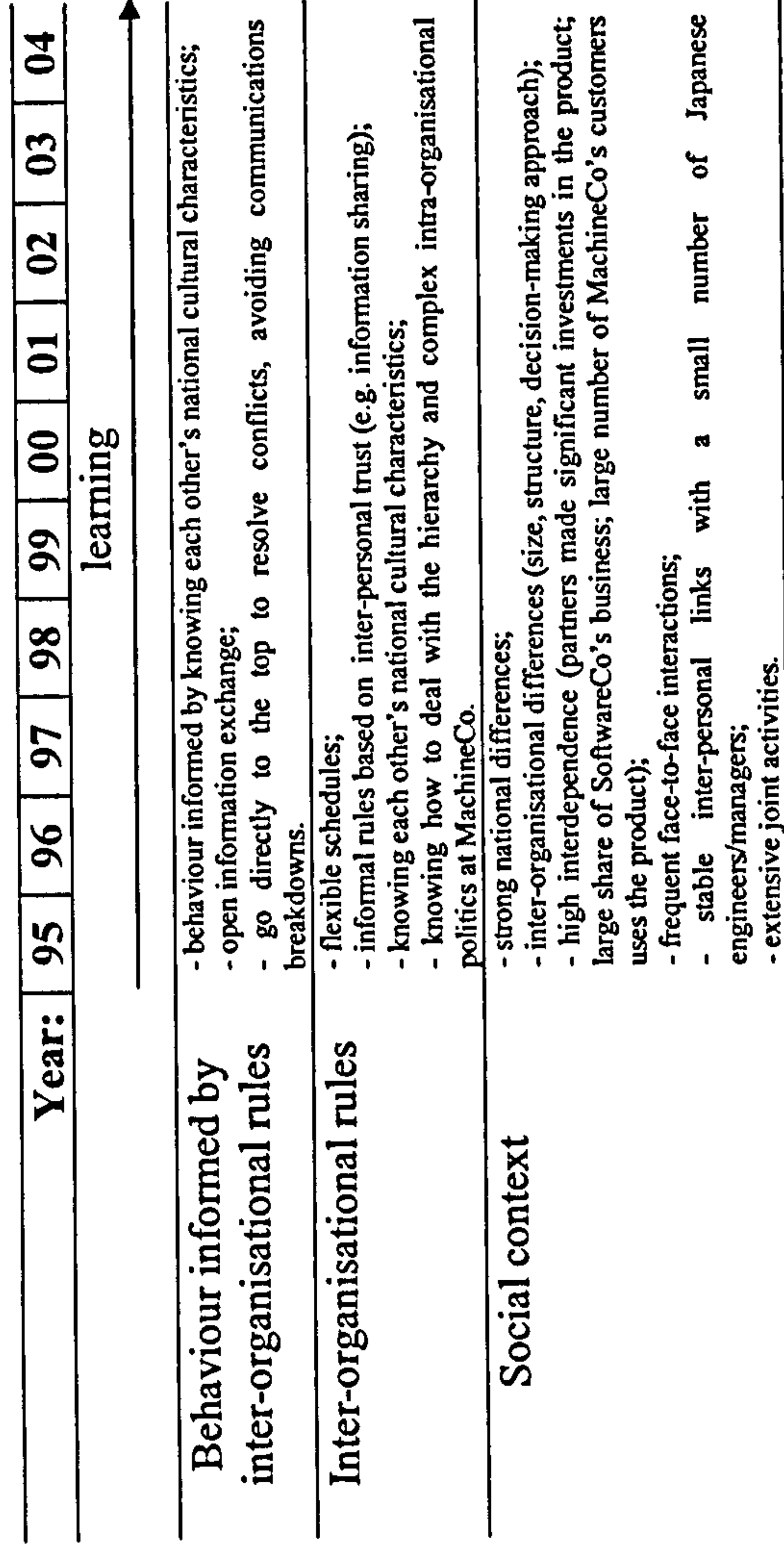


Figure 4.15 Inter-organisational learning along SoftwareCo – MachineCo collaboration development



As you start working on it, it becomes apparent that there is much more you can do with this. We have to constantly review process with this company and look at the schedule and reschedule.

Furthermore, the two partner organisations differed considerably from each other (Parkhe, 1991). Besides national differences, there were very significant organisational differences. With regard to the national cultures, all the members of SoftwareCo's team frequently stressed the impact of the differences between Japanese and European cultures on their work on this project. For instance, the MD at SoftwareCo commented,

People in this collaboration are from different cultures. It tends to have quite an impact on the way things work. I find that Japanese culture is different from European culture. You have to constantly bear this in mind and think about it. For example, they prefer information to be given to them in a certain way. And that way is usually different from if you were dealing with another European or American company. They don't like direct information whereas, European people do. They don't like direct replies. They consider it to be very immature. They don't like you to say directly 'I disagree with you.' and things like this. They prefer you to talk around and be indirect. They prefer you to say 'I think your proposal is very interesting, and we have given it a lot of consideration and you have some very interesting points here. Maybe you could consider looking at it in a different way though?' I can see that it can bring some kind of conflict between my people and the Japanese people.

The impact of inter-cultural differences is frequently found in international joint ventures (Barkema, et al., 1997). With regard to organisational differences, the Japanese company was a very large hierarchical organisation, while SoftwareCo were small and flexible. These kinds of inter-partner differences have often been found to be significant in inter-organisational collaborations, as it implies different approaches to a variety of organisational practices, such as decision-making, for example (Parkhe, 1991). The project manager at SoftwareCo commented,

This Japanese company is completely different to us. They are very large with many levels of hierarchy, while we are small, and when you want to do something, you just do it. Communications with the Japanese are generally good, but sometimes breakdowns occur, as with any other large company, because it is just too many people. For example, people ask the same thing several times, so I have to explain the same thing to different people. It gets lost in the information loop.

SoftwareCo's project team had to learn and adapt to MachineCo's ways of working not only by considering the national differences, but also by understanding the workings of their complex and hierarchical organisation. The project manager at SoftwareCo gave an example,

At one meeting, when a senior director [from MachineCo] came over, we discussed what we could do to speed things up. We made two or three different suggestions how to improve things. And this was one of those times when it didn't get back to the top. So, we had one director that came over and we

explained it to him, and then we had another director to come over and he didn't know anything about it. We explained to him and said that we had already explained this. The lines of communication in that company... You get a lot of conflict between different people. A doesn't like B. So, they don't talk. For example, if A caused B some kind of problem and made A look better and otherwise.

Only with the passing of time, were SoftwareCo able to establish stable lines of communication and working relationships with a number of people in Japan. As the project manager at SoftwareCo explained,

It has more to do with the Japanese way of working. They actually rotate people from department to department, and also the managers are moved to different sections every couple of years. When we were first technically specifying the project in Japan, there must have been 20 Japanese people. 20% would have been engineers, 30% would have been engineering managers or directors, 25% would have been sales and marketing, and the rest would have been very senior managers, like the presidents and the vice presidents. They would come and sit in the meetings just to see what was going on. And some other people would have been specialists in different fields that would be called when required. So, they were not there all the time. There was a group of people, 5-6 people that remained the same at all visits in Japan.

Gradually, the partners were able to adapt to each other's ways of working and national differences. As the MD at SoftwareCo stressed,

We had to understand these things and try to adapt to them. But I think it is the same for them. They also, working with us, have to understand the way we think and to try to adapt to it. Quite often, we get letters asking about something and they start like this 'Maybe you think it is just Japanese mentality, but please could you give me some information on something...'. They know that I would read this and think 'Why do you need this information? You don't need it.' They know this in advance.

The project manager at SoftwareCo also highlighted the way in which his understanding of the partner evolved, and how he adapted his behaviour while dealing with his Japanese colleagues,

It is a completely different culture. There is a big thing about not losing face. This is our interpretation. So, if I report something to Japan explaining the situation, I don't know what actually is getting reported up there at the end. And we know for a fact on occasions, it definitely hasn't been reported. For instance, we had to have two meetings in Japan just to say to the president what was going on, to tell our side. And he had a completely different story. It was quite embarrassing actually. We do try to avoid this kind of situation. Sometimes, we will accept responsibility. But other times it is their fault, for example, they haven't given us the control they actually used, so we couldn't do it. But we wouldn't blame them, we would use the approach like 'Ah, we are still waiting'.

Personal relationships that developed through collaboration also helped to establish the modes of working (Ring and Van de Ven, 1994) that would overcome inter-organisational and national differences and make the project progress. A programmer on the project team at SoftwareCo commented,

We actually built a very good personal relationship with the people we were working with, became friends. That really helps. It is important in any business relationship. If you are actually friends with somebody, and when they ask you to do something which is perhaps a little bit inconvenient for you, you tend to be more approachable because you are friends. Because you know these people personally and are friends with them, you think 'Ok, I'll see what I can do.' It is just that kind of relationship.

In this way, informal inter-personal relationships had a significant contribution to make to the collaboration (Liebeskind, et al., 1996), just as in the case of Bodycote, TWI and FORCE. The difference was that, in the latter case, such relationships had been in place prior to the inter-organisational collaboration, while, in the present case, they developed gradually in the course of collaboration development. The personal relationships were important in this case, because they supported collaboration in the context of a large Japanese company, in which there was a constant rotation of personnel. The project manager at SoftwareCo also stressed that the relationship between the two organisations became more open over time, and gave an example of how personal links affected the way work was done on the project,

They had to share with us some of their technology, so we could develop software. What they did at the beginning of the collaboration was to put their technology inside a DLL, and our software accessed their technology through a DLL [this works like a black box: it gives access to technology without revealing the source code]. We were comfortable with this. Now, they give us their source code, so we actually can see what is going on. I think, it is more a personal thing rather than a company thing. At the company level, they wouldn't allow it. And, at the personal level, we have been working together with the same people for seven years now and we trust each other. It is more a personal thing. It is like 'OK. We need to fix this problem. This is the easiest way to do it'. It is not a formal agreement.

The pattern of collaboration development, as described above, was consistent with the teleological force operation. First, although there was a well-defined purpose for the inter-organisational relationship (new product development), the project could not always be specified in advance, and was constantly being adjusted in the light of new ideas or problems encountered. This is characteristic of the teleological mode of development (Ring and Van de Ven, 1994). Second, there was a great amount of adaptation in behaviour on both sides in order to allow the development to progress. This kind of adaptation and adjustment has also been addressed in the literature that employed teleology to explain development as an important mediating process pressing collaboration forward (Parkhe, 1991; Doz, 1996).

Although the teleological mode of development dominated most of the duration of this inter-organisational collaboration, other generative forces as well eventually came to the fore. The recent downturn in the manufacturing industry affected MachineCo's overall strategy of product development (as discussed in more detail in the previous sections). Consequently, it was necessary for them to start developing more complex machines, which meant adding new controls and functionalities to the design. This became the responsibility of SoftwareCo, as they had to supply software for these new machines. The MD at SoftwareCo commented,

The pressure comes to us with these new functions and new controls on the machines.

With increasing pressure to develop new software modules, which came shortly after the beginning of the collaboration, when the partners were still learning how to work with each other, potential conflicts began to surface. In this way, the operation of the co-evolutionary force triggered the underlying dialectical tensions, and established a context in which the dialectical forces were able to come to the fore. This development is indicated in Figure 4.14 by the dotted vertical arrow that represents the interrelation between the evolutionary and dialectical forces. Once again, just as in the cases of HRI – Becker Underwood, HRI – SeedCo, and AnalytucsCo – BiotechCo, the evolutionary forces played a key role in bringing the dialectical tensions of collaboration to the fore.

The dialectical nature of the generative mechanisms were manifested through tensions between various conflicting forces coming to the fore in collaboration development. De

Rond and Bouchikhi (2004) depicted a number of the potential sources of dialectical tensions in inter-organisational relationships, among them expansion versus contraction, and conflict versus compromise. Indeed, the scope for collaboration changed all the time in the present case study, expanding or contracting, depending on the demands for new functionalities and on the amount of effort that software development required (because of the uncertain nature of software development activity, the amount of work needed could not fully be anticipated). The project manager at SoftwareCo commented,

It tends to run in cycles. We will have a period of time, a number of months, when we know exactly what we're going to do, and we will just be working on it. Then we need to go to Japan or the Japanese engineers will come to us; it rotates, and there is no work at all, we are just discussing what the next stage is, modifying the specifications, that kind of thing.

Conflict and compromise were other contradictory forces affecting the collaboration dynamics. The national and inter-organisational differences between the partner companies demanded constant negotiation and bargaining in order to deal with upcoming issues, and to establish common frameworks and understandings. These issues were frequently resolved through compromise, with both partners changing their behaviour to adapt to each other. However, there were some instances when the issues resulted in open conflict and confrontation, as described in the previous section.

Co-evolutionary forces continued at the fore throughout most of the period of collaboration development. Software development, in general, involves constant updating

of the product, with the periodic release of new versions. The product being developed by SoftwareCo and MachineCo was no exception. The programmer working on the project explained how the continuity of the product was sustained while new developments were being incorporated,

Basically, this project uses our core product and we just write around it. So, anything in the core product, including new technologies, will be used. When we release the software and it satisfies all adequate working and we are not aware of any bugs, we freeze the code. If we start working on a new project, which is still the same code, the code at the time of the release, we got a copy of it. So, if we find some problems, we can go back to that code. That means it is stable. If we add the new technology after the release, it will not affect what was already released.

Along with this continuous maintaining of the product, there were major developments to be incorporated in the product, affecting the course of collaboration. These came when MachineCo introduced new generations of machine controls (which happened twice in the eight years of collaboration) and when new technology that could significantly change the product appeared, as was the case with the arrival of new solid body modelling technology. The project manager at SoftwareCo explained,

Going to solid geometry was a fundamental change to the way we work. And that does not come very often at all.

In this way, the co-evolution of MachineCo's product development strategy and the technological advances in the CAM software area, which affected product development at SoftwareCo, defined the scope of the overall course of the collaborative project. This pattern is consistent with Koza and Lewin's (1998) propositions regarding the co-evolutionary approach to alliances, which postulates that inter-organisational collaborations are embedded in a firm's strategic portfolio and co-evolve with the firm's overall strategy. The co-evolutionary dynamics with the overall partners' strategy were also observed in the cases of HRI – SeedCo and AnalyticsCo – BiotechCo.

This section examined the underlying generative forces that came to the fore and shaped the development of collaboration. It also addressed the surrounding contexts providing the circumstances that enabled these forces to manifest their operation, and examined the interaction between these forces. The next section examines further the dynamics of this collaborative relationship by focusing on the inter-organisational learning processes involved.

4.6.5 Inter-organisational learning

This section starts to examine inter-organisational learning processes in collaboration development. The following narrative focuses on four main issues concerning inter-organisational learning (as discussed in Section 2.5.3 of Chapter 2): the nature of the accepted inter-organisational rules governing collaboration and what the consequent patterns of organisational behaviour are within the relationship; how these rules emerged;

how this process was shaped by social forces; and, once established, whether these rules and behaviours changed or prevailed over time. Figure 4.15 schematically represents the inter-organisational learning processes in the course of the collaboration development.

Shared social practice (frequent prolonged visits from/to Japan, weekly meetings with the MachineCo's UK division) played a crucial role in the development of this collaborative relationship. The project manager at SoftwareCo gave an example of such joint activities,

With the Japanese, it is much easier if you can go and actually show them something rather than trying to describe it. When we were developing specifications for the very first project, they spent four hours talking about it amongst themselves in Japanese. So, after two hours, I thought 'I can see what they are talking about'. So, I just wrote some code, and after four hours I said 'Excuse me, do you mean like this?' and it was like 'Ah, yes! That is what it was.' We do find that it is much better when we go over there and get together to actually have something to demonstrate; nothing finished, just 'This is what we think'.

It has been indicated in the literature that engaging in common organisational practice and interacting face-to-face is important for learning because it allows the participants to become familiar with each other's organisation, to get to know other participants, to sustain social networks, and to create shared identities (Brown and Duguid, 1991; Lave and Wenger, 1991; Orlikowski, 2002). Indeed, over time, the members of the

SoftwareCo's team established close inter-personal relationships with their Japanese colleagues. Despite the personnel rotation in the Japanese company and countless levels of hierarchy involved, stable inter-personal links developed with a number of people from the Japanese side. The project manager at SoftwareCo described the nature of the inter-personal relationships in the collaboration,

My contacts in Japan, we are really close friends. I think personal relationships are quite important. It was when we were getting some problems with the project's deadlines and things like that... personal relationships we developed helped people on that side to see our point of view. I am not sure if not having these personal relationships would the jeopardise project, but... Personal relationships kept things reasonably smooth, even when there were problems. It has been quite important.

Through intense and frequent inter-personal interactions, and while staying in Japan for long periods of time (up to 10 weeks during each visit), SoftwareCo's team members were also able to learn about the way their Japanese partner's organisation worked. For example, they gained understanding of the role played by intra-organisational politics in managing the project, and the way decisions were made. This knowledge enabled the partners gradually to reach a common understanding with regard to the establishing of work schedules. The projects manager at SoftwareCo described this process,

Here, we will deal with a certain level of their management. And, at this level of management, they will accept 'OK, you couldn't reach these targets because we didn't have these things on schedule. It wasn't what we originally agreed.' or 'OK, we asked you to drop off that and pick up something else', for example. So, at that level of management, it is OK. But then they have to report it to a more senior level of management. This company is huge. They have a lot of levels of senior managers and directors. So, at the next level, they won't accept it. So, now we tend not to agree time-scales. So, for example, for these new controls, they are not too dissimilar to the previous generation, so we say 'OK. It will take six months to implement'. But implementing it, we came across something that they didn't tell us; we discovered it, and it was going to take much more than six months. It was going to take nine months, for example. So, we used that kind of, if you like, tactic to beat them 'OK, we don't agree to schedules, what we agree to is we know this is your target.' And they accept it.

In contrast to the case of AnalyticCo – BiotechCo, while this collaboration also presented strong inter-partner differences (Parkhe, 1991), the coordination mechanisms (Inkpen and Dinur, 1998) that were established to govern joint activities provided an appropriate level of inter-partner interactions, and made possible frequent engagement in shared practice by the partners. The role of shared practice in inter-organisational learning will be discussed in Chapter 5, Sections 5.3.1 and 5.3.2. In this way, particular inter-organisational rules were established, for instance, indicating that the schedules would be agreed, but without SoftwareCo's necessarily committing to the time-lines. Informal rules also emerged at inter-personal level, for instance, concerning information exchange

between the two organisations. While describing the open exchange of information between the partners, the project manager at SoftwareCo highlighted the following,

I think it is more a personal thing rather than a company thing. At the company level, they wouldn't allow it. And, at the personal level, we have been working together with the same people for seven years now and we trust each other. It is more a personal thing. It is like 'OK. We need to fix this problem. This is the easiest way to do it'. It is not a formal agreement.

Another inter-organisational rule that emerged over time concerned the way in which potential conflicts were approached. Instead of dealing with the levels of hierarchy at MachineCo, SoftwareCo would talk directly to a director at a very high level, to avoid communication breakdowns and the effects of the complex intra-organisational politics at MachineCo. The project manager at SoftwareCo explained,

Luckily, the person who initiated the whole project is the president of the company. So, instead of all these layers, if we get to talk to him and explain to him in person what has happened, everything is fine. He would want to know our side. So, whenever we go to Japan or he comes to the UK, we get together. Every time we have to discuss something big, like new piece of technology coming up, apart of that, we also will have meetings to explain particularly what is going on.

Inter-partner differences with regard to their national cultures and organisational contexts have been depicted in the literature as having an impact on learning in inter-organisational collaborations (Parkhe, 1991; Barkema, et al., 1997; Lane and Lubatkin, 1998). It is usually indicated that, in the alliances with greater inter-partner differences, greater inter-organisational learning may be expected (Parkhe, 1991). In the case of SoftwareCo and MachineCo, in contrast to the case of AnalyticsCo – BiotechCo, the partners indeed, underwent intense inter-organisational learning to overcome their national and organisational differences, and to establish ways of working acceptable to both organisations. These cross-case differences will be explored further in the Chapter 5, Section 5.3.1.

The development of software products, in this case, involved significant investments on the part of the partner companies. The MD at SoftwareCo explained,

This project is very important to us. It is about 25-30% of our business. They could change to another supplier but it wouldn't be very easy. They currently have 5, 000 systems they have sold to customers. It would be very difficult if suddenly, all support for these 5, 000 systems stopped. The customers are using them. They always want new things, upgrades, new technologies, product support, so on. It is not impossible, but it would be very difficult for them to walk away from this relationship. For example, it took us around two years before we had anything ready for them to sell. If they went to somebody else, they would have to go through the same period. It is very labour intensive. They have a lot of

their engineers tied up with it. After training their people, training customers, training support people, producing marketing information for the products... Yes they could do it, but it would be a very big and difficult job for them to change that. But nothing is impossible and we have to remember this. However, currently, I think, it is in both our interests to continue as we are.

The interdependence (Inkpen and Beamish, 1997) between the partners grew even stronger over time. This implied that there was no strong asymmetry in the balance of power in this relationship, even in view of the fact that SoftwareCo was tiny in comparison with MachineCo. The project manager at SoftwareCo commented,

We do have to be careful. Because they are a massive company, they could easily afford to go to another provider and ask them to write software while we still carry on. The only thing is that in our industry, in CAM software, word gets around pretty quickly. We are legally obligated not to disclose that we work for this company, but everybody in the industry knows. So, if somebody was to write software for them, we would find out very quickly. We've actually got quite a bit of power in that. We had once got so upset by their attitude, we just told them 'OK, forget it. We'll stop working on it.' Things started moving after that.

Strong interdependency increases incentives to commitment, aligning the partners' interests, and deterring opportunistic behaviour (Das and Teng, 2000). In the present case study, combined with extensive shared practice and face-to-face interactions, this created

a context in which extensive inter-organisational learning was able to take place. In this way, the partners were able to develop the common understandings and norms of reciprocal relationship necessary to govern and coordinate inter-partner interactions, the process highlighted in the literature as crucial for collaboration to progress (Ring and Van de Ven, 1994; Arino and de la Torre, 1998; Buchel, 2000).

CHAPTER 5 DISCUSSION

5.1 INTRODUCTION

Chapter 4 presented case analysis and began to outline the findings emerging from this study. This chapter will present cross-case analysis, and discuss the findings and their implications. Section 5.2 outlines the contribution of the present research. Then, Sections 5.3, 5.4, 5.5 and 5.6 discuss inter-organisational learning and knowledge creation in collaboration, the process and mechanisms of inter-organisational learning, and the relationship between inter-organisational learning and collaboration development, respectively. Section 5.7 concludes with a summary of the implications of the study.

5.2 INTER-ORGANISATIONAL COLLABORATION AND KNOWLEDGE CREATION: AN OVERVIEW OF THE STUDY'S CONTRIBUTION

Section 2.4 of Chapter 2 outlined that participation in inter-organisational collaborative relationships played an important role in new knowledge creation. The existing studies in various sectors linked network activity to innovation and value-creation (Powell, et al., 1996; Lowe, et al., 1997; Bresnen and Marshall, 2000). Although it has been recognised that inter-organisational partnerships have great potential for knowledge creation, there has been very limited attention in the existing literature to the way in which organisations actually learn and produce knowledge jointly (Larsson, et al., 1998; Lubatkin, et al., 2001). Only a few studies have begun to draw attention to particular inter-organisational

processes essential to joint knowledge development (see Chapter 2, Section 2.4.2). Thus, Lubatkin et al. (2001), in their conceptual model of reciprocal inter-firm learning, pointed towards the important role of, and the difficulties associated with, the development of inter-organisational governance and coordination mechanisms to support joint learning. Dyer and Nobeoka (2000) have empirically examined such mechanisms of inter-organisational coordination in the case of Toyota's supply network. They highlighted how these mechanisms, or inter-organisational rules and routines (i.e. behaviours informed by rules), enabled effective participation of the network members in the product development and production processes. Only one study, by Holmqvist (1999; 2003b; 2004), has empirically examined how such rules and routines actually emerged and became established in inter-organisational domains. In his case study of joint software development by a Scandinavian software producer and its partners, Holmqvist showed how inter-organisational rules and behaviours were produced through interaction among actors, which involved considerable bargaining and reconciliation of concurrent perspectives and views.

Thus, the existing research, although very scarce, started to indicate that the process of inter-organisational learning, conceptualised here as social production and reproduction of inter-organisational rules that leads to changed organisational behaviour, might play an important role in new knowledge creation through collaboration (i.e. generating of new knowledge that was not available to either of the collaborators previously) (see Chapter 2 Section 2.4.2). The present study aimed to contribute to this area of research and to examine the processes that enable and constrain knowledge creation through inter-

organisational collaboration. The findings of this research contribute to the existing bodies of knowledge on inter-organisational collaboration and learning in a number of ways.

First, the present research demonstrates that the presence of inter-organisational learning is essential for the partners in collaboration to create new knowledge (e.g. new practices, technology, products, services, etc). In this way, the present research addressed the limitations of the existing studies of learning through collaboration, which adopted an outcome-oriented perspective, and focused on how partners themselves could learn from each other and compensate for the lack of internal skills (see Chapter 2, Section 2.4.1.1). The present study demonstrates that collaboration with the objective of learning is not only a means of providing for missing skills through a series of discrete transactions resulting in knowledge transfer, but is also an on-going social process leading to knowledge creation. This will be discussed in Section 5.3.

Second, the present research provides fuller understanding of the mechanisms underlying inter-organisational learning. The existing research has been limited in addressing the complexity of social processes involved in learning through collaboration, by overemphasising the prevalence of opportunistic behaviour among partners to explain learning outcomes, and by addressing only constraining effects of power dynamics on learning (see Chapter 2, Section 2.4.1.2). Through cross-case analysis (which will be presented further in this chapter), a number of the relationships between inter-organisational learning and emerging collaboration characteristics are identified,

revealing various aspects of social dynamics associated with inter-organisational learning. In this way, the present study extends the existing research by, first, presenting a detailed account of the process of inter-organisational learning and thus, examining how such learning is actually achieved. Second, it examines the emergent characteristics of collaboration, beyond the balance between its competitive and cooperative aspects, associated with inter-organisational learning that helps to explain learning dynamics and outcomes. These issues will be discussed in Section 5.4.

Third, by adopting a longitudinal perspective of inter-organisational relationships, the present study sheds light on the relationship between inter-organisational learning and collaboration dynamics. The existing process studies of collaboration indicate that learning is at the core of collaboration development (see Chapter 2, Section 2.5.3); however, the way in which they interrelate has not been adequately addressed in the literature. The cross-case analysis revealed a variety of inter-organisational learning dynamics and their underlying mechanisms, indicating that inter-organisational learning could have positive, as well as negative, effects on collaboration development. The results also suggest that inter-organisational learning closely co-evolved with the developmental dynamics of collaboration. This means that inter-organisational learning is not only a product of collaboration development, but is also a force capable of shaping it. This is discussed in Section 5.5.

5.3 INTER-ORGANISATIONAL LEARNING AND KNOWLEDGE CREATION

The present study conceptualizes inter-organizational learning as social production and reproduction of inter-organizational rules that leads to changed organizational behaviour. Thus, in the collaborations studied in this research, inter-organisational learning has been seen to be manifested in the emergence of formal and informal inter-organisational rules (Holmqvist, 1999; 2003b) and the ability of the collaboration participants to read those rules and demonstrate behaviours informed by those rules (Brown and Duguid, 1991; Tsoukas, 1996). A variety of inter-organisational learning dynamics was observed across cases. In two cases, Bodycote, TWI, and FORCE and AnalyticsCo - BiotechCo, there was no significant inter-organisational learning observed (see Figures 4.9 and 4.12 respectively). In the other two cases, HRI - Becker Underwood and HRI - SeedCo, the periods of intensive inter-organisational learning were intercalated with periods when no significant inter-organisational learning took place (see Figures 4.3 and 4.6 respectively). Finally, one case, SoftwareCo and MachineCo, presented continuous inter-organisational learning throughout the whole period of the collaborative relationship (see Figure 4.15). To address the effects of inter-organisational learning on knowledge creation through collaboration, six temporal episodes across the five cases were taken as units of analysis. They are depicted in the Table 5.1. The first three episodes demonstrated a high degree of inter-organisational learning, while the remaining three showed low inter-organisational learning, as discussed below.

Across five cases, three periods of intensive inter-organisational learning were identified: HRI – Becker Underwood (1986-1988), HRI – SeedCo (2001-2004), and SoftwareCo – MachineCo (1995-2004). During these periods, a number of inter-organisational rules and behaviours informed by these rules emerged and governed collaboration. The detailed account of this process was given in Chapter 4. Furthermore, across the five cases, five episodes with no significant inter-organisational learning were identified: HRI – Becker Underwood (1988-1993); HRI – SeedCo (1992-1998); HRI – Becker Underwood (1999-2004), AnayticsCo – BiotechCo (2000-2004), and Bodycote, TWI and FORCE (2000-2004). In the first two episodes, no significant inter-organisational learning took place because there were already inter-organizational rules in place governing the relationship. In the HRI – Becker Underwood case, the same rules that emerged during the first two years of collaboration continued to operate throughout the period from 1988 to 1993, by which time, main research and development activities had already been completed. In the case of HRI – SeedCo, the initial period of collaboration, from 1992 to 1998, was governed by the formal rules determined by the license agreement for the technology transfer. These two episodes are not included in Table 5.1 because these particular periods of collaboration were oriented more towards exploitation rather than exploration. Exploitation consists of the processes by which organizations create reliability in experiences through refinement and routinization, while exploration involves the processes by which organizations create variety in experience through search, novelty, and experimentation (March, 1991). In this way, they involved technology transfer and not knowledge creation (see case analysis in Chapter 4). The last

three episodes are included in Table 5.1 because during those periods of collaboration, the development of new knowledge was expected.

The case analysis indicates (see Chapter 4) that the first three episodes depicted in Table 5.1 can be characterised as demonstrating high degrees of knowledge creation. In the HRI – Becker Underwood (1985-1988) episode, new nematode technology and production methods were developed jointly by the partners. In the HRI – SeedCo (2001-2004) episode, the joint research and development project progressed according to the milestones set, resulting in advances in knowledge about new breeding methods. In the SoftwareCo – MachineCo (1995-2004) episode, the software package was under constant development, incorporating new machine control requirements and new technologies. In contrast, the next two episodes can be characterised as low in knowledge creation. In the HRI – Becker Underwood (1999-2004) episode, new knowledge was expected to be developed in the form of a novel cold-active application of the nematode technology. However, instead of the straightforward process of testing and development, it took years before the partners were able to bring the new product to market. In the AnalyticsCo – BiotechCo (2000-2004) episode, the partners failed to develop joint analytical services the provision of which was one of the main objectives of this collaboration.

Table 5.1 Summary of data analysis

	HRI- Becker Underwood (1986-1988)	HRI- SeedCo (2001-2004)	SoftwareCo- MachineCo (1995-2004)	HRI- Becker Underwood (1999-2004)	AnalyticsCo- BiotechCo (2000-2004)	Bodycote, TWI and FORCE (2000-2004)
Knowledge creation	High	High	High	Low	Low	High*
Inter-organizational learning	High	High	High	Low	Low	Low
Interactions among organizations	Work at the same location; Joint activities on the daily basis	Frequent face-to-face interactions; Exchange of personnel to perform joint activities	Frequent face-to-face interactions; Exchange of personnel to perform joint activities	Limited face-to-face interactions; No joint activities	Limited face-to-face interactions; No joint activities	Interactions are limited to the key people and mostly informal
Interdependence	High	High	High	Low	Low	High
Power balance	HRI is more influential partner	Partners exercise equal influence	Partners exercise equal influence	Partners exercise equal influence	Partners exercise equal influence	Bodycote is more influential partner
Generative forces manifested in collaboration development	Life cycle Teleology	Life cycle Teleology Dialectics Evolution	Teleology Dialectics Evolution	Life cycle Dialectics Evolution	Life cycle Dialectics Evolution	Teleology

*Knowledge creation by one organization

The final episode depicted in Table 5.1, Bodycote, TWI and FORCE (2000-2004), can be characterised as high in knowledge creation, because the knowledge about a new corrosion testing method was being developed in accord with the initial conception of the project. However, as discussed in the case analysis in Chapter 4, this was essentially knowledge creation by one organisation because almost all of the work was carried out by one partner, with no significant input from the other participating organisations.

Table 5.1 demonstrates that, with the exception of the Bodycote, TWI and FORCE case, collaboration high in knowledge creation is associated with high inter-organisational learning. In the case of Bodycote, TWI and FORCE, the collaboration was low in inter-organisational learning because it relied on the rules that emerged prior to the formal establishment of the relationship between the partners' organisations. This was because the relationship between the principal participants was long-standing and based on personal friendships which preceded the collaboration (see Chapter 4 Section 4.4.5). Informal or inter-personal networks are often seen as playing an important role in enabling and reinforcing formal inter-organisational networks (Kreiner and Schultz, 1993; Grandori and Soda, 1995; Liebeskind, et al., 1996). This collaboration is distinct from other episodes depicted in Table 5.1 because, as described above, during the period of formal inter-organisational collaboration, knowledge creation stemmed principally from only one of the partners. Thus, although generated mainly by one of the partners, knowledge creation was classified as high in this collaboration.

The present research makes an important observation that the presence of inter-organizational learning, as conceptualized in this study, was essential for the partners to create new knowledge through collaboration. The reason for that is that inter-organizational rules (e.g. those defining the content of the joint projects and the way to perform activities), that emerged through inter-organizational learning (see case analysis in Chapter 4 for a detailed account of this process), enabled and shaped knowledge creation. Thus, in the first three episodes depicted in the Table 5.1, the partners, once having established common frameworks for action and having developed common understandings, were able to create knowledge (e.g. nematode-based biopesticides production techniques, selection and breeding methods based on molecular markers, new software applications) that they would not be available to them without collaboration.

The partner organisations in the collaborations studied here developed the abilities leading to knowledge creation through joint activities and participation in social networks, a process similar to that observed by Tsoukas and Vladimirou (2001) in the intra-organisational context (see Chapter 2 Section 2.2). For example, in the case of HRI – SeedCo, HRI’s scientists’ understanding of how to ‘score’ plants for their resistance to a disease emerged through the actual observation of the way in which the SeedCo’s breeders conducted the ‘scoring’, rather than from the reading of protocols documenting the procedure. The actual experience of ‘scoring’ was essential for the later interpretation of the test results. Furthermore, in the SoftwareCo – MachineCo case, SoftwareCo’s knowing how MachineCo worked as an organisation within a specific national culture (knowledge necessary to be able to approach situations when problems with the product

development arose) developed through constant interaction with the partner and prolonged visits (up to 10 weeks) to their Japanese headquarters.

Furthermore, the common know-how (e.g. how to 'score' plants for disease) developed through shared organisational practice, facilitating knowledge sharing between partners. For instance, in the HRI – SeedCo case, HRI's knowing how SeedCo performed trials with a large number of new lines (which developed during inter-partner visits, when HRI's scientists could actually see the trials) was essential when interpreting the data representing the results of the trials sent by SeedCo later. When inconsistencies or unexpected results were found during the analysis of the data, HRI's scientists knew how to interpret them based on their knowledge of how the trials had actually been performed. In this way, knowledge could be shared when there was shared practice between the partners (Brown and Duguid, 2001).

The shared know-what and know-how (i.e. the content of the joint projects and the way to perform activities) developed through a process of inter-organisational learning. The inter-organisational rules emerging from social interaction gave shape to further action, as they served as normative constraints and criteria by which behaviour could be guided and assessed. Thus, in the case of SoftwareCo – MachineCo, new members of the project team at SoftwareCo learnt about their job by directly engaging in practice. They initiated visits to the partner's UK facilities for the purposes of machine operations familiarisation. They were assigned immediately to the new developments in the software and were responsible for the interactions with the partner regarding those developments. Having

learnt in this way, the new members of the team were able fully to participate in the joint project. In the case of HRI – SeedCo, new members also joined the inter-organisational project team at HRI as the project presented new demands. For example, a pathologist from HRI became involved in the joint project at a certain point in time. To integrate into the team and to understand fully what was being achieved in the project, so as to be able to contribute, it was important for him to engage in the joint activities with SeedCo. It was required that he personally visited the people with whom he was going to interact and also participated in the joint meetings. Thus, it was through the process of socialisation into practice that the new organisational members joining the collaborative projects learnt (Lave and Wenger, 1991; Tsoukas, 1996).

The above account of the processes enabling knowledge creation supports the view advocated by the ‘situated’ perspective on knowledge and learning (see Chapter 2 Sections 2.2 and 2.3). The empirical findings of the present study demonstrate that knowledge creation (or lack of it) through inter-organizational collaboration is better explained while recognizing that knowledge is localized, embedded, and invested in practice. The conceptualisation of inter-organisational learning as social production and reproduction of inter-organisational rules is useful in explaining knowledge creation effects of collaboration (Hardy, et al., 2003) as inter-organisational rules enable and shape further action and, ultimately, knowledge creation. At this point, it is possible to start outlining some of the implications of the present study, which will be further refined and extended throughout this chapter.

Thus, the present study addressed the limitations of the existing research on learning in collaboration. While the existing research links learning outcomes to the properties of knowledge and fixed collaboration characteristics such as inter-partner differences (see Chapter 2 Section 2.4.1.1), the approach taken in the present research addresses the social processes through which new knowledge actually emerges. The findings of the present research are useful in clarifying exactly what aspects of collaboration and what processes are important for knowledge creation through inter-organisational collaboration. In this way, the examination of the process of inter-organisational learning (addressed in the next Section 5.4) may help understanding why some inter-organisational arrangements are more successful in knowledge creation than others. Having indicated some of the implications of the present research, the following sections of this chapter will further refine and extend the discussion of the contributions of the study.

5.4 THE PROCESS OF INTER-ORGANISATIONAL LEARNING

Section 5.3 of this chapter outlined and discussed some of the findings of the present research, indicating that collaborations successful in new knowledge creation were also characterised by intensive inter-organisational learning. This section further unfolds this relationship and addresses the process of inter-organisational learning in the course of collaboration development. In examining the inter-organisational learning process, it focuses on such issues as the nature of the inter-organisational rules and behaviours informed by these rules, the process of emergence of these rules and behaviours, the way in which this process is shaped by social forces, and, once established, the extent to

which these rules and behaviours change or prevail over time. The examination and comparison of the episodes when inter-organisational learning took place with those when no significant inter-organisational learning was observed reveal certain commonalities and differences across the cases. Three major elements have emerged from the comparative analysis as having influence over the process of inter-organisational learning: the nature of inter-partner interactions, interdependence and power balance. These elements are depicted in the rows three, four and five of Table 5.1.

The nature of inter-partner interactions indicates the extent to which partners are involved in joint activities and share practice, whether partners have face-to-face interactions, and the relative frequency of the inter-partner interactions. Furthermore, the degree of importance of collaboration for both partners, coupled with their reliance on each other's resources, indicate the degree of interdependency between the partners. Interdependency has been conceptualised in a number of different ways in the literature on inter-organisational collaboration. For instance, Makhija and Ganesh (1997), in their conceptual model of learning in joint ventures, addressed it as a combination of resource asymmetry and need. Asymmetry is concerned with ownership by the partners of a crucial set of resources, including knowledge and skills (Grant, 1996), necessary to conduct, for example, research and development projects. Need, on the other hand, indicates the importance attributed by the partners to the collaborative relationship for achieving and maintaining desired competitive position. It has emerged in the present research that, besides resource complementarity among partners, the need for collaboration also appeared to influence social dynamics associated with inter-

organisational learning. Moreover, the power balance among the partners indicates the degree to which partners can influence the course of collaboration. In this way, it is possible for one partner to be more influential than the others, although, the situation may change over time.

With regard to inter-partner interactions, the cross case comparison indicates that the nature of interactions and the degree of inter-organisational learning are related. Thus, in the three episodes (HRI – Becker Underwood (1986-1988), HRI – SeedCo (2001-2004) and SoftwareCo – MachineCo (1995-2004)) where intensive inter-partner interactions took place (i.e. frequent, face-to-face interactions and engagement in joint activities such as laboratory work), significant inter-organisational learning was achieved. On the other hand, the episodes (HRI – Becker Underwood (1999-2004), AnalyticsCo – BiotechCo (2000-2004) and Bodycote, TWI and FORCE (2000-2004)) where inter-partner interactions were less intensive demonstrated no significant inter-organisational learning. This pattern, consistent across cases, suggests that intensive inter-partner interactions facilitate the inter-organisational learning necessary to create new knowledge. The reason for this is that intensive inter-partner interactions and joint activities help to create the context of a community (Brown and Duguid, 1991) and provide means for shared practice, as defined by Cook and Brown (1999) (see Chapter 2, Section 2.2). Indeed, knowledge creation occurs in the context of a community (Powell, et al., 1996), and shared practice plays an essential role in inter-organisational learning, as discussed in detail in Section 5.3.

In respect to interdependence, four of the episodes depicted in Table 5.1 are characterised by high interdependence amongst the partners, and two by low interdependence. Thus, in the HRI – Becker Underwood (1986-1988) episode, the collaboration was politically important to both partners at the time. The partners also relied on each other's resources to conduct the project. Similarly, in the HRI – SeedCo (2001-2004) episode, the joint project was of strategic importance to SeedCo (the company intensified investments in this particular research area) as well as to HRI (it was a high profile project expected to demonstrate the direct transfer of technology from a research institute to the industry). The partners also relied on each other's resources (e.g. complementary knowledge and facilities). In the SoftwareCo – MachineCo (1995-2004) episode, the collaboration was responsible for bringing in a large portion of SoftwareCo's business, and MachineCo relied on their partner to support the software used by a very large number of their end customers. In addition, the nature of the product development implied very intensive investments in terms of time and labour made by both partners. In the Bodycote, TWI and FORCE (2000-2004) episode, where the three organisations had to act jointly in order to secure resources for the project (from sponsors), a high degree of interdependency was also evident. On the other hand, in the HRI and Becker Underwood (1999-2004) episode, the introduction of one more product line was not of crucial importance to either of the partners, especially to Becker Underwood, as biopesticides became peripheral to its business. In addition, Becker Underwood had the capacity to conduct the development alone. In the AnalyticsCo and BiotechCo (200-2004) episode, collaboration was valued by the partners only in the case of future acquisition, which was uncertain at the time.

A pattern emerges across the cases. In the episodes characterised by high interdependency, with the exception of the Bodycote, TWI and FORCE (2000-2004) episode, significant inter-organisational learning was achieved, while in the episodes with low interdependency, there was no significant inter-organisational learning. By comparing the first three episodes characterised by high levels of inter-organisational learning, depicted in Table 5.1, with HRI – Becker Underwood (1999-2004) and AnalyticsCo – BiotechCo (2000-2004) episodes, characterised by low inter-organisational learning, it becomes apparent that the partners had different degrees of engagement with the collaboration. Thus, in the two latter cases, there were significant delays in resolving issues related to collaboration and break-downs in communication for significant periods of time. In this way, the degree of interdependence between the partners explains why partners would be motivated to engage in collaboration, allocating resources important for learning (Khanna, et al., 1998).

With regard to the power balance, it has emerged through the cross-case analysis that the way in which inter-organisational rules emerged and were legitimised depended on the degree of relative influence of the partners over the course of collaboration. In the HRI – SeedCo (2001-2004), SoftwareCo – MachineCo (1995-2004), HRI – Becker Underwood (1999-2004) and AnalyticsCo – BiotechCo (2000-2004) episodes, both partners were able to influence, to an almost equal degree, the content of the joint projects and the way in which they should be performed. The issue of the nature of power exercised by partners in these four episodes will be discussed in more detail in Section 5.4.1. On the other hand, in the HRI – Becker Underwood (1986-1988) episode, HRI was the only partner at

the time with the necessary expertise and the laboratory facilities. This meant that HRI dominated the way in which the joint project was to be conducted. Power dynamics were similar in the Bodycote, TWI and FORCE (2000-2004) episode. Bodycote was the most influential partner in this collaboration, due to the nature of the project, which relied on the personal initiative of the key person from Bodycote and the fact that Bodycote could continue the research and development programme alone, without relying on the contributions of the other two partners.

The different balance of power amongst partners across the episodes corresponded to the different ways in which the process of inter-organisational learning took place. Thus, the episodes characterised by power that was equally balanced between partners involved a high level of inter-partner conflict and divergence. In such a situation, the formation of inter-organisational rules involved more bargaining and negotiation among partners. This pattern was found in four of the six episodes depicted in Table 5.1. In the two episodes where one of the partners was dominating, there was no apparent clash between the participants with regard to the content of the project and the way in which the project should be conducted. The power to influence the course of collaboration being shared equally between the partners has been recognised as an important driver for inter-organisational learning and joint knowledge production, as the inter-organisational relationships dominated by one partner are unlikely to produce innovative outcomes, and can be unstable (i.e. present dynamics leading to dissolution) (Inkpen and Beamish, 1997; Makhija and Ganesh, 1997).

Indeed, in the four cases discussed above, the considerable amount of bargaining and reconciling that took place between different perspectives resulted in novel ways of operating based on the inputs from all partners. In the episodes in which one partner dominated, the formation of inter-organisational rules resulted in the adoption of the practices originated from the dominant partner. As a result, the process of knowledge creation was placed at risk of being essentially intra-organisational (as happened in the Bodycote, TWI and FORCE case), impoverishing a variety of experiences meant to be provided by an inter-organisational setting. In this way, the findings indicated that power played an important role in the process of inter-organisational learning. Section 5.4.1 below considers closely the issues related to power, before discussing further and addressing the implications of the cross-case findings presented here.

5.4.1 The role of power in the process of inter-organisational learning

The focus of the present research is not on the analysis of power, but nonetheless the findings suggest some interesting implications concerning the role of power in the process of inter-organizational learning. In this way, this section explores to some extent the nature of power partners had to influence collaboration. The degree to which each partner could influence the course of collaboration at the time of each episode had important consequences for inter-organisational learning because it had a direct impact on how the emergent inter-organisational rules gained legitimacy and acceptance among the partners (Hardy and Phillips, 1998).

The case evidence suggests that the source of influence was based on the superior expertise that endowed arguments and behaviours of the participants with legitimacy. The most valued expertise in the kind of collaborations studied here (collaborations with the objective of developing new knowledge) consisted of knowledge necessary for developing a new technology, product, or service. By taking a broad definition of power as a force that affects outcomes (Hardy and Phillips, 1998), it becomes apparent that knowledge was an important source of power held by the partners to influence the course of collaboration. In their assessment of power in inter-organizational domains, Hardy and Phillips (1998) highlighted three aspects of power: formal authority, critical resources, and discursive legitimacy (see Chapter 2 Section 2.4.1). The source of power in the inter-organisational relations studied in this research was not based on formal authority, as the partners did not have any formal authority over each other. Consequently, the following discussion will focus on other two forms of power: power based on resources and power based on discursive legitimacy.

In the HRI – SeedCo (2001-2004) episode, SeedCo controlled the major part of resources such as money, facilities, and some of the knowledge needed for the development of a new breeding method. HRI was not able to control the resources such as money and trial facilities; however, by being a highly reputable organisation and possessing another aspect of the necessary knowledge, they could exercise power just as strongly as SeedCo, to legitimise their interests with regard to the way in which the joint project should be conducted. Thus, the power of resources, combined with the power of meaning exercised by HRI was balanced with the power of SeedCo with respect to resources. In the case of

SoftwareCo – MachineCo, the power exercised by both partners was also relatively balanced. Their power was based mainly on resources. By contributing highly complementary resources, i.e. knowledge and skills, they were equally able to influence the way in which the collaboration developed.

In the HRI – Becker Underwood (1999-2004) episode, Becker Underwood, by having gained experience in biopesticide production over the years, accumulated sufficient expertise and possessed all the necessary resources for cold-active nematode product development. In this way, most of the power based on resources was concentrated with Becker Underwood. However, HRI was able to resist Becker Underwood's attempts to impose the rules for joint development by exercising the power of discursive legitimacy based on their scientific reputation in the area. The dynamics observed in the AnalyticsCo – BiotechCo case, indicate that the partners could influence the course of collaboration based on their experience with the end customers in the pharmaceutical industry. They also relied on each other's complementary services to present the end product to the client. This indicates that the partners could exercise relatively equal power based on resources (e.g. knowledge in complementary areas).

These relationships where the power to influence the course of collaboration shared equally between the partners present the risk of an escalation of conflict (Hardy and Phillips, 1998). Indeed, in the episodes discussed above, conflicts did eventually erupt. However, first two episodes were characterised as high in knowledge development, which means that the partners were able to exercise their power in a productive way by

engaging in inter-organisational learning and moving the collaboration forward. Consequently, under different circumstances, shared power between the partners could have a constraining effect on collaboration. This happened in the two latter episodes. In the circumstances these collaborations developed power balanced equally among the partners had a constraining effect on inter-organizational learning. As the Table 5.1 demonstrates, in the first two episodes discussed above, contrary to the latter two, the sufficient conditions for high inter-organizational learning were present, i.e. shared practice through frequent interactions among partners and high interdependence. Such circumstances were crucial so that power balanced equally among partners had productive effects, ultimately, leading to knowledge creation with both partners contributing.

After examining the nature of power, it is important to examine to greater extent the relation between power and interdependence, because both partly derive from the partner's complementary resources and may be closely interlinked. However, whether two are interrelated depends on the nature of the resources involved in the interdependence and also the nature of power. If interdependence is based on the same resources that are involved in generating power, two are interrelated. In this case, high interdependence would imply equally shared power based on resources as, for example, in the HRI – SeedCo (2001-2004) episode. On the other hand, two may be unrelated if the nature of interdependence is different from the nature of power. For example, in the HRI – Becker Underwood (1986-1988) episode, interdependency was not based on knowledge but on the financial resources, while the main source of power was

knowledge. Thus, high interdependency didn't apply that partners could exercise equal power based on resources. In this way, it is necessary to consider interdependency and power balance separately.

By examining the distinctive way in which power was implicated in the unfolding of collaboration and learning processes, the findings presented above demonstrated, first, the influence of different forms of power, i.e. power of resources and power of discursive legitimacy, on establishing the power balance among partners. Even when partners had unequal power based on resources, the power balance was compensated by the power of discursive legitimacy, which, in the cases studied here, was mainly derived from the reputation characteristics of the organisations involved.

Second, the findings demonstrated the mediating role of power in the process of inter-organisational learning. Examination of power dynamics allows better understanding of why and how certain inter-organisational rules emerged. Thus, in the episodes characterised by power balanced between partners, the process of inter-organisational learning involved more bargaining, and the resulting rules were based on the inputs from all partners. Furthermore, in those of the episodes characterised by high interdependence and intensive inter-partner interactions, conflicts were eventually resolved and inter-organisational rules emerged, as indicated by high inter-organisational learning. On the contrary, in the episodes, characterised by low interdependence and limited interactions, the partners were not able to reconcile their differences and agree on a common way of working, as indicated by low inter-organisational learning.

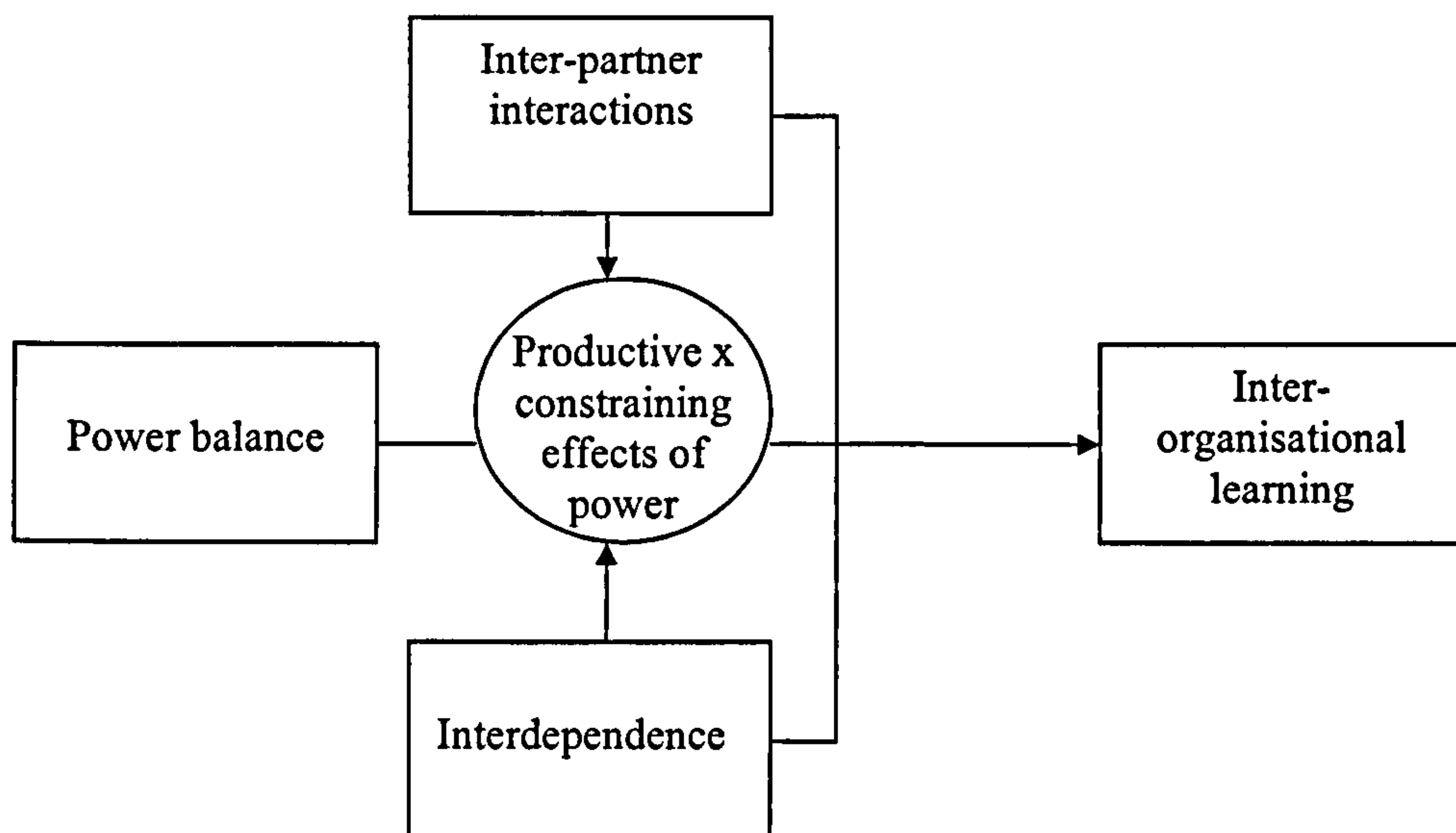
5.4.2 Cross-case findings and their implications

Figure 5.1 maps the key elements that informed the case-by-case findings. Thus, the characteristics of inter-partner interactions and the degree of interdependence between the partners appeared as the most distinguishable similarities and differences across the cases with respect to the presence of significant inter-organisational learning and joint knowledge creation. The cross-case findings suggest that while the presence of intensive inter-partner interactions was a necessary condition for powerful inter-organisational learning (i.e. all episodes of high inter-organisational learning were characterised by intensive inter-partner interactions), only a combination of intensive inter-partner interactions and a high degree of interdependency was necessary for inter-organisational learning to occur (i.e. high interdependency and intensive inter-partner interactions led to inter-organisational learning). In this way, the nature of inter-partner interactions and the degree of interdependency help to explain the extent to which inter-organisational learning takes place. Thus, while intensive inter-partner interactions provide the means for a community context to emerge and for practice to be shared, a high degree of interdependency ensures that the parties engage in knowledge sharing and, more importantly, are motivated to reconcile the differences in perspectives and interests and resolve emerging conflicts.

Furthermore, as Figure 5.1 indicates, the balance of power and its implications had more subtle effects across cases. Distinct ways in which the power balance was formed and

inter-organisational rules emerged in the cases were determined by the particularities of each singular case context. Nevertheless, commonalities and differences were found through the comparative analysis in the mediating effects, productive or constraining, produced by the power balance throughout the process of inter-organisational learning. Thus, when power was balanced amongst the partners, it produced opportunities for new ways of working and new knowledge to emerge through a process of inter-organisational learning as the partners had to reconcile their differences and resolve conflicts. In conditions of intensive inter-partner interactions and high interdependency, these opportunities were realised while, combined with less intensive interactions and low interdependence, power balance had a constraining effect on inter-organisational learning and inhibited new knowledge creation.

Figure 5.1 Key elements that emerged from cross-case comparative analysis



In this way, the present research makes the observation that the process of inter-organisational learning relies on such emergent characteristics of collaboration as the nature of inter-partner interactions, the degree of interdependency between the partners, and the balance of power exercised by the partners to define the course of collaboration. This has a number of implications, as follows. First, the present research addresses the limitations of the existing research that relied mainly on differentiating between competitive and cooperative elements of collaboration and the prevalence of opportunistic behaviour among partners to explain learning dynamics and outcomes. The findings of this research indicate that the absence of a competitive element in collaboration does not necessarily lead to co-operative behaviour and superior learning as the existing studies on learning in collaboration would predict (see Chapter 2, Section 2.4.1.2). Five inter-organisational relationships studied here did not have a competitive element, as the partners in collaboration were not competitors. However, learning dynamics observed across the collaboration episodes highlighted that learning behaviour leading to collaborative knowledge development was not always present. This draws attention to the need to consider other aspects of collaboration affecting social dynamics to help explain learning processes and outcomes, namely, the nature of inter-partner interactions, interdependency and power balance.

Second, the evidence emerging from the case studies provides a wider view of the role of power than usually pictured in the literature on learning in collaboration (Hamel, 1991; Inkpen and Beamish, 1997; Makhija and Ganesh, 1997; Larsson, et al., 1998). This has

important implications for the understanding of the role of power in inter-organisational learning and collaboration. As discussed in Chapter 2, Section 2.4.1, the studies of inter-organisational collaboration concerning competitive learning and bargaining power focus mainly on the negative effects of power that lead to the dominant position of one partner over another and the constraint on learning processes. In contrast, the present research demonstrated productive, as well as constraining, effects of power dynamics on learning in collaboration. Furthermore, the findings highlight a variety of sources and forms of power implicated in inter-organisational processes rather than power alone based on resources frequently emphasised in the existing literature (see Chapter 2, Section 2.4.1.2). Distinguishing between different forms of power permits refinement of the explanation of the mechanisms underlying inter-organisational learning and the associated social dynamics by specifying how legitimacy arises and certain inter-organisational rules become established.

In this way, the present research provides fuller understanding of the mechanisms underlying inter-organisational learning. A number of collaboration characteristics associated with learning dynamics have emerged from the data analysis. The findings, depicted in Table 5.1, also indicate that the evolution of these characteristics in the course of collaboration development can have important implications for inter-organisational learning and, consequently, the capacity for knowledge creation in collaboration. For instance, the learning dynamics observed in the episode in the early stage of the HRI – Becker Underwood collaboration (1986-1988) were different in the episode in the latter

stage of this collaboration (1999-2004). This issue will be further discussed in the next section.

5.5 INTER-ORGANISATIONAL LEARNING AND COLLABORATION DEVELOPMENT

The previous section addressed the way in which a number of emerging collaboration characteristics affects inter-organisational learning processes. It also indicated that the evolution of these characteristics may influence inter-organisational learning dynamics. This section aims to examine the relationship between inter-organisational learning and the process of collaboration development. The last row of the Table 5.1 depicts which generative forces were manifested in collaboration development during the six collaboration episodes. The operation and timing of generative forces were discussed in detail and graphically presented in the case analysis in Chapter 4. A number of observations can be made based on the finding presented in Table 5.1. First, it indicates that the teleological force was manifested in those collaboration episodes characterised by high inter-organisational learning, with the exception of the Bodycote, TWI and FORCE case. Second, the dialectical force was manifested in those episodes when power to influence collaboration was balanced equally among partners.

Inter-organisational learning is a central process in the teleological mode of development. Teleology implies that, in the course of collaboration, participants purposefully evaluate and adjust inter-organisational environments (Larson, 1992; Ring and Van de Ven, 1994;

Doz, 1996; Kumar and Nti, 1998). Learning leading to formation and modification of inter-organisational rules is a part of this process of mutual adaptation (Parkhe, 1991). In this way, in most of the cases, the teleological mode of development was always accompanied by inter-organisational learning. In the HRI – Becker Underwood (1986-1988) episode (see Figures 4.2 and 4.3), the initial product development period presented a teleological pattern of development. During the same period, intensive inter-organisational learning took place. The same pattern could be observed in the HRI – SeedCo (2001-2004) (see Figures 4.5 and 4.6) and SoftwareCo – MachineCo (1995-2004) (see Figures 4.14 and 4.15) episodes. Finally, in the Bodycote, TWI, and FORCE case, learning associated with the teleological mode of development was mostly intra-organisational, rather than inter-organisational.

It was noted in Section 5.4.1 that relationships where power is equally balanced among partners created the risk of an escalation of conflict (Hardy and Phillips, 1998). The manifestation of the dialectical force in four such collaboration episodes indicates precisely that conflicts did arise among the partners, although collaboration outcomes played out differently across these four episodes. While the first two episodes demonstrated high degrees of inter-organisational learning and knowledge development, the other two were low in inter-organisational learning and, consequently, failed to produce new knowledge. This means that inter-organisational learning was a mechanism crucial for the process of synthesis (Van de Ven and Poole, 1995) in the dialectical mode of development. The studies that emphasise dialectical processes in the inter-organisational domains, which consist of a range of actors with frequently conflicting

interests, highlight that reconciliation of the conflicting forces involves the process of bargaining and negotiating between different perspectives and identities (Elg and Johansson, 1997; Hardy and Phillips, 1998; Buchel, 2000; Shenkar and Yan, 2002). The production of inter-organisational rules (i.e. inter-organisational learning), which become legitimate and accepted by the participants, constitutes the process of synthesis which is a part of the dialectical development (Van de Ven and Poole, 1995), and is essential for the collaboration to continue. In the HRI and SeedCo (2001-2004) episode, inter-organisational learning that occurred along with the dialectical pattern of development ensured that the partners resolved their differences and the collaboration progressed. Similar dynamics were observed in the SoftwareCo – MachineCo episode. The dialectical tensions that came to the fore for a period of time were accompanied by inter-organisational learning through which the partners reconciled their interests.

The findings discussed above have an important implication. They explain the mechanisms underlying the way in which inter-organisational learning may contribute positively to collaboration development. The existing studies indicate that learning and mutual adaptation between partners could lead to the longevity and, ultimately, to the success (i.e. achieving what was sought as an objective) of collaboration (Parkhe, 1991). Thus, Larson (1992), Doz (1996) and Buchel (2000) found that the presence of inter-organisational learning ensured the progress of collaboration towards further advancement. Furthermore, the studies that examined failure in inter-organisational collaborations (Arino and de la Torre, 1998; Shenkar and Yan, 2002) demonstrated how the absence, or inadequacy, of inter-organisational learning led to the deterioration and

eventual termination of the inter-organisational relationships. Findings presented here offer a fuller explanation, which is discussed below.

In the case analysis in Chapter 4, teleology was found to directly influence the progression from one life-cycle stage of collaboration to another. For instance, in the HRI – Becker Underwood case, the teleological force governed the initial product development (1986-1990) and propelled the collaboration to its next mature life-cycle stage. Larson (1992), in her study of several entrepreneurial inter-organisational dyads (see Chapter 2, Section 2.5.2.2), observed similar dynamics. The teleological processes of learning and adaptation between the partners facilitated the development of effective mechanisms to integrate their operations and, consequently, allowed the collaborations to progress.

Furthermore, the dialectical force was repeatedly found to influence the duration and transition from one stage of the life-cycle to another. For instance, in the HRI – Becker Underwood and HRI – SeedCo cases, dialectical tensions resulting in conflicts between partners introduced delays in collaboration development and, in the first case, led to a termination stage of collaboration. In the same manner, in the AnalyticsCo – BiotechCo case, there was no inter-organisational learning while the dialectical tensions came into play, resulting in the static relationship. Buchel (2000; 2002) and Shenkar and Yan (2002), in their longitudinal studies of inter-organisational alliances (see Chapter 2, Section 2.5.2.2), observed the effects of the dialectical forces on the duration of the life-cycle stages and the transition between them. Buchel, in particular, examined in detail

how the emergent conflicts in the course of collaboration development influenced each stage of the joint venture, and ultimately led to its termination. Shenkar and Yan also indicated the role of the emerging inter-partner conflicts and intensification of political behaviour on the part of the partner organisations in the dissolution of the alliance. In this way, the above examination of the interrelation between the forces reveals how inter-organisational learning, as a part of the teleological and dialectical modes of development, affected the progression of collaboration.

Although strong evidence was found to demonstrate the positive aspect of inter-organisational learning as a part of the process of collaboration development, other evidence was also found suggesting the negative influence of inter-organisational learning on collaboration development. The negative effects in this respect observed in this study pertained to the 'myopia of learning' (Levinthal and March, 1993). For instance, in the HRI – Becker Underwood case, inter-organisational learning occurring during the initial stages of collaboration soon became an impediment for further collaboration development. The next section addresses this issue.

5.5.1 Unlearning

A particular aspect of inter-organisational learning dynamics that was observed in two cases, HRI – Becker Underwood and HRI – SeedCo, was unlearning (see Chapter 4). As discussed in Chapter 2, once organisations learnt, in the course of time, learning could become biased and narrow, exploiting only particular experiences that came to dominate

further learning (Hedberg, 1981; Levinthal and March, 1993). As a result of this 'myopia of learning' (Levinthal and March, 1993), organisational learning has the capacity to make negative, as well as positive, contributions to the facilitation of new knowledge development. In this way, in order to maintain variety in terms of experience, organisations must unlearn, i.e. discard in some way obsolete experiences to be able to experience situations in a new way (Hedberg and Jonsson, 1978; Hedberg, 1981) (see Chapter 2, Section 2.3).

In the inter-organisational context, learning results in the inter-organisational rules that create coupling between otherwise independent human behaviours (Holmqvist, 2003b), making joint activities possible. However, when conditions change, these learnt rules and behaviours can become impediments for further learning and the development of new knowledge. This seemed to be the case for the collaboration between HRI and Becker Underwood (see Figure 4.3). The inter-organisational rules developed at the beginning of the collaboration were able to govern the relationship and ensure new knowledge production (development of new biopesticide product lines) for a certain period of time (from 1988 to 1993). Yet, when the conditions changed (e.g. restructuring in both organisations, Becker Underwood, or Microbio's acquiring their own expertise in the nematodes and production experience), these rules became impediments for further inter-organisational learning, much needed for the release of the cold active nematode product, delaying the progress of the collaboration. The process of unlearning, i.e. the discarding of the obsolete rules and behaviours, was crucial for the partners to have an opportunity to start learning again.

One part of the process of unlearning in the HRI – Becker Underwood case, occurred through the gradual turnover of people involved in the collaboration from both organisations. In this way, old inter-organisational rules (e.g. HRI technically led the collaboration and performed the trials with Becker Underwood funding) did not ‘work’ anymore, as they were partly destroyed by personnel turnover (Carley, 1992), especially on the science side of the collaboration. Another part of the process of unlearning occurred through the inquiry into ‘theories in use’, or the existing inter-organisational rules, by the organisational members (Schon, 1983). In this way, the process of unlearning that took place through personnel turnover and inquiry into the existing rules on the part of the collaboration participants, resulted in the complete discarding of the old inter-organisational rules, making it possible for further inter-organisational learning to begin.

The inter-organisational learning dynamics in the HRI – SeedCo case involved refocusing from collaboration with the exploitative orientation toward joint explorative undertakings (see Figure 4.6). The initial period of this collaboration consisted of exploitation by the partners of each other’s experiences through a license agreement. While HRI developed a breeding technology to produce uniform leeks, SeedCo exploited this knowledge through commercial production of seeds for this crop. HRI, in turn, shared the benefits of SeedCo’s commercial success in this area by receiving royalty payments. Changes in SeedCo’s product development strategy (e.g. a shift of the R&D investments to certain crops) led to the reorientation of the collaboration towards joint exploration activities, as

SeedCo saw an opportunity to enhance its position in one of their strategically important crops through collaboration with HRI. Switching to joint exploration involved a process of unlearning on the part of the partners. This unlearning took place through direct inquiry into the previous way of collaborating between the two organisations. In particular, the existing inter-organisational rules with regard to HRI's use of royalty payments from their contract with SeedCo and, more importantly, the degree of control that SeedCo could have over HRI's activities within joint projects were reassessed. As a result of this process, the way in which the two organisations collaborated changed fundamentally.

5.5.2 The effects of inter-organisational learning on the process of collaboration development

The findings discussed above have a number of implications. First, they indicate the presence of constraining effects of inter-organisational learning on the process of collaboration development, which is not entirely consistent with the view of inter-organisational relationships that place emphasis on the positive role of inter-organisational learning and development of inter-organisational routines (Gulati, 1995a; 1995b; Zollo, et al., 2002) (see Chapter 2, Section 2.5.2.2). Thus, the case evidence from this research points out that the assumption that inter-organisational learning is positively related to alliance adaptation and survival is not always the case.

Second, the findings demonstrate some of the mechanisms of unlearning in the inter-organisational contexts. Thus, one mechanism of unlearning observed in this study was directly associated with the changes occurring in collaboration (e.g. the turnover of people involved in collaboration, in the HRI – Becker Underwood case). Another way of unlearning occurred through the process of enquiry on the part of organisational members into existing inter-organisational rules. Nevertheless, the process of enquiry was triggered by changes undergone by the collaborative relationships, rendering the existing rules inadequate for governing further collaboration and thus, obsolete. This required their reassessment on the part of the collaboration participants (e.g. negotiations about changing the way royalty payments were used to facilitate further refocused collaboration in the HRI – SeedCo case). In this way, the evidence suggests that unlearning is not a planned process that can be fully controlled by the participants. Importantly, it is a process closely related to the changes occurring in the course of collaboration development.

The above Section 5.5.1 addressed an important aspect of inter-organisational learning dynamics, namely, the process of unlearning. Based on the findings discussed in the above section, the present study demonstrates that inter-organisational learning can have facilitating, as well as constraining, effects on collaboration dynamics. However, the presence and timing of these effects are closely related to the dynamics of collaboration itself. For instance, collaboration dynamics were found to trigger the process of unlearning, as discussed above. This indicates the recursive path-dependent relationship between inter-organisational learning and collaboration dynamics. Before discussing

further implications of these findings, Section 5.5.2 will specifically address the dynamics of collaboration development.

5.5.3 The process of collaboration development: longitudinal analysis

This section longitudinally examines the process of collaboration development. Previous research into the process of inter-organisational collaboration provided limited explanations of the collaboration development, as most of the studies emphasised only one mode of development (see Chapter 2, Section 2.5.2.2). By adopting a generic process framework (see Chapter 2, Section 2.5.2.1), the present research avoided the need to follow any particular theory of collaboration to produce process explanations. It highlighted the circumstances when each generative force came into play and examined the timing when different generative forces predominated (see Chapter 4). Table 5.2 shows which of the four generative forces were observed to shape the pattern of development in each case of inter-organisational collaboration.

Table 5.2 Generative forces that shaped collaboration development

Case Study	Interplay among generative forces			
	Life-Cycle	Evolution	Teleology	Dialectics
HRI – Becker Underwood	√	√	√	√
HRI - SeedCo	√	√	√	√
Bodycote, TWI and FORCE	-	-	√	-
AnalyticsCo - BiotechCo	√	√	-	√
SoftwareCo - MachineCo	-	√	√	√

Table 5.2 indicates that, in most of the cases, the pattern of collaboration development was shaped at least by three different generative forces brought to the fore, on the one hand, by the contexts surrounding collaborations and, on the other, by their internal dynamics. Besides the presence of a variety of developmental forces and their timing, another important driver shaping collaboration patterns was interrelation among the generative forces. Earlier, in Section 5.5.1, some of the interrelations between the generative forces and their effects on the development of collaboration were addressed. Specifically outlined was the way in which teleological and dialectical forces interrelated with the life-cycle. There were other interrelations between the generative forces that also emerged from the case studies.

The evolutionary dynamics were found to affect the duration of the life-cycle stages both directly and indirectly. Thus, in the case of AnalyticsCo – BiotechCo (see Figure 4.11), the co-evolution with AnalyticsCo's strategy for growth through acquisitions sparked the alliance. The overall duration of the alliance also depended on the further acquisition activity of AnalyticsCo (as it might end with the acquisition of BiotechCo by the partner). In this way, the life-cycle of this particular inter-organisational relationship directly co-evolved with AnalyticsCo's acquisition strategy.

In the HRI and Becker Underwood case (see Figure 4.2), the co-evolution with changes in both partner organisations (e.g. major restructuring) introduced delays to product development and, in this way, directly influenced the current life-cycle stage by prolonging it. Restructuring undertaken by both organisations, as well as the general

change in the biopesticides sector (less investment in new R&D), intensified the dialectical tensions arising from inter-partner differences, and produced additional tensions. For instance, having biopesticides as a peripheral product, combined with the industry tendency to cut new investments, rendered Becker Underwood unwilling to invest in a new product line development different from the HRI's interests at the time. Co-evolutionary dynamics led to a change in the interdependency between the partners (e.g. Becker Underwood were less dependent on HRI's expertise) and destroyed the existing inter-personal links between the two organisations. In this new context, the dialectical forces came to the fore, resulting in high levels of conflict. This introduced further delays in product development. Ultimately, both forces, evolutionary and dialectical (activated by the co-evolutionary dynamics) propelled the collaboration towards termination, indicating the indirect influence of the evolutionary force on the length of, and transition between, the life-cycle stages.

Similar effects could also be observed in the case of HRI – SeedCo (see Figure 4.5). Co-evolution with SeedCo's overall strategy (achievement of the leading position in a particular crop area) directly affected the life-cycle development of the collaboration, which, instead of terminating, turned tangentially, refocusing on a new area. These co-evolutionary dynamics also triggered dialectical processes. SeedCo's interests conflicted with the way HRI conducted its commercial projects (e.g. with the way in which royalties were reemployed). The tensions within HRI and, consequently, between the partners, resulted in prolonged negotiations before the collaboration could continue (2000-2002).

In this way, in the above cases, co-evolutionary dynamics influenced the life-cycle of the relationships directly and also indirectly by bringing the dialectical tensions to the fore.

The following evidence further highlights the crucial role of the evolutionary force in bringing the dialectical processes to the fore. In the case of AnalyticsCo – BiotechCo, the delay of the acquisition to an undetermined future (because of the acquisition opportunities pursued elsewhere) generated uncertainty about the course of collaboration. This allowed the differences between the partners to erupt into conflicts, which, failing to be resolved, resulted in a static relationship. In the case of SoftwareCo – MachineCo, the co-evolution with the overall strategy of MachineCo (initial production of complex multifunction machines) placed pressure on the young relationship between the partners. Under the pressure of the additional developments, the inter-organisational differences surfaced, resulting in explicit conflicts between the partners.

In this way, the cross-case analysis, first, revealed how the evolutionary force was interrelated with the life-cycle development. Thus, the evolutionary force directly affected the duration of the life-cycle stages identifiable in the collaborations' prolonging or accelerating of their pace. It also had an effect on the timing of the transition between the stages by triggering collaboration to enter its next life-cycle stage. Second, the analysis highlighted the mediating role of the dialectical force between evolution and life-cycle. This means that the changes provoked by the evolutionary force produced indirect effects on the life-cycle via dialectical processes activated by the evolutionary dynamics. Third, the findings emphasised the crucial role that the evolutionary force played in

introducing new sources of dialectical tensions and shifting the contexts surrounding collaboration in a way that encouraged already existing potential dialectical tensions to come to the fore. Indeed, the emergence of the dialectical tensions was frequently associated with the evolutionary force operating in the foreground. In this way, the research demonstrated the way some of the mechanisms in which the shifting contexts of collaborations were embedded played a crucial role in the pattern of development.

The findings presented in this section make the important observation that, although there were some commonalities across cases, there was no common pattern of development observed across the five collaborative relationships studied. This means that in order to explain the developmental pattern of the collaborative relationships, it is necessary to consider a combination of factors specific to each particular case, such as the evolution of the institutional, industrial and organisational contexts, inter-partner dynamics, and the characteristics of the organisations involved. The commonalities across cases were, first, the similarity of the contexts, in which certain generative forces were able to come to the fore and, second, some of the mechanisms through which the generative forces interrelated. For instance, the evolutionary and dialectical forces and their interrelation (as discussed above) appeared as the most influential across the majority of the cases, indicating the importance of these particular developmental dynamics; dynamics which have not been sufficiently explored in the existing studies (de Rond and Bouchikhi, 2004). Although it was possible to draw some general conclusions, the longitudinal analysis showed that each of inter-organisational collaborations followed a specific path

of development, which was determined by a particular combination of different generative forces and the interrelation among them over time.

This has an important implication for research into inter-organisational collaboration. It is common in the existing research in this area to offer specific models, such as linear or cyclical stage models (Ring and Van de Ven, 1994; Doz, 1996; Arino and de la Torre, 1998) and frameworks that rely on specific inter-organisational dynamics such as politics (Hardy and Phillips, 1998), rivalry (Inkpen and Beamish, 1997; Makhija and Ganesh, 1997) or internal tensions (Das and Teng, 2000; de Rond and Bouchikhi, 2004), or solely rely on the population dynamics, ignoring the internal drivers and historical path of each particular relationship (Gulati, 1995; Zollo, et al., 2002) to explain collaboration development. The present research makes the point that inter-organisational collaboration dynamics cannot be a function of either the choices made by the participants or some unpredictable contradictory forces within the relationship, nor can they be completely explained by the exogenous population level developments. By presenting broader (than those available in the existing literature) analysis of collaboration development, the present research has produced process explanations that encompass a variety of aspects of collaboration dynamics such as learning, politics, bargaining power, and co-evolution among others, without being limited to a particular perspective. In this way, the present study advocates that a variety of generative forces that come into play in the specific contexts and interrelate in a specific manner should be considered, in order to provide fuller and non-exclusive explanations of collaboration dynamics.

5.5.4 The relationship between inter-organisational learning and collaboration development

The above Section 5.5.3 addressed the process of collaboration development. It provided a view of collaboration dynamics that did not rely on a predetermined model or a specific theoretical perspective to explain the pattern of development. The purpose of Section 5.5 was to examine the relationship between inter-organisational learning and collaboration developmental dynamics. The existing process studies of collaboration indicate that learning is at the core of collaboration development (see Chapter 2, Section 2.5.3). However, the way in which collaboration and learning interrelate has not been adequately addressed in the literature. By having examined the process of inter-organisational learning in the longitudinal context of collaboration development, the present study demonstrates an important implication for research into collaboration and learning.

The findings of the present study provide better understanding of the role of inter-organisational learning in collaboration dynamics. At the same time as inter-organisational learning comprises an element of the forces shaping collaboration development (having diverse effects by enabling and constraining it), it is also a product of the collaboration process. The shifting contexts surrounding collaboration, which are the result of complex collaboration dynamics, affect the emerging characteristics of collaboration (e.g. interdependence, inter-partner interactions and power balance), found to enable or constrain inter-organisational learning. In this way, as well as shaping

collaboration dynamics, the inter-organisational learning process co-evolves with the changes occurring along collaboration development.

5.6 KEY INFLUENTIAL ELEMENTS IN PROCESSES OF COLLABORATION AND KNOWLEDGE CREATION

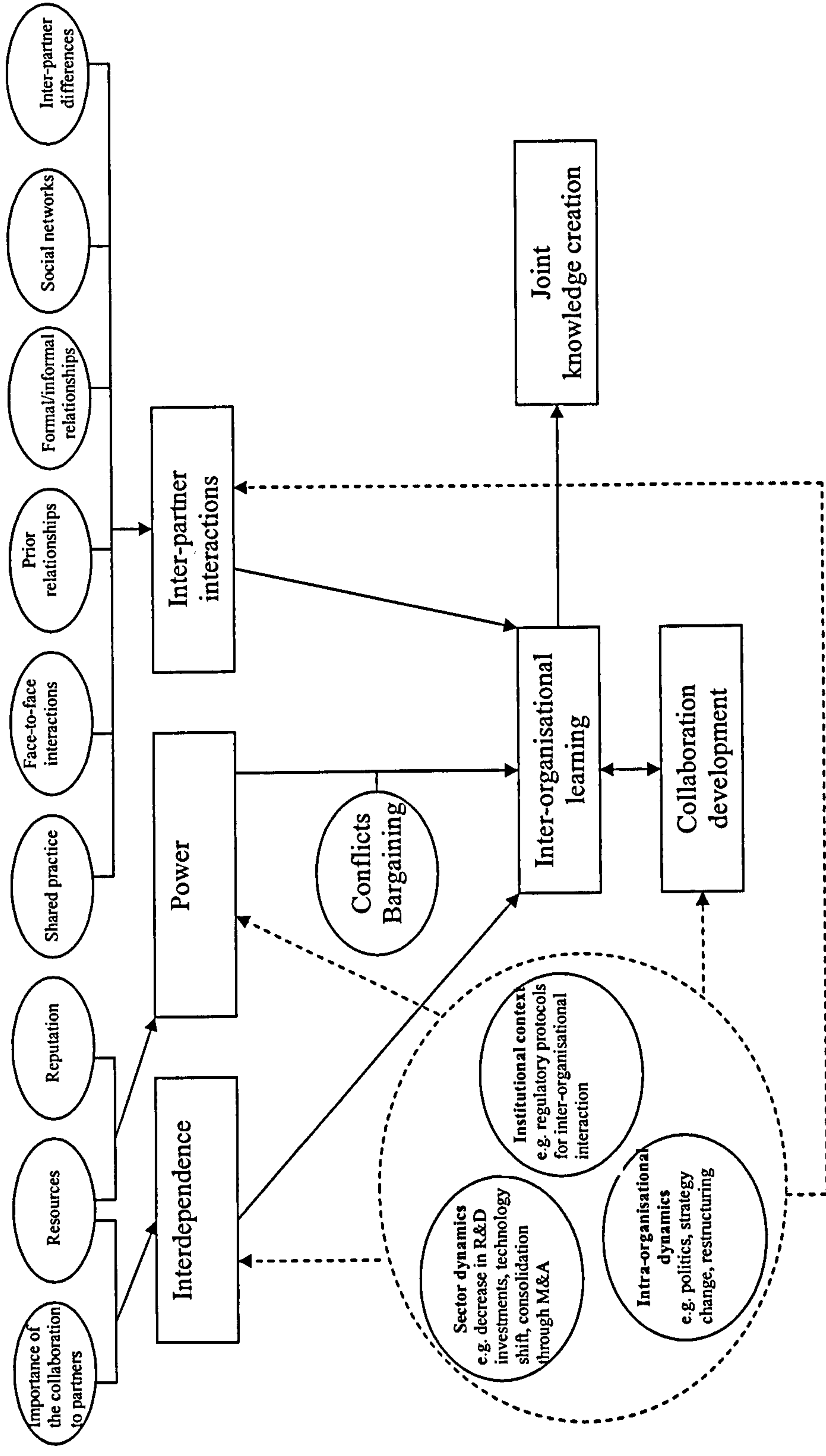
Before presenting a summary of the findings, their implications and conclusions, this section maps and discusses various elements that have been identified as influential in the processes of collaboration and knowledge creation in the cases under consideration. They are diagrammatically depicted in Figure 5.2. The diagram does not represent causal relationships, but rather indicates influences and interdependencies among the elements.

The core relationships depicted in Figure 5.2 are, first, a two-fold relationship between inter-organisational learning and collaboration development. It indicates that learning can be envisioned as a driving force, contributing positively (Parkhe, 1991) and/or negatively (as the present research has demonstrated) to collaboration dynamics, as well as co-evolving with it. Second, joint knowledge creation is a process found to be closely related to inter-organisational learning. The findings across cases demonstrated the presence of significant inter-organisational learning in the collaborations that were successful in knowledge creation. Inter-organisational learning is essential for development of the coordination mechanisms (Dyer and Nobeoka, 2000) and establishment of inter-firm governance (Lubatkin, et al., 2001) that ultimately are responsible for the emergence of common understandings and the shaping of common frameworks for action (Brown and

Duguid, 2001; Holmqvist, 2003). In this way, the knowledge creation process is facilitated.

Furthermore, the diagram indicates that the process of inter-organisational learning is associated with the presence of bargaining and the emergence of conflicts among the partners. Despite being purely co-operative, non-competitive relationships, the collaborations depicted in the case studies did not always present a propitious environment for learning. Learning dynamics were determined not by the balance between co-operative and competitive orientation (c.f. Hamel, 1991; Larsson, et al., 1998), but by the degree of interdependence between the partners, the nature of inter-partner interactions and the balance of power in collaboration. Thus, the combination of strong interdependence and intensive inter-partner interactions created the necessary conditions for significant inter-organisational learning to take place. In addition, the diagram emphasises the mediating effect of power. When power was equally balanced among the partners, it implied eventual escalation of conflicts (c.f. Hardy and Phillips, 1998), but, at the same time, presented an opportunity for creative dynamics to trigger the emergence of new ways of doing things. Moreover, such productive effects of power were only possible in the conditions of high interdependency and intensive inter-partner interactions. In this way, the findings highlight the aspects of inter-organisational dynamics associated with 'power to' rather than 'power over' (Hardy, 1996).

Figure 5.2 Key elements influencing over processes of collaboration and knowledge creation



Furthermore, the diagram depicted in Figure 5.2 encompasses a number of concrete collaboration characteristics found to influence the processes discussed above. The nature of inter-partner interactions emerged across the cases as one of the crucial elements influencing inter-organisational learning and consequent knowledge creation. The presence of face-to-face interactions and shared practice permitted the development of shared interpretive schemes (e.g. HRI – SeedCo case), facilitating knowledge flows and enabling reconciliation of inter-partner differences, such as national and organisational cultures (e.g. SoftwareCo – MachineCo case). On the other hand, the absence of face-to-face interactions and shared practice constrained inter-partner dynamics (e.g. HRI – Becker Underwood and AnalyticsCo – BiotechCo cases). Prior relationships and social networks (which were reflected in the initial selection of the partners) in which the participants were entrenched were also important factors influencing the nature of inter-partner interactions (c.f. Gulati, 1995). Positive previous experiences between the organisations or people involved provided a head start for collaborative projects facilitating social exchange (e.g. HRI – SeedCo and Bodycote, TWI – FORCE cases). Furthermore, the established and emerging informal relationships among the participants (c.f. Kreiner and Schultz, 1993; Liebeskind, et al., 1996) were also found to reinforce inter-partner interactions (e.g. in the cases of SoftwareCo – MachineCo and Bodycote, TWI – FORCE).

The characteristics of collaboration depicted in Figure 5.2, indicating the importance attributed by the partners to the collaborations and the resources, were found to determine the degree of interdependence among the partners. The importance of the

collaboration to the partners resulted in the motivation needed to allocate the resources for learning (c.f. Khanna, et al., 1998) and to engage in knowledge sharing (c.f. Swan, et al., 1999). With respect to resources, as the collaborations studied here were essentially oriented towards new knowledge production, the most valuable 'resource' about which the partners operated interdependently was knowledge (e.g. genetic mapping data, plant breeding experience). Such resources not only determined the degree of interdependency between the partners, but also the balance of power that they could exercise over the course of collaboration. The availability of expert knowledge was found to be an important source of influence on the part of the partners in almost all the cases. It was not however, the only source of power available to the partners. In some cases (e.g. HRI – Becker Underwood), the power of meaning (Hardy and Phillips, 1998) derived from the reputation of the partners also contributed to the power balance.

Figure 5.2 depicts a number of the elements identified as influential in processes of inter-organisational learning and knowledge creation and possible relations among them, but more importantly, it indicates how the emergent collaboration characteristics can relate to collaboration dynamics. Thus, the diagram depicts not only the role of the elements in the process of learning and collaboration development, but also how they, in turn, can be influenced by the changes triggered by the collaboration development over time. The effects of the co-evolutionary dynamics of collaboration development with the institutional, sector and organisational contexts were found to be particularly bold. Across all the cases

changes in these contexts had direct effects on the collaboration characteristics depicted above. The importance of co-evolutionary dynamics in explaining inter-organisational processes has been recognised in the literature (e.g. Koza and Lewin, 1998), but has received limited attention (de Rond and Bouchikhi, 2004). The present study has examined some of the mechanisms through which the processes associated with collaboration and knowledge creation co-evolved with a number of contexts. For example, sector dynamics, such as decrease in R&D investments, can change the degree of interdependence between the partners, making R&D oriented partnerships less important to one of the partners (e.g. HRI – Becker Underwood case). This stimulates the inter-organisational learning process and the possibility of knowledge creation. In contrast, such sector dynamics can increase the interdependence between the partners, making collaboration even more important, especially for capturing resources (e.g. Bodycote, TWI – FORCE case), fostering further collaboration development. In a similar manner, co-evolutionary dynamics were found to have direct effects on the nature of inter-partner interactions (e.g. companies' restructuring in the HRI - Becker Underwood case) and power balance (e.g. intra-organisational politics in the HRI – SeedCo case).

In this way, this section brought together various elements influencing processes of collaboration and knowledge creation found across the cases. Some of the elements were present in some cases, but not in the others. Nevertheless, the main relationships depicted in Figure 5.2 remained in all the cases.

5.7 SUMMARY OF THE IMPLICATIONS OF THE STUDY AND CONCLUSIONS

The present study aimed to examine the processes that facilitate and constrain joint knowledge development in inter-organisational collaborations. The findings presented in Chapters 4 and 5 have a number of implications for this area of research, as summarised below.

- First, the present study addresses the limitations of the existing research on learning in collaboration. While the existing research links learning outcomes to the properties of knowledge and fixed collaboration characteristics such as inter-partner differences, the approach taken in the present research addresses the social processes through which new knowledge actually emerges.
- The findings demonstrate that knowledge creation through inter-organizational collaboration, or lack of it, is better explained while recognizing that knowledge is localized, embedded, and invested in practice. Consequently, the examination of the process of inter-organizational learning helps understanding why some inter-organizational arrangements are more successful in knowledge creation than others.
- Second, the present research provided an explanation of learning dynamics and outcomes that surpassed the view frequently advocated in the existing literature

that relies on examining competitive versus cooperative elements of collaboration to explain learning behaviours. It drew attention to the need to consider other aspects of collaboration affecting social dynamics to help explain learning processes and outcomes, namely, the nature of inter-partner interactions, interdependency, and power balance.

- Third, it provided a wider view of the role of power in learning dynamics than usually pictured in the literature on learning in collaboration (see Chapter 2, Section 2.4.1.2). The findings demonstrated productive, as well as constraining, effects of power dynamics on learning, and highlighted a variety of sources and forms of power implicated in inter-organisational processes. As was mentioned in the Section 5.4.1, the analysis of power was not the focus of the present research, however, the findings pointed towards potentially important role of power in shaping the process of inter-organizational learning. Future research could address this topic to a fuller extent.

In this way, the findings of the present research are useful in clarifying precisely what aspects of collaboration and what processes are important for knowledge development through inter-organisational collaboration. Table 5.1 indicated that while high inter-organisational learning was associated with intensive inter-partner interactions and high interdependence, low inter-organisational learning was associated with limited inter-partner interactions and low interdependence. On the other hand, the balance of power between the partners helped to explain what inter-

organisational rules emerged and how. By examining the distinctive way in which power was implicated in the unfolding of collaboration and learning processes, the findings demonstrated the influence of different forms of power, i.e. power of resources and power of discursive legitimacy, on the establishment of the power balance among partners. Furthermore, distinguishing between different forms of power allowed refinement of the explanation of the mechanisms underlying inter-organisational learning and associated social dynamics by specifying how legitimacy had arisen and how certain inter-organisational rules had become established.

- Fourth, the present research presented a view of collaboration development that encompassed a variety of aspects of collaboration dynamics such as learning, politics, bargaining power, and co-evolution, among others, without being limited to a particular perspective. This advocated that a variety of generative forces that come into play in the specific contexts and interrelate in a specific manner should be considered, in order to provide fuller and non-exclusive explanations of collaboration dynamics.

In this way, the present study made the point that instead of developing a variety of models to explain collaboration dynamics, the research into collaboration dynamics should concentrate on understanding the nature and operation of the generative mechanisms driving inter-organisational collaboration, specifying their timing and interrelationships.

- Fifth, the findings provided better understanding of the relationship between inter-organisational learning and collaboration dynamics. At the same time as representing a part of the forces shaping collaboration development (having diverse effects by enabling and constraining it), inter-organisational learning is a product of collaboration process. The shifting contexts surrounding collaboration, which are the result of complex non-linear collaboration dynamics, affect the emerging characteristics of collaboration (e.g. interdependence, inter-partner interactions and power balance) found to facilitate or constrain inter-organisational learning. In this way, as well as shaping collaboration dynamics, the inter-organisational learning process co-evolves with collaboration development.

The longitudinal analysis of inter-organisational learning in the course of collaboration development revealed how inter-organisational learning can have facilitative, as well as constraining, effects on collaboration dynamics. The presence and timing of these effects were found to be closely related to the dynamics of collaboration itself. This indicates the recursive path-dependent relationship between inter-organisational learning and collaboration dynamics.

- Sixth, the present study examined the process of unlearning, an important part of learning dynamics, which, to date, has not been addressed in the literature on learning in the inter-organisational context.

For instance, understanding the mechanisms of unlearning shed light on the mechanisms through which inter-organisational learning could constrain the process of collaboration development. These findings questioned the existing view of inter-organisational relationships that placed emphasis solely on the positive role of inter-organisational learning and inter-organisational routines in collaboration development. The findings demonstrated some of the mechanisms of unlearning in the inter-organisational contexts. Although an aspect of the unlearning involved the process of enquiry on the part of organisational members into existing inter-organisational rules, overall, unlearning was found to be an unplanned process that could not be fully controlled by the participants. Importantly, it was a process closely related to the changes occurring during collaboration development.

- Finally, seventh, the present study also has important methodological implications. It demonstrates the utility of a fine-grained, qualitative, longitudinal approach to the study of learning in collaboration. Much of the existing research in this area has been dominated by large-scale, quantitative methods that measure the outcomes of knowledge transfer, although there is much to be gained from examining more localised dynamics of learning processes in collaboration.

This chapter provided cross-case analysis of the data and presented the discussion of the findings and their implications for the areas of research this study set out to contribute to. The next chapter will present general conclusions of this research,

highlighting its implications for theory and practice, and outlining the limitations of the present study.

CHAPTER 6 CONCLUSIONS

6.1 INTRODUCTION

This chapter first outlines the major conclusions of the present research, by referring to the research questions proposed at the beginning of this study. It then addresses the implications of the study for theory and managerial practice. Finally, it discusses the limitations of the research, and indicates directions for future research.

6.2 GENERAL CONCLUSIONS

The present study aimed to address three main research questions:

1. How does collaboration develop over time as a result of the operation of a variety of generative forces, and how do these forces interrelate?
2. What is the nature of the process of inter-organisational learning in collaboration development?
3. Are inter-organisational learning and the process of collaboration development interrelated, and, if so, how do they interrelate?

First, it longitudinally examined the process of inter-organisational collaboration. It focused on the question of how collaboration developed over time as a result of the operation of a variety of generative forces that have been proposed in the literature. The findings revealed that a variety of collaboration dynamics - such as learning, politics, bargaining power, and co-evolution – operated in the context of inter-organisational learning. This analysis suggests that (a) different generative forces come into play in specific contexts and (b) they interrelate in a specific manner. This interplay between different generative forces should be considered in order to provide fuller and non-exclusive explanations of collaboration dynamics.

Second, the present study aimed to further develop the concept of inter-organisational learning, by viewing it as an inseparable part of collaboration activity. Instead of focusing solely on the outcomes of learning processes and factors affecting those outcomes, this study examined the processes through which inter-organisational learning was actually achieved or not achieved, by drawing upon the notion of learning and knowledge as a ‘situated’ social phenomenon grounded in organisational practices. Indeed, it has emerged from the findings that shared practice through intensive inter-partner interaction was a necessary condition for inter-organisational learning and consequent knowledge creation to take place. Furthermore, only in those collaborations characterised by shared practice, combined with high interdependency, did significant inter-organisational learning occur. The balance and the nature of power exercised by partners in collaboration influenced the kinds of inter-organisational rules that emerged, and the way in which

they emerged. Thus, these aspects of collaboration and their evolution during the course of collaboration development were found to be crucial for the process of inter-organisational learning and consequent knowledge creation.

Third, this research addressed the interrelation between inter-organisational learning and the developmental process of collaboration. By examining learning processes in longitudinal contexts of collaboration development, the findings showed that, at the same time as inter-organisational learning comprised an aspect of the forces shaping collaboration development (having enabling and/or constraining effects), it was also a product of the collaboration process. In other words, inter-organisational learning operates as both a medium for, and an outcome, of collaboration processes. A key contribution of this research is in understanding this generative (or in some cases degenerative) relationship between inter-organizational learning and collaboration.

6.3 IMPLICATIONS FOR THEORY

The findings of this study have a number of implications for research into inter-organisational collaboration and learning. First, they address the limitations of the existing research that has focused on linking learning outcomes to the properties of knowledge and fixed collaboration characteristics such as inter-partner differences (c.f. Mowery and Oxley, 1996; Lynskey, 1999; Simonin, 1999). The approach taken in the present research emphasises the processes through which knowledge actually emerges. By conceptualising inter-organisational learning, the present study shed

light on the on-going social processes through which inter-organisational domains were produced by the actors involved, and shaped new knowledge creation. In this way, the study extends the recent research into inter-organisational learning (Holmqvist, 1999; Dyer and Nobeoka, 2000; Lubatkin, et al., 2001; Holmqvist, 2003b), by examining the evolution of inter-organisational learning dynamics along the entire path of collaboration development, and by providing an account of the path-dependent nature of collaboration development in specific contexts.

Second, by taking a process-oriented longitudinal approach, the present research provides an explanation of learning dynamics and outcomes that goes beyond the view frequently advocated in the existing literature, which relies on examining competitive versus cooperative elements of collaboration to explain learning behaviours (c.f. Hamel, 1991; Larsson, et al., 1998). In this way, it contributes to this area of research by drawing attention to the need to consider other aspects of collaboration affecting social dynamics, namely, the nature of inter-partner interactions, interdependency, and power balance. The present study has also explored the role of power in inter-organisational learning. Whilst this analysis of power is preliminary, the findings here do demonstrate productive, as well as constraining, effects of power dynamics on learning. Moreover, they highlight a variety of sources and forms of power implied in inter-organisational processes. In this way, it extends the existing research that has, either not addressed power, or focused on only one dimension of power (power based on resources) and its

negative effects on learning in collaboration (c.f. Inkpen and Beamish, 1997; Makhija and Ganesh, 1997; Larsson, et al., 1998).

Third, the present study addresses the limitations of the existing research into the process of inter-organisational collaboration. The existing studies tend to offer specific models, such as linear or cyclical stage models (Ring and Van de Ven, 1994; Doz, 1996; Arino and de la Torre, 1998), and frameworks that rely on specific inter-organisational dynamics such as politics (Hardy and Phillips, 1998), rivalry (Inkpen and Beamish, 1997; Makhija and Ganesh, 1997) or internal tensions (Das and Teng, 2000; de Rond and Bouchikhi, 2004), or solely rely on population dynamics, ignoring the internal drivers and historical path of each particular relationship (Gulati, 1995; Zollo, et al., 2002) to explain collaboration development. By employing the generic process framework (Van de Ven and Poole, 1995), the present research makes the point that inter-organisational collaboration dynamics are not a function of either the choices made by the participants or some unpredictable contradictory forces within the relationship, nor can they be completely explained by exogenous population level developments.

Although general conclusions drawn from the five case studies must be limited, this research examined in detail some of the mechanisms through which specific generative forces came into play and interrelated. The insights gained from the empirical findings also allow a fuller examination of the types of relationships that may hold between the four generative forces. For instance, strong evidence was

found to support two relationships: (a) reinforcing effects of the teleological force on the life cycle and (b) reinforcing effects of the evolutionary force on dialectics. The logic behind the first relationships is that teleological processes of learning and adaptation help the collaboration to advance within its life cycle. With regard to the second relationship, it was found that the evolutionary dynamics surrounding the inter-organizational relationship could intensify or invoke the tensions of the dialectical nature. However, other forces were found to produce reinforcing as well as constraining effect on each other. For example, the dialectical force manifested constraining as well as reinforcing effects on the life cycle by delaying its progression in some cases and triggering the transition between the life cycle stages in others. Further research is needed to fully explore the nature of the relationships among different generative forces.

Fourth, the findings provided better understanding of the relationship between inter-organisational learning and collaboration dynamics. The existing research has tended to link learning and collaboration development generally, by attributing positive effects to learning in collaboration development. It has indicated that learning and mutual adaptation between partners can lead to longevity of collaboration (Parkhe, 1991; Larson, 1992; Doz, 1996; Arino and de la Torre, 1998; Buchel, 2000; 2002; Shenkar and Yan, 2002), and has placed emphasis on the positive role of inter-organisational learning and the development of inter-organisational routines (Gulati, 1995a; 1995b; Zollo, et al., 2002) for formation and post-formation patterns of collaboration development. The present research does not contradict these previous

findings; however, it does indicate the presence of constraining effects of inter-organisational learning on the process of collaboration development, which is not entirely consistent with the view advocated by the existing research. Thus, the case evidence from this research points out that previous inter-organisational learning is not necessarily positively related to adaptation and survival. In some circumstances resulting from the change in the contexts surrounding collaboration (e.g. strategy change, downturn in the sector), it can lead to ‘learning myopia’ (Levinthal and March, 1993) and thus constrain further collaboration development. In this case, the process of unlearning becomes crucial for collaboration to progress.

6.4 IMPLICATIONS FOR PRACTICE

The present research also has implications for managerial practice, as it examined a number of collaboration features associated with high knowledge creation. Although collaboration between organisations often has the purpose of exploiting each other’s experiences, it is the opportunities it provides to produce new experiences jointly by engaging in collective exploration that are recognised as most valuable for innovation and knowledge creation. For the organisations that collaborate to maximise knowledge creation, this research highlights the essential role of shared practice as a necessary condition for inter-organisational learning and knowledge creation. Thus, the nature of interaction among partners becomes critical in order to successfully produce new knowledge through collaboration.

It is important to understand that such interactions cutting across organisational boundaries are embedded in and affected by the specific contexts of the participant organisations and their respective sectors and institutional environments. Furthermore, these interactions are governed not only by the formal rules specified in the contracts and agreements, but also and more importantly by the rules arising from experiences which depend on the community-based criteria of validation and justification. In other words, as the present study demonstrated, it is important to understand how people become involved in collaborative activity, how they learn within the context of every day activity, and how shared meanings and understandings arise, because these processes will ultimately define and shape knowledge created through collaboration.

It is also important to consider the potential influence of managerial actions on the development of co-operative relationships with the objective of knowledge creation. There are a number of opportunities available to managers to help foster the knowledge creation effects of collaboration. In particular, the present research has emphasised the major impact of inter-partner interactions on inter-organisational learning and knowledge creation. In view of this, a proactive approach on the part of the managers should be taken with respect to the formation and development of inter-partner interactions. For instance, boundary spanning, i.e. all inter-organisational activities between the partners, should receive particular attention. Thus, the selection and boundary spanners and appropriate communication channels may help moderate the effects of organisational incompatibility and inter-partner

differences. Preferred boundary spanners would be those that have experience with the other organisational domain and are willing to coordinate internal efforts within their organisation in order to resolve the issues related to collaboration (e.g. a manager with entrepreneurial qualities would be more suitable than a bureaucratic administrator). Furthermore, it is important to have managerial support to legitimise the actions of boundary spanners, as they sometimes may extrapolate organisational rules in order 'to make things happen'.

With regards to communication, the interface between the partners should be clearly specified, and a variety of appropriate communication channels should be used. These can be progress meetings, the training and exchange of personnel, presentations and informal gatherings, amongst others. It is crucial to design the interface according to the rationale for the collaboration. For example, as this research has demonstrated, joint activities involving experiential learning (e.g. field trials, laboratory experiments) can be beneficial for further knowledge sharing and interpretation of results. Moreover, co-operation efforts are also facilitated by a high degree of communication between the partners, open discussions of problems, and a good personal understanding among the key actors involved. In this way, the present research draws the attention of managers to a reflective inquiry into these processes and the mechanisms that control them, in order to sustain joint explorative learning and thus, address the challenges associated with the balancing of exploitative and explorative activities in the inter-organisational domain.

6.5 LIMITATIONS OF THE STUDY AND FUTURE RESEARCH

A number of limitations of this study need to be acknowledged. First, the focus of the research was on five particular inter-organisational collaborations. Although this number of cases provided a comparative element to the study and facilitated the interpretative task, it may raise the question of generalisability. Specific settings, i.e. collaborations oriented towards new knowledge creation, in which the research was undertaken, may limit the applicability of the results, especially with regard to the nature of inter-organisational learning and its role in collaboration development. In other types of environments - e.g. collaborations that are not concerned with joint knowledge creation - inter-organisational learning may play a somewhat different role in the collaboration process. For example, in collaborations oriented mainly towards exploitation of existing capabilities – such as licence agreements and technology transfers – formal rules may be sufficient to govern inter-organisational relationships. In this way, inter-organisational learning does not play such a crucial role in collaboration development. Further research is needed in other contexts and situations to address the generalisability of the findings in the sense discussed above.

On the other hand, the findings regarding the nature and role of inter-organisational learning in collaborative knowledge creation have greater generalisability. According to the realist approach adopted in this study, idiographic studies can be valid in the case where they capture new layers of reality, and clarify the structures and their underlying generative mechanisms (Tsoukas, 1989). The present study

aimed to achieve that by addressing the underlying social dynamics, their drivers, and emerging collaboration properties, in order to produce explanations of the inter-organisational learning process.

A second limitation of this study concerns the level of analysis chosen to address joint knowledge development in collaboration. It was limited to one particular relationship, in which each organisation was engaged, and did not consider to the same extent, the whole network context in which organisations were embedded. Such an approach was chosen, due to the limitations of resources and the possible difficulty in gaining access to the participant organisations. This may have resulted in producing a somewhat limited picture of the organisations' ability to produce, integrate and apply knowledge through a variety of inter-organisational relationships in which they were engaged over time. Future research may address this limitation by producing a fuller account of the network activities and their effects of knowledge development.

A third limitation of this study involves the methodological choices made in regard to the conducting of the research. The study relied on a particular framework (Van de Ven and Poole's (1995) framework of process theories) to examine the process of collaboration development. The logic for this methodological choice was that this framework would provide a useful heuristic to examine developmental processes without complying with any particular theoretical stand (e.g. political dynamics, competitive learning, etc.) to produce process explanations. This approach

overcomes the shortcomings of a narrow focus on a particular perspective, which is able to produce only partial explanations, by allowing 'theoretical triangulation' (Gioia and Pitre, 1990). Nevertheless, this approach may introduce concerns about commensurability (i.e. whether different generative forces can be considered simultaneously and non-exclusively) associated with the choice of four generative forces and, more generally, about the relative emphasis in the analysis, based on this particular framework, given predominately to the structural forces at the expense of the effects of agency.

With regard to commensurability, the framework specified conditions under which each particular generative force could operate (e.g. for a teleological mode to operate, a discrete entity, i.e. an inter-organisational relationship, should exist that envisions its end state and relies on a set of requirements to attain the goal). The conditions necessary for each generative force to operate are not exclusive and depend on the level of analysis (e.g. group, organisation, set of organisations, population of organisations in a sector, etc.) taken. In this way, all four generative forces may be considered to operate simultaneously, as long as the relationships between them are specified. The case evidence demonstrated that, in principle, all four generative forces could even be manifested simultaneously. In the five cases studied, the simultaneous manifestation of all four generative forces was not observed; nevertheless, the overall patterns of development indicated that it was possible and that the four forces were not exclusive.

With respect to the weight given to the structural dimension by Van de Ven and Poole's framework, the examination of collaboration dynamics indeed, relied heavily on the analysis of the rules and resources, both being the characteristics of structure (Orlikowski, 1992), that restricted and enabled agents to make sense of the contexts they acted in. Nevertheless, together with the issues of sense-making and legitimacy, the issue of power was also addressed insofar as the research demonstrated how power exercised by actors shaped the structural characteristics, i.e. inter-organisational rules, and the process of their emergence. It is important to recognise this particular limitation of the present research, brought about by the choice of a particular framework to aid analysis. The produced analysis is not as balanced with regard to consideration of the effects of structures as well as agency as it could have been had other frameworks (e.g. the structuration approach) been used (Giddens, 1984)).

With regard to the limitations of this particular methodological approach, future research may apply other frameworks to address collaboration dynamics. However, in the present study, this framework was the only one found sufficiently generic and inclusive to support research that was largely inductive. Moreover, such as framework has been repeatedly used in the studies of inter-organisational collaboration, for instance, to identify the limitations of the existing research (de Rond and Bouchikhi, 2004), and also to guide empirical investigation and produce process explanations (Buchel, 2000; 2002).

Having indicated the limitations of the present research, the findings of this study are able to inform future research in the area of inter-organisational collaboration and learning in a number of ways. First, by emphasising the issues of sense-making, power and legitimacy associated with the process of learning in collaboration, it draws attention to the complex social dynamics, to a certain extent particular to inter-organisational contexts, underlying knowledge integration and creation when various actors from different organisations are involved. This requires a different approach to studying the way innovations are made by inter-organisational collaboration, shifting the focus from the issues of knowledge transfer and absorptive capacity towards the processes of development and emergence of inter-organisational environments as a result of various structural conditions and human action.

Second, the present research may inform the study of power in non-hierarchical settings. Although not the main focus of the research, it has highlighted various ways in which power can shape the development of inter-organisational environments and mediate learning and knowledge creation. In particular, it draws attention to the effects of the power balance and the way it is constituted and evolves. This shifts the focus of future research from exclusive examination of the negative or constraining effects of power of one partner over the other, towards consideration of the productive side of power that brings about the creative elements in collaboration. Third, by unravelling the interrelation between learning and collaboration development, the present research has revealed negative as well as

positive effects of learning on collaboration, and established the presence of a recursive path-dependent relationship between the two. This may bring new emphasis to the studies of the continuity (stability) and longevity of inter-organisational formations, which frequently assume the existence of one way positive effects of learning on collaboration development.

6.6 CONCLUDING REMARKS

Participation in inter-organisational collaborative relationships plays an important role in new knowledge creation. The process of inter-organisational learning is essential for the partners in collaboration to create new knowledge, as it results in the development of shared understandings and frames of action that shape emerging new knowledge. Recognising the limitations of the present study, it does provide useful insights into the mechanisms underlying inter-organisational learning. It brings attention to different aspects of social dynamics associated with learning in collaboration, such as the nature of inter-partner interactions, power and interdependence. It also explains how these characteristics of collaboration and their evolution are related to the course of collaboration development. In this way, the present research shows that in order to understand and explain learning dynamics in inter-organisational domains one should consider on-going collaboration activity involving a range of actors and unfolding in a historical context of a particular inter-organisational relationship.

BIBLIOGRAPHY

- Abbott, A. (1990) 'A primer on sequence methods.' *Organization Science* 1 (4): 375-392.
- Adler, P. S. (2001) 'Market, hierarchy, and trust: the knowledge economy and the future of capitalism.' *Organization Science* 12 (2): 215-234.
- Ahuja, G. (2000) 'Collaboration networks, structural holes, and innovation: a longitudinal study.' *Administrative Science Quarterly* 45: 425-455.
- Alter, C. and Hage, J. (1993) *Organizations working together*. London: Sage.
- Alvesson, M. and Skoldberg, K. (2000) *Reflexive methodology. New vistas for qualitative research*. London: Sage Publications.
- Argyris, C. and Schon, D. A. (1978) *Organizational learning: a theory of action perspective*. Reading, MA: Addison-Wesley.
- Arino, A. and de la Torre, J. (1998) 'Learning from failure: towards an evolutionary model of collaborative ventures.' *Organization Science* 9 (3): 306-325.
- Barkema, H. G., Shenkar, O., Vermeulen, F. and Bell, J. H. J. (1997) 'Working abroad, working with others: how firms learn to operate international joint ventures.' *Academy of Management Journal* 40 (2): 426-442.
- Barney, J. (1991) 'Firm resources and sustained competitive advantage.' *Journal of Management* 17 (1): 99-120.
- Bhaskar, R. (1978) *A realist theory of science*. Hassocks, England: Harvester Press.

- Blackler, F. (1993) 'Knowledge and the theory of organizations: organizations as activity systems and the reframing of management.' *Journal of Management Studies* 30 (6): 863-884.
- Blackler, F. (1995) 'Knowledge, knowledge work and organizations: an overview and interpretation.' *Organization Studies* 16 (6): 1021-1046.
- Blum, B. (2002) 'Blocked opportunities for bio-control.' *Pesticides News* 57:
- Boddy, D., Macbeth, D. and Wagner, B. (2000) 'Implementing collaboration between organizations: an empirical study of supply chain partnering.' *Journal of Management Studies* 37 (7): 1004-1017.
- Bourdieu, P. (1977) *Outline of a theory of practice*. Cambridge: Cambridge University Press.
- Bresnen, M. and Marshall, N. (2000) 'Building partnerships: case studies of client-contractor collaboration in the UK construction industry.' *Construction Management and Economics* 18 (7): 819-832.
- Brown, J. S. and Duguid, P. (1991) 'Organizational learning and communities-of-practice: toward a unified view of working, learning, and innovation.' *Organization Science* 2 (1): 40-57.
- Brown, J. S. and Duguid, P. (2001) 'Knowledge and organization: a social-practice perspective.' *Organization Science* 12 (2): 198-213.
- Bryman, A. (2001) *Social research methods*. Oxford: Oxford University Press.
- Buchel, B. (2000) 'Framework of joint venture development: theory building through qualitative research.' *Journal of Management Studies* 37 (5): 637-661.

- Buchel, B. (2002) 'Joint venture development: driving forces towards equilibrium.'
Journal of World Business 37: 199-207.
- Carley, K. (1992) 'Organizational learning and personnel turnover,' *Organization Science* 3: 20-46.
- Child, J. (2001) 'Learning through strategic alliances', in M. Dierkes, A. B. Antal, J. Child and I. Nonaka (eds) *Handbook of organizational learning and knowledge*. Oxford: Oxford University Press.
- Cohen, W. M. and Bacdayan, P. (1994) 'Organizational routines are stored as procedural memory: evidence from a laboratory study.' *Organization Science* 5 (4): 554-568.
- Cohen, W. M. and Levinthal, D. A. (1990) 'Absorptive capacity: a new perspective on learning and innovation.' *Administrative Science Quarterly* 35: 128-152.
- Collinson, S. (1999) 'Knowledge management capabilities for steel makers: a British-Japanese corporate alliance for organizational learning.' *Technology Analysis and Strategic Management* 11 (3): 337-358.
- Contractor, F. J. and Lorange, P. (ed.) (1988) *Cooperative strategies in international business*. Toronto: Lexington Books.
- Contu, A. and Willmott, H. (2003) 'Re-embedding situatedness: the importance of power relations in learning theory.' *Organization Science* 14 (3): 283-296.
- Cook, S. D. N. and Brown, J. S. (1999) 'Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing.'
Organization Science 10 (4): 381-400.

- Crossan, M. M., Lane, H. W. and White, R. E. (1999) 'An organizational learning framework: from intuition to institution.' *Academy of Management Review* 24 (3): 522-537.
- Cyert, R. and March, J. G. (1992) *A behavioral theory of the firm*. Cambridge, MA: Blackwell.
- Czarniawska, B. (1998) *A narrative approach to organization studies*. Thousand Oaks, CA: Sage.
- Das, T. K. and Teng, B.-S. (2000) 'Instabilities of strategic alliances: an internal tension perspective.' *Organization Science* 11 (1): 077-0101.
- D'Aunno, T. A. and Zuckerman, H. S. (1987) 'A life-cycle model of organizational federations: the case of hospitals.' *Academy of Management Review* 12 (3): 534-545.
- de Rond, M. and Bouchikhi, H. (2004) 'On the dialectics of strategic alliances.' *Organization Science* 15 (1): 56-69.
- DiMasi, J. A. (2001) 'New drug development in U.S. 1963-1999', *Clinical Pharmacology & Therapeutics* 69:
- Dirks, K. T. and Ferrin, D. L. (2001) 'The role of trust in organizational settings', *Organization Science* 12 (4): 450-467.
- Dixon, N. (1994) *The organizational learning cycle: how we can learn collectively*. Maidenhead: McGraw-Hill.
- Dodgson, M. (1993) 'Organizational learning: a review of some literatures.' *Organization Studies* 14 (3): 375-394.

- Dodgson, M. (1996) 'Learning, trust and inter-firm technological linkages: some theoretical associations', in R. Coombs, R. Richards, P. Saviotti and V. Walsh (eds) *Technological collaboration. The dynamics of cooperation in industrial innovation*. Cheltenham: Edwards Elgar.
- Dougherty, D. and Hardy, C. (1996) 'Sustained product innovation in large, mature organizations: overcoming innovation-to-organization problems.' *Academy of Management Journal* 39 (5): 1120-1153.
- Doz, Y. L. (1996) 'The evolution of cooperation in strategic alliances: initial conditions or learning processes?' *Strategic Management Journal* 17 (Summer Special Issue): 55-83.
- Dyer, J. H. and Nobeoka, K. (2000) 'Creating and managing a high-performance knowledge-sharing network: the Toyota case.' *Strategic Management Journal* 21 (Special Issue): 345-367.
- Dyer, J. H. and Singh, H. (1998) 'The relational view: cooperative strategy and sources of interorganizational competitive advantage.' *Academy of Management Review* 23 (4): 660-679.
- Easterby-Smith, M. (1997) 'Disciplines of organizational learning: contributions and critiques.' *Human Relations* 50 (9): 1085-1113.
- Ebers, M. (ed.) (1997) *The formation of inter-organizational networks*. New York: Oxford University Press.
- Eisenhardt, K. M. and Schoonhoven, C. B. (1996) 'Resource-based view of strategic alliance formation: strategic and social affects in entrepreneurial firms.' *Organization Science* 7 (2): 136-150.

- Elg, U. and Johansson, U. (1997) 'Decision making in inter-firm networks as a political process.' *Organization Studies* 18 (3): 361-384.
- Gherardi, S. (2000) 'Where learning is: metaphors and situated learning in a planning group.' *Human Relations* 53 (8): 1057-1080.
- Giddens, A. (1984) *The constitution of society: outline of the theory of structuration*. Cambridge: Polity Press.
- Giddens, A. (1990) *The consequences of modernity*. Stanford, CA: Stanford University Press.
- Gioia, D. A. and Pitre, E. (1990) 'Multiparadigm Perspectives on Theory Building', *Academy of Management Review* 15 (4): 584-602.
- Glaser, B. G. and Strauss, A. L. (1967) *The discovery of grounded theory*. London: Weidenfeld and Nicolson.
- Grandori, A. (1997) 'An organizational assessment of interfirm coordination modes.' *Organization Studies* 18 (6): 897-925.
- Grandori, A. and Soda, G. (1995) 'Inter-firm networks: antecedents, mechanisms and forms.' *Organization Studies* 16 (2): 183-214.
- Granovetter, M. (1992) 'Problems of explanation in economic sociology.' in N. Nohria and R. G. Eccles (eds) *Networks and organizations. Structure, form and action*. Harvard Business School Press.
- Grant, R. M. (1996a) 'Prospering in dynamically-competitive environments: organizational capability as knowledge integration.' *Organization Science* 7 (4): 375-387.

- Grant, R. M. (1996b) 'Towards a knowledge-based theory of the firm.' *Strategic Management Journal* 17 (Winter Special Issue): 109-122.
- Gulati, R. (1995a) 'Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances.' *Academy of Management Journal* 38 (1): 85-112.
- Gulati, R. (1995b) 'Social structure and alliance formation patterns: a longitudinal analysis.' *Administrative Science Quarterly* 40 (4): 619-650.
- Hagedoorn, J. and Duysters, G. (2002) 'Learning in dynamics inter-firm networks: the efficacy of multiple contacts.' *Organization Studies* 23 (4): 525-548.
- Hamel, G. (1991) 'Competition for competence and inter-partner learning within international strategic alliances.' *Strategic Management Journal* 12 (Special Issue): 83-103.
- Hardy, C. (1996) 'Understanding power: bringing about strategic change.' *British Journal of Management* 7 (Special Issue): 3-16.
- Hardy, C. and Phillips, N. (1998) 'Strategies of engagement: lessons from the critical examination of collaboration and conflict in an interorganizational domain.' *Organization Science* 9 (2): 217-230.
- Hardy, C., Phillips, N. and Lawrence, T. (2003) 'Resources, knowledge and influence: the organizational effects of interorganizational collaboration.' *Journal of Management Studies* 40 (2): 321-346.
- Hedberg, B. (1981) 'How organizations learn and unlearn.' in P. Nystrom and W. Starbuck (eds) *Handbook of organizational design*. Oxford: Oxford University Press.

- Hedberg, B. and Jonsson, S. (1978) 'Designing semi-confusing information system for organizations in changing environments.' *Accounting, Organizations, and Society* 3: 47-64.
- Hislop, D., Newell, S., Scarbrough, H. and Swan, J. (2000) 'Networks, knowledge and power: decision making, politics and the process of innovation.' *Technology Analysis and Strategic Management* 12 (3): 399-411.
- Holmqvist, M. (1999) 'Learning in imaginary organizations: creating interorganizational knowledge.' *Journal of Organizational Change Management* 12 (5): 419-438.
- Holmqvist, M. (2003a) 'Intra- and interorganizational learning processes: an empirical comparison.' *Scandinavian Journal of Management* 19 (4): 443-466.
- Holmqvist, M. (2003b) 'A dynamic model of inter- and interorganizational learning.' *Organization Studies* 24 (1): 95-123.
- Holmqvist, M. (2004) 'Experiential learning processes of exploitation and exploration within and between organizations: an empirical study of product development.' *Organization Science* 15 (1): 70-81.
- Huber, G. P. (1991) 'Organizational learning: the contributing processes and the literatures.' *Organization Science* 2 (1): 88-115.
- Inkpen, A. C. and Beamish, P. W. (1997) 'Knowledge, bargaining power, and the instability of international joint ventures.' *Academy of Management Review* 22 (1): 177-202.

- Inkpen, A. C. and Dinur, A. (1998) 'Knowledge management processes and international joint ventures.' *Organization Science* 9 (4): 454-468.
- Khanna, T. (1998) 'The scope of alliances.' *Organization Science* 9 (3): 340-355.
- Khanna, T., Gulati, R. and Nohria, N. (1998) 'The dynamics of learning alliances: competition, cooperation, and relative scope.' *Strategic Management Journal* 19: 193-210.
- Kim, D. H. (1993) 'The link between individual and organizational learning.' *Sloan Management Review* Fall: 37-50.
- Kogut, B. (1988) 'A study of the life cycle of joint ventures.' *Management International Review* 28: 39-52.
- Kogut, B. (2000) 'The network as knowledge: generative rules and the emergence of structure.' *Strategic Management Journal* 21: 405-425.
- Kogut, B. and Zander, U. (1992) 'Knowledge of the firm, combinative capabilities, and the replication of technology.' *Organization Science* 3 (3): 383-397.
- Koza, M. P. and Lewin, A. Y. (1998) 'The co-evolution of strategic alliances.' *Organization Science* 9 (3): 255-264.
- Kraatz, M. S. (1998) 'Learning by association? Interorganizational networks and adaptation to environmental change.' *Academy of Management Journal* 41 (6): 621-643.
- Kreiner, K. and Schultz, M. (1993) 'Informal collaboration in R&D. The formation of networks across organizations.' *Organization Studies* 14 (2): 189-209.

- Kumar, R. and Nti, K. O. (1998) 'Differential learning and interaction in alliance dynamics: a process and outcome discrepancy model.' *Organization Science* 9 (3): 356-367.
- Lane, P. and Lubatkin, M. (1998) 'Relative absorptive capacity and interorganizational learning.' *Strategic Management Journal* 19: 461-477.
- Lane, P., Salk, J. E. and Lyles, M. A. (2001) 'Absorptive capacity, learning, and performance in international joint ventures.' *Strategic Management Journal* 22: 1139-1161.
- Langley, A. (1999) 'Strategies for theorizing from process data.' *Academy of Management Review* 24 (4): 691-710.
- Larson, A. (1992) 'Network dyads in entrepreneurial settings: a study of the governance of exchange relationships.' *Administrative Science Quarterly* 37 (1): 76-98.
- Larsson, R., Bengtsson, L., Henriksson, K. and Sparks, J. (1998) 'The interorganizational learning dilemma: collective knowledge development in strategic alliances.' *Organization Science* 9 (3): 285-305.
- Lave, J. and Wenger, E. (1991) *Situated learning*. Cambridge: Cambridge University Press.
- Levinthal, D. A. and March, J. G. (1993) 'The myopia of learning.' *Strategic Management Journal* 14: 95-112.
- Levitt, B. and March, J. G. (1988) 'Organizational learning.' *Annual Review of Sociology* 14: 319-340.

- Liebeskind, J. P., Oliver, A. L., Zucker, L. and Brewer, M. (1996) 'Social networks, learning and flexibility: sourcing scientific knowledge in new biotechnology firms.' *Organization Science* 7 (4): 428-443.
- Lincoln, Y. S. and Guba, E. G. (2003) 'Paradigmatic controversies, contradictions, and emerging confluences.' in N. K. Denzin and Y. S. Lincoln (eds) *The landscape of qualitative research. Theories and issues*. London: Sage.
- Lowe, J., Delbridge, R. and Oliver, N. (1997) 'High-performance manufacturing: evidence from the automotive components industry.' *Organization Studies* 18 (5):
- Lubatkin, M., Florin, J. and Lane, P. (2001) 'Learning together and apart: a model of reciprocal interfirm learning.' *Human Relations* 54 (10): 1353-1382.
- Lynskey, M. J. (1999) 'The transfer of resources and competencies for developing technological capabilities - the case of Fujitsu-ICL.' *Technology Analysis and Strategic Management* 11 (3): 317-336.
- Makhija, M. V. and Ganesh, U. (1997) 'The relationship between control and partner learning in learning-related joint ventures.' *Organization Science* 8 (5): 508-527.
- March, J. G. (1991) 'Exploration and exploitation in organizational learning.' *Organization Science* 2 (1): 71-87.
- March, J. G. and Olsen, J. P. (1989) *Rediscovering institutions. The organizational basis of politics*. New York: The Free Press.
- March, J. G., Schultz, M. and Zhou, X. (2000) *The dynamics of rules*. Stanford, CA: Stanford University Press.

- Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis*. Cambridge, UK: Cambridge University Press.
- Mody, A. (1993) 'Learning through alliances.' *Journal of Economic Behavior and Organization* 20: 151-170.
- Morgan, G. (ed.) (1983) *Beyond method. Strategies for social research*. London: Sage.
- Mowery, D. C. and Oxley, J. E. (1996) 'Strategic alliances and interfirm knowledge transfer.' *Strategic Management Journal* 17 (Winter Special Issue): 77-91.
- Nelson, R. and Winter, S. (1982) *An evolutionary theory of economic change*. Cambridge, MA: Belknap.
- Newell, S. and Swan, J. (2000) 'Trust and inter-organizational networking.' *Human Relations* 53 (10): 1287-1328.
- Nohria, N. and Eccles, R. G. (1992) *Networks and organizations. Structure, from and action*. Harvard Business School Press.
- Nonaka, I. (1994) 'A dynamic theory of organizational knowledge creation.' *Organization Science* 5 (1): 14-37.
- Nonaka, I. and Takeuchi, H. (1995) *The knowledge creating company*. New York: Oxford University Press.
- Orlikowski, W. (1992) 'The duality of technology: rethinking the concept of technology in organizations.' *Organization Science* 3 (3): 398-427.
- Orlikowski, W. (2002) 'Knowing in practice: enacting a collective capability in distributed organizing.' *Organization Science* 13 (3): 249-273.

- Orr, J. E. (1996) *Talking about machines: an ethnography of a modern job*. Ithaca, NY: ILR Press.
- Orton, J. D. (1997) 'From inductive to iterative grounded theory: zipping the gap between process theory and process data.' *Scandinavian Journal of Management* 13: 419-438.
- Osborne, R. N. and Hagedoorn, J. (1997) 'The institutionalization and evolutionary dynamics of interorganizational alliances and networks.' *Academy of Management Journal* 40 (2): 261-278.
- Outhwaite, W. (1983) 'Towards a realist perspective.' in G. Morgan (eds) *Beyond method. Strategies for social research*. London: Sage.
- Parkhe, A. (1991) 'Interfirm diversity, organizational learning, and longevity in global strategic alliances.' *Journal of International Business Studies* 4: 579-601.
- Penrose, E. (1959) *The theory of the growth of the firm*. New York: Wiley.
- Pentland, B. T. (1999) 'Building process theory with narrative: from description to explanation.' *Academy of Management Review* 24 (4): 711-724.
- Pepper, S. C. (1942) *World Hypotheses*. Berkely: University of California Press.
- Pettigrew, A. M. (1979) 'On studying organizational cultures.' *Administrative Science Quarterly* 24: 570-581.
- Pettigrew, A. M. (1990) 'Longitudinal field research on change: theory and practice.' *Organization Science* 1 (3): 267-292.
- Pettigrew, A. M. (1997) 'What is a processual analysis?' *Scandinavian Journal of Management* 13 (4): 337-348.

- Pettigrew, A. M., Woodman, R. W. and Cameron, K. S. (2001) 'Studying organizational change and development: challenges for future research.' *Academy of Management Journal* 44 (4): 697-713.
- Pfeffer, J. and Salancik, G. R. (1978) *The external control of organizations. A resource dependence perspective*. Harper and Row.
- Polanyi, M. (1967) *The tacit dimension*. London: Routledge & Kegan Paul.
- Powell, W. W. (1991) 'Neither market nor hierarchy: network forms of organization.' in G. Thompson, J. Frances, L. R. and J. Mitchell (eds) *Markets, hierarchies and networks: the coordination of social life*. Sage Publications.
- Powell, W. W., Koput, K. W. and Smith-Doerr, L. (1996) 'Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology.' *Administrative Science Quarterly* 41: 116-145.
- Prahalad, C. K. and Hamel, G. (1990) 'The core competence of the corporation.' *Harvard Business Review* 3: 79-91.
- Reuer, J. J. (2000) 'Parent firm performance across international joint venture life-cycle stages.' *Journal of International Business Studies* 31 (1): 1-20.
- Ring, P. S. (1997) 'Transacting in the state of union: a case study of exchange governed by convergent interests.' *Journal of Management Studies* 34 (1): 2-25.
- Ring, P. S. and Van de Ven, A. H. (1994) 'Developmental processes of cooperative interorganizational relationships.' *Academy of Management Review* 19 (1): 90-118.

- Schon, D. A. (1983) 'Organizational learning.' in G. Morgan (eds) *Beyond method. Strategies for social research*. London: Sage.
- Shenkar, O. and Yan, A. (2002) 'Failure as a consequence of partner politics: learning from the life and death of an international cooperative venture.' *Human Relations* 55 (5): 565-601.
- Simonin, B. L. (1999) 'Ambiguity and the process of knowledge transfer in strategic alliances.' *Strategic Management Journal* 20: 595-623.
- Spender, J. C. (1996a) 'Making knowledge the basis of a dynamic theory of the firm.' *Strategic Management Journal* 17 (Winter Special Issue): 45-62.
- Spender, J. C. (1996b) 'Organizational knowledge, learning and memory: three concepts in search of a theory.' *Journal of Organizational Change Management* 9 (1): 63-78.
- Stake, R. E. (1995) *The Art of Case Study Research*. London: Sage Publications.
- Starbuck, W. and Hedberg, B. (2001) 'How organizations learn from success and failure.' in M. Dierkes, A. B. Antal, J. Child and I. Nonaka (eds) *Handbook of organizational learning and knowledge*. Oxford: Oxford University Press.
- Swan, J., Newell, S., Scarbrough, H. and Hislop, D. (1999) 'Knowledge management and innovation: networks and networking.' *Journal of Knowledge Management* 3 (4): 262-275.
- Szulanski, G. (1996) 'Exploring internal stickiness: impediments to the transfer of best practice within the firm.' *Strategic Management Journal* 17 (Winter Special Issue): 27-43.

- Teece, D. J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management.' *Strategic Management Journal* 18 (7): 509-533.
- Tsang, E. W. K. (2000) 'Transaction cost and resource-based explanations of joint ventures: a comparison and synthesis.' *Organization Studies* 21 (1): 215-242.
- Tsoukas, H. (1989) 'The validity of idiographic research explanations.' *Academy of Management Review* 14 (4): 551-561.
- Tsoukas, H. (1996) 'The firm as a distributed knowledge system: a constructionist approach.' *Strategic Management Journal* 17 (Winter Special Issue): 11-25.
- Tsoukas, H. (2002) 'Knowledge-based perspectives on organizations: situated knowledge, novelty, and communities of practice.' *Management Learning* 33 (4): 419-426.
- Tsoukas, H. and Vladimirou, E. (2001) 'What is organizational knowledge?' *Journal of Management Studies* 38 (7): 973-993.
- Turner, S. (1994) *The social theory of practices: tradition, tacit knowledge, and presuppositions*. Chicago: University of Chicago Press.
- Van de Ven, A. H. and Huber, G. P. (1990) 'Longitudinal field research methods for studying process of organizational change.' *Organization Science* 1 (3): 213-219.
- Van de Ven, A. H. and Poole, M. S. (1995) 'Explaining development and change in organizations.' *Academy of Management Review* 20 (3): 510-540.
- Van de Ven, A. H. and Poole, M. S. (1990) 'Methods for studying innovation development in the Minnesota Innovation Research Program', *Organization Science* 1 (3): 313-335.

- Walsh, V. and Ungson, G. R. (1991) 'Organizational memory.' *Academy of Management Review* 16 (1): 57-91.
- Weick, K. E. (1979) *The social psychology of organizing*. Reading, MA: Addison-Wesley.
- Weick, K. E. (1991) 'The nontraditional quality of organizational learning.' *Organization Science* 2 (1): 116-124.
- Weick, K. E. and Westley, F. (1996) 'Organizational learning: affirming an oxymoron.' in S. R. Clegg, C. Hardy and W. R. Nord (eds) *Handbook of organization studies*. London: Sage.
- Williamson, O. E. (1991) 'Comparative economic organization: the analysis of discrete structural alternatives.' *Administrative Science Quarterly* 36: 269-296.
- Yamin, M. (1996) 'Understanding 'strategic alliances': the limits of transaction cost economics.' in R. Coombs, R. Richards, P. Saviotti and V. Walsh (eds) *Technological collaboration. The dynamics of cooperation in industrial innovation*. Cheltenham: Edwards Elgar.
- Yin, R. K. (1984) *Case study research: design and methods*. Beverly Hills, CA: Sage.
- Zander, U. and Kogut, B. (1995) 'Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test.' *Organization Science* 6 (1): 76-92.
- Zeitz, G. (1980) 'Interorganizational dialectics.' *Administrative Science Quarterly* 72: 72-88.

Zollo, M., Reuer, J. J. and Singh, H. (2002) 'Interorganizational routines and performance in strategic alliances.' *Organization Science* 13 (6): 701-713.

APPENDIX 1

Questionnaire

Company _____ identification: _____

Respondent identification (name, position, contact number) _____

Please, mark the box where appropriate.

1) Is your company currently involved or was involved in last 5 years in any collaborative partnerships with other organisations?

Yes. *Please, use separate sheets in the case of more than one partnership.*

No. *Please, go to the end of the questionnaire.*

2) The purpose of the partnership is

joint R&D product development process development

technology transfer
experience/knowledge best practices transfer sharing

other. _____ Please _____ specify

3) The partner company

is in direct competition with your company (it produces substitute product).

is not in direct competition with your company (it produces complementary product).

does not operate in the same market as your company.

4) Does the partnership involve a formal contract?

Yes.

No.

5) Is it of great importance for your company to enhance its existing capabilities/skills through the partnership?

Yes.

No.

6) Does the partnership involve personal interactions between people on management level?

Yes.

No.

Does the partnership involve personal interactions between people on operational level?

Yes.

No.

7) How would you classify the partnership's outcomes so far?

Successful.

Satisfactory.

Unsuccessful.

Would your company be interested in hearing more about the research?

If so, please identify the person for further contacts:

Thank you very much for your time. Please, return this questionnaire using the provided envelope.