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KNOWLEDGE SHARING AND SECRECY IN INTER-FIRM COOPERATION

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Dear reader,

After years of working in business I stepped back into the academic world, and what I've experienced here in academia is the pure joy of being with people, the pleasure of intellectually challenging discussions and the gratitude of being here and now within perpetual change. I met so many people who supported me in this journey and I would like to thank them all for their dedication, generosity and passion. I will only highlight several personal notes below to the people who I especially 'blame' for how the world sits in me now. I am nevertheless much indebted to many more people who supported and continue to support me, and I hope that you all can sense that I am here for you in our daily life.

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Irina

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INTRODUCTION

Practical and Theoretical Significance of the Research

Knowledge sharing and protection in inter-firm cooperation is a challenging endeavour for a firm and a complex phenomenon to study for a scientist. In a variety of industries, firms actively engage in relationships with their external counterparts – it is an opportunity for them to run research and development activities more efficiently, complement their resources and move products faster to market. The cooperation nevertheless also stimulates competitive dynamics, which, paradoxically, both facilitate and complicate the partnership. Considering the practical significance of cooperative activities in the modern business world, management theories extensively investigate the diversity of the issues associated with the process and find that firms are motivated to cooperate because of the potential competitive advantage that they gain by accessing and learning the knowledge of their partners and dynamically reacting to changes in the environment. By acknowledging the importance of knowledge as one of the most valuable organisational resources and, at the same time, one of the most difficult to manage, scholarly research has achieved tremendous progress in examining the issues that companies experience in trying to balance the openness and commitment to innovate with the need to protect their independence and safeguard competitive advantage. It is a critical tension that firms need to resolve to succeed in their cooperation with external partners.

The tension between the need to share knowledge and protect is even more intense due to the tacit nature of knowledge and impossibility of enforcing its protection by legal contract. Once organisations share their knowledge with an external partner, they cannot take it back. Therefore, cooperating companies form social contracts and environments of trust and also choose ways of sharing knowledge based on the characteristics of this knowledge and the favourability of the contexts in which they are carrying out this knowledge exchange. Secrecy as an informal measure to protect the proprietary knowledge of an organisation is a necessary measure but is perceived as detrimental, unethical and non-transparent behaviour. Due to the negative effects of secrecy on forming trusting cooperative

relationships, researchers seek to understand the ways that would minimise the extent of secrecy for better cooperation outcomes. At the same time, knowledge sharing is perceived as inherently positive and beneficial to cooperative relationships, therefore, it needs to be encouraged and enhanced. Sharing of knowledge and secrecy seem to be too incommensurable to efficiently perform together because one poses a threat to the integrity of the other: more open sharing puts companies at risk of unintentionally revealing their company secrets; in turn, more secrecy endangers trusting relationships, and, in many cases, firms cannot afford to reduce their secrecy levels, which presumably conditions the boundaries between organisations and inhibits their collaborative activities.

As it stands now, several important issues inhibit the progress of further scientific research in understanding simultaneous knowledge sharing and secrecy in inter-firm cooperation. First, most cooperation theories employ an individualist perspective of knowledge sharing and protection, which calls for a more holistic view that would incorporate social and material arrangements in inter-firm cooperation. Second, the holistic view is needed to understand how knowledge sharing and protection interplay in the cooperative activities of partners – in an actual cooperation setting, knowledge sharing and protection are simultaneous activities and the separation of them into two distinct phenomena in research oversimplifies the actual inter-firm cooperation contexts. Furthermore, the cooperation process is still predominantly understood from a structural perspective and needs to be investigated not only as to “what” and “why” organisations do things in cooperation, but also “how”. Lastly, scientific knowledge is purposefully made context-independent for the sake of objectivity and is therefore difficult to apply in messy and pluralistic practical environments.

Knowledge sharing and secrecy are inherently social organisational practices, and in order to appreciate the complexity of this phenomenon, it needs to be approached holistically and with the fundamentally new understanding of social. The economic theory assumptions of duality and individual motives underlying the issues of knowledge sharing and protection tension are prohibiting researchers from dealing with the question; however, by employing a socio-ontological approach to the practice, I suggest that knowledge sharing and secrecy are intertwined and may jointly contribute to the success of cooperation. Contrary to economic theories, by

employing a practice theory lens, knowledge sharing and secrecy activities are not simplified to entities contained in individual minds, or to independent structures existing “out there”. Therefore, the practice theory lens addresses the issues that impede current scientific research progress in knowledge sharing and secrecy in cooperation. This view connects the social, cognitive and material dimensions of what organisations do and what the meaning is behind these activities which constitute practice; this way, the practice lens enables us to focus on “how” the organisations come about and to view their activities as produced and reproduced in a local context and by local actors and, consequently, understand the simultaneous happenings of the diverse practical arrangement, which are not explainable within the economic paradigm.

Therefore, in this research, I address the question of how knowledge sharing and secrecy are intertwined in inter-firm cooperation practices and bring joint contribution to cooperation outcomes. To answer the question, I use the practice lens, which integrates social and material dimensions as well as individual agency and complements currently existing knowledge in this area by analysing the complexity of organisational contexts.

Research Aim and Method

This research aims to address the shortcomings of current, primarily economic-based, analyses of knowledge sharing and secrecy in cooperation. It aims to develop a new theoretical understanding and explanation of the phenomenon of simultaneous knowledge sharing and secrecy in a competitive and complex environment of inter-firm cooperation: the theory that is based on a holistic view of the phenomena as a socially and materially embedded process. It aims to answer the question of **how knowledge sharing and secrecy are intertwined in inter-firm cooperation practice and how they bring joint contribution to cooperation outcomes**.

In this research, **inter-firm cooperation** refers to a form of a formal inter-company partnership agreement, where two or more independent companies collaborate, and which is characterised primarily by the need to partially integrate the structures, processes and coordination mechanisms of cooperating firms (Contractor & Lorange, 2002; Gulati et al., 2012; Hagedoorn, 2002). The concept of **knowledge**

as used in this thesis refers to a particular way of "understanding the world" (Reckwitz, 2002, p. 253), and **knowledge sharing** (or knowledge work) – as a socio-organisational activity of knowing embedded in physical (material) worlds and human practices (Newell, Robertson, Scarbrough, & Swan, 2009). Finally, **secrecy** in this work refers to an intentional act of concealment and a social practice of protecting some secretive content, which may have immediate or symbolic value (Bok, 1982; Costas & Grey, 2014; Grey & Costas, 2016; Marx, 2016).

In practice-theoretical terms, which are employed in this work, **practices** refer to what people do and say and the underlying meanings of these doings and sayings; whereas **materiality** refers to the dynamic experience of the matter that surrounds us, and **sociality** refers to what we do and experience as part of coexistence with other human beings (Schatzki, 1996, 2001a, 2005, 2016).

Thus, in answering the research question of how knowledge sharing and secrecy are intertwined in inter-firm cooperation practice and how they bring joint contribution to cooperation outcomes, the key objectives of this research are:

1. To explore the theories of inter-firm cooperation and how these theories address the issues of knowledge sharing and secrecy in this context;
2. To problematise the existing theoretical assumptions for the analysis of the phenomenon and identify an alternative theoretical framework that would address the issues of research into knowledge sharing and secrecy in inter-firm cooperation;
3. To use practice theory as a socio-ontological lens to explore a case of knowledge sharing and secrecy practices in inter-firm cooperation from the bilateral perspective of the cooperating company and its cooperation partners;
4. To build a theoretical understanding of knowledge sharing and secrecy process in inter-firm cooperation, which, complementary to an economic understanding of those activities and their outcomes, offers an understanding of socially and materially embedded practices.

This research is an inductive qualitative case study, which follows interpretivist tradition and iterative research design and analysis.

Contributions and Limitations

The extended understanding of knowledge sharing and secrecy practices within the context of inter-firm cooperation contributes to the literatures of knowledge sharing and protection in inter-firm cooperation and the contribution is manifold:

1. It creates a different understanding of knowledge sharing and secrecy as interdependent activities that companies perform simultaneously, and as bringing joint contribution to cooperation outcomes;
2. It analyses the process of knowledge sharing and secrecy in inter-firm cooperation through the practice lens, which integrates social and material dimensions of the process as opposed to solely individualist account of cognitive dimension; it lays the ground for a new theoretical understanding of the process;
3. It analyses the cooperation process from a bilateral perspective, which transits through the boundaries of one company's operations. In doing so, it enables richer data to be gathered compared to firm-level research;
4. It studies the phenomena, which is not only a theoretically but also a practically acute issue and which has the potential to inform managerial practice.

The limitations of this research are:

1. Limited secondary data resources and high privacy concerns of the industry players, as well, restricted access for observation inside the company's premises. This is overcome by ensuring confidentiality of data, building trusting relationships with research participants, approaching them as experts in the field and avoiding normative evaluations of their activities.
2. Low sample qualitative research is not generalisable to a larger population. However, research includes rich contextual details, which improves the transferability of the research findings to other contexts.

The thesis is structured as follows. In Chapter 1, I present the literature review of knowledge sharing and secrecy in inter-firm cooperation and identify the need for an alternative approach – the practice theory lens, which is then introduced in

Chapter 2. In Chapter 3, I describe the research design and analysis methods that I employed in this study. The research findings are presented in Chapter 4 and are followed by the discussion of the findings in Chapter 5. The last chapter, Chapter 6, summarises and concludes the research study findings and provides some potential implications of this study to management theory and practice.

Publications and presentations of research findings

Peer-reviewed publications:

Liubertė, I. (2019). On Social Knowledge and Its Empirical Investigation in Contemporary Organisations. *Organizacijų vadyba: sisteminiai tyrimai, 80*, forthcoming.

Liubertė, I. (2018). Theorising practice and developing practically relevant insights in organisational research. *Organizacijų vadyba: sisteminiai tyrimai,* 79, pp. 55-70. https://doi.org/10.1515/mosr-2018-0004.

Presentations of research findings at conferences:

Liuberte, I., Feuls, M. (2019). Entrepreneurial uncertainty and language games *4th Annual Entrepreneurship as Practice Conference and PhD Consortium*. Nantes, France.

Liubertė, I. (2018). Dealing with uncertainty in communication: A reflective account on talking about knowledge sharing and secrecy with an entrepreneur having secretive concerns. *ESU 2018 Conference and Doctoral Programme*, Lodz, Poland.

Liubertė I. (2018). Organizing secrecy in inter-firm cooperation. *Academy of Management Proceedings 2018 (1)*, 11051, Chicago, USA.

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Liubertė I. (2017). The ways firms share and hide: Knowledge secrecy in inter-firm

cooperation. 33rd *EGOS Colloquium*. 33(62), 1-25.

Liubertė, I. (2014). Knowledge Transfer through Social Interactions in the Pharmaceutical Licensing. *10th Interdisciplinary Workshop on Intangibles, Intellectual Capital and Extra-Financial Information,* Ferrara, Italy, pp. 1-10. ISSN: 2295 – 1679.

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1. KNOWLEDGE SHARING AND SECRECY IN INTER-FIRM COOPERATION

This chapter is dedicated to reviewing the extant work on knowledge sharing and secrecy in inter-firm cooperation and consists of three sub-chapters, which discuss three major concepts in this research – inter-firm cooperation, knowledge sharing and secrecy – and research progress in these areas. Each chapter supplies the basis for the understanding of these concepts – definitions, major theoretical developments and areas of concern. It ends with a summary, which outlines the limitations of the currently dominant economic-based approach to organisations and their relationships: it puts forward the need for a more holistic and integral understanding of knowledge sharing and secrecy in inter-firm cooperation, which would attend to the material boundedness of human actions and would encompass more of the dimension of social human life than just individual mental states in interaction. It also outlines the limitations of the structural approach to cooperation process and the shortcomings of the objectivity that is being pursued in the creation of scientific knowledge.

1.1 Inter-Firm Cooperation

The growth of technological complexity in organisations requires increased knowledge and a greater variety of skills; however, large bureaucratic organisations lack flexibility, therefore, the integration of forces between organisations becomes essential to the maintenance of the capability to respond to rapid developments in industries (Alter & Hage, 1993): cooperation enables firms to achieve what they cannot afford to achieve alone (Harrigan & Newman, 1990). There are multiple barriers that firms need to overcome in inter-firm relationships, which scientists abundantly explore – seeking how organisations may overcome these barriers and what the favourable circumstances are for organisations to reach their cooperation goals. These explorations include a wide range of topics covering the numerous issues of inter-firm relationships, such as forms of cooperation; the cost and value of cooperation; the sharing of resources and appropriation of external knowledge; and motivation and performance measures at different stages of the inter-firm cooperation

process. At the same time, the attention to specific factors or processes reflects the underlying assumptions of theoretical approaches, which I discuss in the subsequent sections. I therefore start with a general definition of cooperation which, in the broadest sense, is a type of contractual or non-contractual agreement between two or more independent firms. I discuss the concept of cooperation as defining a complex phenomenon that not only requires specific integration and coordination between firms, but also poses different issues depending on the form of the cooperative agreement, the stages in its process and any competitive concerns. I then review two groups of dominant theoretical approaches to inter-firm cooperation and how these literatures view the role of knowledge and secrecy in this process. This leads me to identify different stances towards knowledge in inter-firm cooperation and the critical role of knowledge management in cooperation.

1.1.1 The Nature of Inter-Firm Cooperation

Scholars define inter-firm cooperation as a type of formal inter-company partnership agreement, in which two or more independent companies collaborate (Hagedoorn, 2002). Inter-firm cooperation is an operating mode which lies somewhere between the independent work of firms (in-house development or production) and full acquisition and is typically characterised by some type of legal contract – a formal acknowledgement of inter-firm relationships (Contractor & Lorange, 2002). It may also be viewed as a formalised inter-organisational network, as opposed to an informal (social) network, which is a form of network that is not bound by a formal contract (Grandori & Soda, 1995). Many cooperative agreements, especially in hi-tech industries, also include all or at least a small part of shared R&D efforts (Hagedoorn, 2002).

The nature of cooperation is dependent on the degree of integration and how firms coordinate and align their joint activities, which differ based on the form and stage of the cooperative affair. As well, despite the fact that often a cooperative attitude is understood as synonymous to a friendly and open to sharing attitude, most cooperating firms also have competitive concerns that they need to deal with, even in cases in which they are positively disposed towards their cooperative affair. I discuss these characteristics of inter-firm cooperation in more detail in the next four

sub-sections.

1.1.1.1 Integration and Coordination

Two processes characterise cooperation – integration and coordination of inter-firm activities. First, integration describes the intensity of co-work between firms. Inter-firm cooperation falls between two extreme ends of integration: the full integration of a company (i.e. acquisition or merger) and totally unrelated company transactions (e.g. supplier arrangements) (Contractor & Lorange, 2002; Hagedoorn, 2002). When cooperating, firms "remain independent economic agents" (Hagedoorn, 2002, p. 478), but share some of their efforts in an agreed co-project. The point between total integration and none at all is not discrete, and there are various degrees of company involvement that follow such semi-integration of their activities.

Second, coordination is an administrative part of cooperation and includes "the specific ways that partners devise to implement and operate the relationship" (Gulati, Wohlgezogen & Zhelyazkov, 2012, p. 537). Coordination is an ongoing process of inter-organisational planning (Palmer, 1983) which includes the division of tasks between cooperating companies, alignment and realignment of their joint or individual activities, also communication and decisions related to these activities (Doz, 1996; Gulati & Singh, 1998).

It is not necessarily obvious from the terminology that is used to define the mode of cooperation what the intensity of the co-work is and how much companies integrate their actions; however, calling inter-company relationships "collaboration" would typically imply more co-working efforts (Hord, 1986) without indicating the legal form of an inter-firm relationship; whereas "cooperation" would mean a lesser degree of involvement in joint performances of tasks (Polenske, 2004). For example, no co-work may be required when companies engage in a cooperative affair in which they share and coordinate necessary information but perform cooperative project-related activities on an individual company basis. Similarly, R&D activities may also be a part of the joint efforts of cooperating companies, or only be performed by one or some of the companies that are participating in a cooperative agreement. Two other commonly used names for inter-firm relationships are "partnership" and "network", e.g. as in the studies by Hagedoorn (2002) or Hagedoorn, Roijakkers and

Kranenburg (2006). Both concepts, but especially “partnership”, are used interchangeably and as synonyms for cooperation, collaboration or alliance.

1.1.1.2 The Forms of Cooperation

Joint ventures vs contractual agreements. There are various forms and classifications that define how companies use cooperation for their R&D advancement. Prevalent classifications of inter-firm cooperation are based on the legal form of inter-firm relationships and use two primary cooperation types as a starting point: equity joint ventures and contractual agreements (Hagedoorn, 2002). Joint ventures are characterised as those in which companies create an organisational unit for the specific R&D project and this unit is jointly controlled by those companies. Whereas contractual agreement implies that companies also share their resources or risks, but the teams that work on a joint project are created separately on each cooperating company’s side as opposed to one common unit in joint ventures.

Alliances. Alliance is commonly defined as a voluntary inter-firm agreement “aimed at achieving competitive advantage for the partners” (Das & Teng, 2000, p. 33) and which “involves exchange, sharing, or co-development” (Gulati & Singh, 1998, p. 781). It is a common umbrella term for inter-firm cooperation and may consider different content, e.g., only contractual agreements may be treated as alliances, keeping joint ventures as a distinct form of inter-firm relationships; alternatively, both joint ventures and contracts may be referred to as the modes of alliances: alliances may include inter-company agreements “ranging from an arm’s-length contract to a joint venture” (Yoshino & Rangan, 1995, p. 4). Not all literatures explicitly define the boundaries of what specific legal forms of inter-firm relationships are encompassed by the “alliance” term, and in some cases may equate alliances with nearly any type of inter-firm relationship; e.g. as summarised in the model of collaboration by Todeva and Knoke (2005), alliances are any form of inter-company relationship between full integration and market relationships (“arm’s-length” transactions), and this inclusive definition qualifies, for example, supplier-subcontractor relationships as a form of alliance as well. More often, however, scholars define a narrower scope of what counts as an “alliance”. Yoshino and

Rangan (1995) assign three distinct characteristics to alliances, which allows alliance to be discriminated from other forms of inter-firm relationships: firms should remain independent, share the benefits of alliance and control over the tasks, and contribute on a continuous basis. Therefore, licensing or acquisitions, as well as certain joint venture types, that do not simultaneously possess those three characteristics should not be called alliances. Yoshino and Rangan (1995) provide examples of inter-firm affairs which are wrongly named alliances such as: a multinational firm entering a new market and forming a joint venture with a local firm for legal purposes, as well as licensing or cross-licensing of the rights to use a technology.

Cooperative licensing. There are other literatures, which, nevertheless, see licensing as an important part of some cooperative agreements. Standard licensing is defined as "granting of permission to use intellectual property rights" (Chandler, 2012), which are owned by one organisation and are planned to be exploited by another party in the agreement. Whereas in the case of cooperative licensing, the relationships between firms involve co-work alongside the transfer of property rights. Hagedoorn, Lorenz-Orlean, and van Kranenburg (2009) propose to call such licensing agreements "partnership-embedded licensing" – the type of an agreement, where licensing is a part of broader partnering arrangements. While this view on licensing overall still draws essential support from the traditional licensing theory, Somaya, Kim and Vonortas (2011), in contrast, qualify such a licensing agreement as more proximal to alliances. These authors call this phenomenon "licensing alliances" and address it through the lens of alliance theoretical research: they disagree with the view on licensing as an arm's-length transaction and view cooperation research as a more substantial support in explaining processes and issues in current licensing affairs than standard licensing research.

Other forms. A variety of other legal forms may be associated with inter-firm cooperation – cooperatives, cartels, franchising, licensing, acquisitions, subcontracting, networks, equity investment and similar (Todeva & Knoke, 2005). However, more scientists would limit cooperation to only those inter-company agreements that require at least some degree of integration and, therefore, such activities as, for example, licensing may represent a type of cooperation only if mixed with co-development, the way it is defined by Hagedoorn et al. (2009) as partnership-

embedded licensing. Similarly, cooperative out-sourcing (Suarez-Villa, 1998) may include out-sourcing contracts embedded in an alliance and together those activities represent a form of cooperation.

The complexity of relationships between partners increases when more than two partners or more varied kinds of partners (e.g. from other industries, universities, public research institutions) join together in cooperative activities (Bogers, 2011). Furthermore, the analysis of inter-firm cooperation also tends to move away from legal forms and base typologies on different criteria, e.g. on the type of cooperation partners – "lead-user innovation, university-industry collaboration" (Ritala, Kraus, & Bouncken, 2016, pp. 2-3), or ownership control – e.g. different degrees and combinations of the partners' propensities, power and persistence during cooperation form unique alternatives (Harrigan & Newman, 1990). Furthermore, cooperation types may be discerned based on the nature of relationship, as in the cooperation typology by Alter and Hage (1993), who outline two major groups of cooperation which are based either on competitive same-industry relationships or on symbiotic (non-competitive) attitudes. Lastly, network literature partially overlaps with what the focus of alliances research is: it uses "formal networks" to define inter-firm relationships that are formalised by some type of cross-functional communication between the representatives of participating firms (Coles, Harris, & Dickson, 2003) but interpret the boundaries of a firm as more indefinite than the way the alliance literature tends to define them.

1.1.1.3 **The Stages of Cooperation**

Cooperative inter-organisational relationships are not linear and homogeneous processes but "socially contrived mechanisms for collective action, which are continually shaped and restructured by [the] actions and symbolic interpretations" of the involved cooperating parties involved (Ring & Van de Ven, 1994, p. 96). Analytically, nevertheless, the whole process may be conditionally split into two broad cooperation stages based on the legal status and the nature of the issues that firms face in these periods: first – negotiation and commitment, and second – execution (Ring & Van de Ven, 1994, p. 96).

Negotiation and commitment stage. In the negotiation and commitment

stage, each company “formulates its own strategic plans, subjectively evaluates its exchange alternatives, and begins its involvement in interorganizational exchange” (Zajac & Olsen, 1993, p. 139). At this stage, partners negotiate a future contract in which due diligence and early involvement are critical properties of the process (Mitsuhashi, 2002). During this process, partners try to reduce uncertainty about the future contract (Rhodes, Nelson, & Berman, 2003).

The formal setting of rules for the inter-organisational relationship is an important but not the only activity at this stage: partners also socially engage and build trust in each other, which is a kind of a “social contract” alongside the formal contractual obligations, which do not accurately reflect the actual working relationships (Llewellyn, 1931). “Confidence is intermediate between knowledge and ignorance” (Simmel, 1950, p. 318) – partners cannot gain full knowledge of each other, and having partial knowledge requires them to gain some level of trust to be comfortable working together. Confidence in partners helps to minimise opportunistic behaviour and build institutional and social ties (Rindfleisch, 2000), which is a critical condition for their future co-work. Trust creates an initial environment between cooperating firms that shapes their interactions and increases willingness to share knowledge with another party (Inkpen & Currall, 2004). It is especially critical in the firms that are negotiating their first cooperation agreement with this partner: as when partners engage in a series of cooperative projects, they enjoy a leaner learning curve with “greater trust and adaptive flexibility” (Doz, 1996, p. 74).

Furthermore, building a social contract is not only important for the subsequent co-execution of a project under a signed contractual agreement, but also in the period of negotiation itself: it is a so-called “disclosure dilemma” or “information paradox” as “knowledge has to be revealed in negotiations to show its value – effectively entailing the transfer of the knowledge.” (Bogers, 2011, p. 96). Firms need to evaluate how reasonable or risky their partnership is, and public information or general statements are not enough for this purpose; therefore, companies carry out a knowledge exchange in which they could build a more grounded estimation of the expected future result. This way, trust in the negotiation stage of inter-firm relationships is not only the confidence in a partner’s goodwill but also the

management of the uncertainty through gaining greater predictability in the expectations about cooperation outcomes (Ring & Van de Ven, 1994). The stage ends with the commitment to the established structure and terms of the cooperative relationship (Ring & Van de Ven, 1994).

Execution stage. After committing to the structure and ways of future co-work, cooperating companies engage in the translation of "their contractual commitments into concrete reality" (Das & Kumar, 2007, p. 694) and administration of "whatever is needed to execute the agreement" (Ring & Van de Ven, 1994, p. 98). Cooperation research became more actively engaged with the dynamics of the execution of cooperative agreements only after extensive studies had been done on the pre-conditions and characteristics of alliances: it then analysed how firms connect through interpersonal networks, management function or shaping behaviours (Albers, Wohlgezogen, & Zajac, 2016). However, the dominant appeal has been that inter-firm cooperation is a primary source of external learning (Das & Kumar, 2007; Goeltz, 2010). In the inter-firm cooperation process, partners learn both on inter- and intra-firm levels and these levels are interrelated: partners learn from and about the other partner, learn specific contents and cooperation experience itself (Das & Kumar, 2007). Learning is also an incentive for cooperation (Mody, 1993): what firms learn in the cooperation process – stays with them. However, the learning of specific content is also associated with conflict and negative dynamics among partners and highly depends on the confidence in partners (Das & Kumar, 2007); therefore, even under confidentiality agreements, firms still carefully consider the types of knowledge appropriate to share (Bogers, 2011) and classify knowledge and its shareability based on when the knowledge was created, and whether or not it is related to the cooperative project (Bogers, Bekkers, & Granstrand, 2012). The stage concludes with the termination of the inter-firm relationships (Ring & Van de Ven, 1994) that pertain to the completed co-project.

Summary. Cooperation process was discussed here in two distinct parts based on the legal status and issues that cooperating parties need to solve at different points of the process of cooperation development. Speaking of the first stage of cooperation, research concentrates on how firms negotiate formal and informal contracts and establish the basis for protecting their internal knowledge in the future;

however, the same concern is critical at the negotiation stage itself, because companies experience the need to partially share their knowledge before the final cooperation contract is even signed. In the second phase, researchers mainly consider what partners learn in cooperation, the consequences and how they enable successful learning in inter-firm cooperation. As previously noted, the process of cooperation is nonlinear and unpredictable: firms may go through the negotiation stage and agree on the commitments, but in the execution stage, the firm may still come back to renegotiate their formal and informal arrangements as they work together and change expectations, approach conflicts or meet unexpected circumstances (Ring & Van de Ven, 1994). Cooperation is dynamic and iterative process where parties may reconsider further actions and the implementation of agreements throughout the process (Ring & Van de Ven, 1994; Zajac & Olsen, 1993), and it may be even "less cognitive, conscious and calculated" than how cooperation research studies attempt to show it (Smith, Carroll, & Ashford, 1995, p. 16).

1.1.1.4 **Competition in Cooperation**

Traditionally, cooperation and competition in management research were analysed as distinct concepts and not considered as parts of the same inter-firm process. Competition is treated as an environmental characteristic, and where cooperation is viewed as easier to accomplish in symbiotic (non-competitive) inter-firm relationships (Alter & Hage, 1993). However, in reality, many inter-firm relationships are built between competitors working in the same industrial sector (Bouncken, Gast, Kraus, & Bogers, 2015; Knudsen, 2007): it may be explained that same-industry firms typically share a greater similarity of contexts and common knowledge, which facilitates the process of their engagement in co-work and may be critical to speeding up the entry of new products to market (Hagedoorn, Frankort, & Letterie, 2006). Not surprisingly, there are also multiple challenges involved when engaging in cooperative work while still remaining competitors (Raue & Wieland, 2015) and both dimensions – cooperation and competition – are suggested to be taken into account and optimally managed (Yoshino & Rangan, 1995, p. X).

Cooperation between competing firms has recently adopted the name of

“coopetition”: the concept that was introduced by Brandenburger and Nalebuff (1996) defines the relationships of multiple parties, which simultaneously deal with competition and cooperation strategies. Coopetition in management research is defined as “combination of collaboration and competition taking place in the context of a relationship, a business strategy, or a business model in which firms compete and cooperate with each other at the same time” (Ritala et al., 2016, p. 2) and closely related to the distribution of power in inter-firm relationships (Bengtsson & Kock, 2000).

The decision-making power and influence may not be the same across the companies involved in cooperation (Das & Teng, 2000). Starting with joint ventures, where parent organisations may contribute differently and, based on ownership and size of their investment, retain different bargaining power (Harrigan & Newman, 1990). As well, the size of the company and any previous experience in cooperation with external companies may put one of the partners into a more advantageous or less advantageous position. As, for example, in a partnership-embedded licensing predominant scenario, when a smaller company is a licensor and larger company is their licensee (Hagedoorn et al., 2009), the smaller company often has less experience and therefore, is more willing to abide the guidance and decisions of the larger company, their partner.

As a summary, while the concept of cooperation tends to be treated as a “friendly” engagement of multiple firms that work towards a shared purpose, it nevertheless is practice blended with competition. It brings both the positive and negative sides to the relationships of partners, and paradoxically may either facilitate or complicate the partnership. The competitive dynamics also go closely with the asymmetries of power due to differences in amount of information or experience of cooperating parties.

1.1.2 Motivation and Demotivation for Inter-Firm Cooperation

There are three generic choices that firms have when developing a new product: to host all operations solely in-house, to purchase services and products from other companies or to find another company that would agree to developing a product jointly (Das & Teng, 2000). In the previous section, I have outlined the major

characteristics that define the nature of inter-firm cooperation and how firms cooperate; however, there is another important aspect in this process – why do firms engage at all in cooperation and what motivates or demotivates them to build relationships with an external firm? Statistics show that the number of R&D partnerships and alliances has been increasing since 1960 (Contractor & Lorange, 2002), especially in R&D intensive sectors (i.e. high-tech) (Hagedoorn, 2002). However, a relatively few collaborations succeed in achieving the desired outcome (Foos, Schum, & Rothenberg, 2006; Park & Ungson, 2001). Until recently, joining efforts with some external company was viewed as a less expected direction for a company to take (Hagedoorn, 2002) compared to in-house development, due to many risks associated with such an undertaking. If increased numbers of partnerships cannot be explained by past successes and low risks, what are the motivators that drive companies to engage in cooperation with external firms?

There are different theoretical approaches as to what motivates companies to cooperate with other industry players, and scientific research studies have gone through multiple transformations and focused on different characteristics and processes of this phenomenon. The approaches of how inter-firm cooperation is viewed and analysed in management research closely correlate with the development of general management theories, where firstly the economic basis of cost and value stood out, which further appeared to be insufficient in explaining the functioning of firms, and, therefore, further theoretical approaches complemented the cost-related reasons with the analysis of the management of the resources, knowledge and capabilities of organisations. The transaction, resource-based and dynamic capabilities views are the major theoretical approaches that help with the understanding of the premises of inter-firm cooperation studies and I present them in the subsequent sections: starting with transaction cost and value analyses, then I present the resource-based and capabilities group of approaches, and, lastly, summarise their achievements and problematise the dominant approach. I discuss their essential focus, the questions and concerns that they raise, how these approaches explain the motivation of organisations to engage to inter-firm cooperation, as well, what roles these views ascribe to knowledge sharing and secrecy in cooperation process.

1.1.2.1 Transaction Cost and Value Views

The core premise of the transaction-based view of the firm is that the existence of an organisation is based on economic motivation – minimising the cost of transactions between individuals (Coase, 1937); the key question of this approach stands as "whether to organize activities internally (within a firm) or externally (using a market)" (Mayer & Salomon, 2006, p. 942). Looking through the economic lens, inter-firm cooperation is a set of transactions guided by the consideration of their costs, or, alternatively, their transaction values. The transaction-based view assumes that firms govern their activities to minimise their costs and maximise their profits. Cooperating firms integrate some of their resources, which is an irreversible process and carries associated costs (Foray, 1991); therefore, the task of cooperating firms is to analyse contractual hazards (Mayer & Salomon, 2006), which in turn depend on appropriability (Oxley, 1997), asset specificity (Riordan & Williamson, 1985), and imperfect information (Hölmstrom, 1979), which require elaboration.

Transaction cost view. The classical transaction cost perspective views inter-firm relationships as increasing the extent of transactions and associated costs, therefore, preference is given to the internal company operations, whenever it is possible to achieve (Coase, 1937). The motivation to look for an external company to cooperate with on some development would only be considered worthwhile if the missing resources cannot be created in-house and resources cannot be exploited inside the company. Different types of inter-firm relationships are based on the formal (legal) form of contract and see cooperation as a means to minimise the overall costs of internal company production and external transactions (Kogut, 1988): when the cost of internal production becomes too high, then companies seek for market or hybrid modes of operation, where the total cost of internal production and external transactions would be lower than carrying out the whole production internally. According to Oliver Williamson (Osborn & Baughn, 1990), firms seek to balance efficiency and protection, which pushes them to select a hybrid form of operation (a mix of markets and hierarchies). As such, inter-firm cooperation is a group of hybrid governance modes, which stand in between the market (arm's-length contracts) and the hierarchy (transactions within the firm) (Oxley, 1997) and use the resources of multiple organisations (Borys & Jemison, 1989). Based on Oxley (1997), the logic of

transaction theory suggests that distinct types of alliance may be discerned by looking at the appropriability hazards that companies meet, and those hazards are different based on the legal arrangement: contract based (forms of alliances that are closer to arm's-length contracts) and equity investment based (forms of alliances that are closer to a hierarchical transaction inside the firm) cooperation forms. The author distinguished three broad groups of types of alliances, where two types include contract based inter-company agreements, both unilateral and bilateral, and the third one – equity-based agreement. The unilateral contract based alliances are the least hierarchical (closest to market transactions) and include in- and out-licensing, long-term supply and similar types of inter-company contracts; bilateral contracts are ranked as more hierarchical compared to unilateral agreements and include such types of contracts as cross-licensing or joint R&D; lastly, equity-based alliances are the closest to hierarchical relationships – "quasi-hierarchies" as per Osborn and Baughn (1990) – where cooperating companies pool their resources and create a relatively independent unit and both companies have their share, e.g. joint ventures or similar type of contracts (Oxley, 1997). The more severe appropriability hazards firms perceive, the closer to the hierarchical structure alliance they choose (Oxley, 1997).

Alongside appropriability concerns, firms align their governing structures based on their (technological) asset specificity (Riordan & Williamson, 1985) and use inter-firm cooperation as a tool to overcome the uncertainty regarding partners' and competitors' performance (Bogers, 2011). Jones (1987) argues that technology correlates with structure, which organisations choose based on transaction cost concerns: the choice of a structure may be conditioned by the uncertainty and ambiguity situated in technology, or vice versa – technology output may be different based on what structure of transactions is chosen by the firm. Extending Gareth Jones' work, which analyses transactions between organisations and their clients, Osborn and Baughn (1990) conduct a study of multinational alliances and finds support for the idea that the structure choice is dependent on technological uncertainty; therefore, technologically intense industries tend to choose a contractual (quasi-market) alliance, which allows companies more control over what information is being shared with their partners and less room for unintended leaks. On the other

hand, when an inter-firm relationship involves joint R&D efforts, due to the inseparability of tasks related to commercialisation, even under the conditions of technological uncertainty and imperfect information (Hölmstrom, 1979), a firms' preference leans towards quasi-hierarchies – e.g. equity alliances. Joint ventures are a better choice "for protection and control, but at a substantial administrative cost" (Osborn & Baughn, 1990, p. 505). Contracting helps to gain efficiency in a stable market but is hazardous when information is asymmetrically distributed between the firms; such an ambiguous context would suggest the use of the internal operations mode (hierarchical) or acquisition (full internalisation).

Transaction Value View. Late theorists of transactional economics shifted the attention from pure costs to the value of the transaction. They aimed to address the issues of inter-dependence of cooperation partners: the framework provides perspective on joint value creation and maximisation instead of cost minimisation of the individual firms (Zajac & Olsen, 1993). Joint value and costs may be closely correlated, however, they are not fully overlapping, and the rationality of inter-firm cooperation choices may be viewed differently from two perspectives; for example, if, from a cost perspective, the early period of cooperation planning is only concerned with cost (O. Williamson, 1985), approaching it from the transaction value point of view it is seen as a more complex consideration of a projected exchange in the future: of the value for your own firm, anticipated value of your partners and complementarity that forms the basis for "mutually beneficial exchange" (Zajac & Olsen, 1993, p. 139).

Table 1 below summarises the transaction-based approaches, which primarily attend to transaction cost and, to some extent, to value, and hold a major premise that a firm's functioning depends on its attempts to minimise these costs or maximise the value of transactions. Transaction cost and value theories focus on individual transactions between companies, and mostly analyse the integration structures. They look to find the most appropriate structures and conditions under which cooperating firms would reach the best economic value, keeping in mind appropriability hazards, technological uncertainty and imperfect information. Knowledge is mostly viewed as a relatively unproblematic characteristic of technological development and treated as if specific knowledge that will need to be shared is known in advance. Thus, this theory concerns how to protect the rest of

one's knowledge from unintended leaks and balance such protection with cost-efficiency.

Table 1. Summary of transaction cost and value views on inter-firm cooperation

Theoretical approach:	**Transaction cost and value views**	**Sources**
Premises	Firms function by minimising the transaction cost and/or maximising transaction value	Coase (1937), Mayer and Salomon (2006), Kogut (1988), Zajac and Olsen (1993), Williamson (1985)
Relevant questions:	What is an appropriate structure and form for the functioning of the organisation? What conditions need to be considered to reach higher cost/value efficiency?	Jones (1987), Osborn and Baughn (1990)
Motivation to cooperate with another firm:	Cost and time efficiency, managing uncertainty	Bogers (2011), Osborn and Baughn (1990)
Primary concerns:	Cost of transaction (e.g. technology transfer); ratio of cost and value of transaction; appropriability hazards; asset (technological) specificity; observability of information (level of uncertainty)	Foray (1991), Mayer and Salomon (2006), Oxley (1997), Riordan and Williamson (1985), Hölmstrom (1979)
Role of knowledge sharing:	The need for sharing is known in advance: firms choose different operation modes based on how much they can safely share with partners	Osborn and Baughn (1990), Hölmstrom (1979)
Role of secrecy:	Firms seek to balance knowledge protection with the efficiency of cost and leave little room for unintended leaks	Osborn and Baughn (1990)

1.1.2.2 Resource-Based and Dynamic Capabilities Views

Another group of approaches to inter-firm cooperation consists of theories that attend to what firms have and what gives them their competitive advantage – resources and capabilities. Resource-based theory, the knowledge-based view (a special case of the resource-based theory), and the dynamic capabilities approach are three major theories that concern organisational resources in inter-organisational relationships. These approaches are still largely focused on a legal form of cooperation and integration processes; however, they shift their attention from transaction costs and values to the trade-offs in managing organisational resources. The shift of attention from the analysis of external forces to internal company resources opens the "black-box" of a firm and enables us to understand more about the management of tangible and intangible resources. The assumption is that resources bring a competitive advantage to organisations, including such previously mostly neglected resources as competences, know-how and other forms of human knowledge.

Resource-based view. The resource-based view sees an organisation as "a bundle of related resources" (O. E. Williamson, 1999, p. 1096) and the aim of cooperation with other organisations is to gain access to complementary resources (Faems, Janssens, & Van Looy, 2005) while keeping control of their own resources at the same time. The roots of this approach stem from the well-known works of Edith Penrose, in which she analysed the principles of a firm's effective growth, including the principles of the effective management of a firm's resources (Kor & Mahoney, 2004). Like in the transaction economic view, resource-based research still focuses on cooperation structure, nevertheless, the basis for classification is different – it draws on involvement with a partner's resources and the inequality of resource investment, rather than informational asymmetry, that is addressed in the transaction cost perspective.

Das and Teng (2000) view alliances as an overarching term for four kinds of inter-firm cooperation modes: equity joint ventures, minority equity alliances, bilateral contract-based alliances and unilateral contract-based alliances. The classification is based on how firms align their resources among cooperating parties and range from high to mid to low involvement in cooperative activities and sharing. First, equity joint

venture is a form of alliance, where two or more companies integrate their efforts to the greatest extent, and “literally work together”, while in minority equity alliances, “one or more partners take an equity position” to others (Das & Teng, 2000, pp. 44,46), which refers to different kinds of resources invested by different parties and differences in decision power between those firms. Bilateral contract-based alliances are a form of cooperation where parties are involved in joint production, R&D, marketing or promotion, but the agreement has a better defined and limited time-horizon as compared to joint ventures (Hagedoorn, 2002); as well, firms get less direct access to the other firm’s assets. The last type, unilateral contract-based alliances, “include licensing, subcontracting, and distribution agreements” (Das & Teng, 2000, p. 47) and other similar kinds of contracts where the engagement of partners is the least intense and where shared resources would primarily be property based. Such an alliance typology is based on differences in resource sharing rather than cost consideration and introduces separation between equity and minority equity alliances, which in turn acknowledges that joint ventures are not necessarily a collaborative group of companies with equal decision power. While focusing on the distribution and sharing of resources between firms, the classification of cooperation forms still relies on the legal forms of contract similarly to the transaction-based view.

There are three broad groups of resources that scientists attend to, i.e. physical capital (e.g. technologies, equipment), human capital (e.g. experience, relationships) and organisational capital (e.g. structures, control and coordination systems) (Barney, 1991). Inter-firm cooperation allows companies to exploit these different types of resources that are “heterogeneously distributed across firms” (Barney, 1991, p. 99) and build their competitive advantage in industry (Peteraf, 1993). This is an important distinction from other theoretical perspectives of the time, which were built on the assumption of relative homogeneity of firms within the same industry and differences in external factors (Barney, 1991). As well, another important shift in core theoretical assumptions is while resources adapt to the demand in many cases, it is not true for all types of resources: e.g. some of them may take a long time to develop or they cannot be acquired – these are “immobile” (Barney, 1991) or “inelastic” (Barney, 2001) resources, and they are particularly characteristic of human capital: i.e. intellectual and social resources (Barney, 2001). The possession of such unique

intangible resources is an advantage to the firm that engages in inter-firm cooperation, as such resources are not easily imitable; however, at the same time, the need to transfer or appropriate such resources serves as a drawback due to the difficulty and uncertainty of such an accomplishment: “capabilities often are based on tacit knowledge and are subject to considerable uncertainty concerning their quality and performance” (Mowery, Oxley, & Silverman, 1998, p. 508). While looking at the physical resources, contrary to human capital, some overlap of technological resources of cooperating firms is important because in such a case, organisations have more common ground, which facilitates “knowhow exchange and development” (Mowery et al., 1998, p. 510). Therefore, successful alliances build on the similarity and utilisation of their resources (Das & Teng, 2000) but besides the deployment of their knowledge, it is essential that companies sustain the protection of this type of resource (McEvily, Eisenhardt, & Prescott, 2004) and deal with resources differently depending on their characteristics.

Knowledge-based view. A special case of the resource-based view is the approach that is primarily concerned with knowledge as a key organisational resource. Organisational knowledge is a specific company resource that requires special treatment and has received attention from organisational theorists, who define alliances as “knowledge trading” (Grant, 1996, p. 120) platforms. This knowledge-based approach to inter-firm relationships is concerned with cooperation as “superior to either market or hierarchical governance in efficiently utilizing and integrating specialized knowledge” (Grant & Baden-Fuller, 1995, p. 17) and knowledge is treated as a strategic resource of a firm (Grant & Baden-Fuller, 1995). Organisational knowledge is as a large heterogeneous group of company resources and alliance is a learning vehicle (Inkpen & Tsang, 2007) and such approach to knowledge as similar to dynamic property is like the capabilities approach that is discussed in a further paragraph. Additionally, cooperative aims are not limited only to learning or the acquisition of knowledge, but also to gaining access to the resources of the cooperation partner – the knowledge that partner has does not necessarily need to be absorbed to benefit from the partnership (Grant & Baden-Fuller, 2004).

Dynamic capabilities-based view. While the resource-based view offers a

rather static approach to the resources of organisations, the dynamic capabilities approach looks at companies and their relationships in a more dynamic way. The theory of dynamic capabilities does not only look at the possession of physical, human or organisational capital, but at the capability of the firm to flexibly and dynamically change and adapt based on changing circumstances (Teece, 2007; Teece, Pisano, & Shuen, 1997).

The capabilities of an organisation are its capacity "to perform a particular activity in a reliable and at least minimally satisfactory manner" (Helfat & Winter, 2011, p. 1244). Scholars distinguish between two types of capabilities of organisations: operational and dynamic. Operational capabilities are those capabilities "that permit a firm to 'make a living' in the short term" (Winter, 2003, p. 1): they are purposeful actions enabling repeated performances (Helfat & Winter, 2011). Whereas dynamic capabilities "govern the rate of change of ordinary capabilities" (Winter, 2003, p. 4): it is the capacity of an organisation "to purposefully create, extend, or modify its resource base" (Helfat et al., 2009, p. 1). The competition between firms is not sustainable: "gained, lost and regained cyclically" (Wójcik, 2015). Therefore, the operational capabilities of a firm are valuable for running daily activities, but organisations need dynamic capabilities that "change over time in order to maintain their value" (McEvily et al., 2004) and help the firm sustain a long-term competitive advantage.

The motivation for a firm to engage in cooperation with another firm is in the possibility to develop new dynamic capabilities that would have a better fit for the changing environment, which in turn helps in gaining greater competitiveness in market (Helfat et al., 2009), but additionally in considering the prior history of the events (Nelson & Winter, 2009). Similar to economic and resource-based research, dynamic capabilities scholars consider the choice of firms either to cooperate or develop technology in-house, as well as what the best structure of cooperation would be to attain "in the most (dynamically) efficient way" (Teece, 1989, p. 40). In line with the discussion on the dynamic efficiency of organisations, W. M. Cohen and Levinthal (1990) developed the term "absorptive capacity", with which they labelled the capacity of a firm to recognise new and valuable external information. The concept of absorptive capacity helps to explain how firms may effectively transfer their

capabilities to another firm, and how the cooperating firms may support their inter-dependent structures and content (Mowery, Oxley, & Silverman, 1996).

Learning new knowledge, a frequent target of the inter-company transfer, includes “such codified knowledge products as written documents and blueprints, as well as tacit knowledge such as uncodified routines” (Liebeskind, 1996, p. 94) and serves an important role in the inter-firm relationship. Knowledge is understood as a part of a firm’s routines, and therefore, a potential source of dynamic capabilities, or in other words, one of the “microfoundations of dynamic capabilities” (Teece, 2007, p. 1319). Therefore, it is important for organisations to ensure the security of their intangible resources by legal or other measures and prevent the leakage of their knowledge to a cooperation partner. However, if organisations are unable to protect their intangible resources (i.e. know-how), they should undertake this technological development in-house (Teece, 1989; O. E. Williamson, 1999) due to the fact that protection of unique organisational knowledge is more important to the competitive advantage of an organisation than building new dynamic capabilities through alliances (Helfat et al., 2009). In transaction economics terms, the cooperation between firms would hardly be attainable, as there is always imperfect protection of a contract and a firm’s resources, as well as high competition – firms’ “race”, competing for learning (Khanna, Gulati, & Nohria, 1994); however, cooperation becomes accomplishable “by a variety of supporting relationships and non-market exchanges” – the social structure of cooperation, trust and “norms of reciprocity” (Teece, 1989, p. 41). Firms inherently experience the contradiction between the need for external resources for their innovative activities and the need to maintain independence; therefore, firms configure and structure their activities in a way that would allow them to achieve a balance between the intra- and inter-firm cooperation modes (Foray, 1991).

Dynamic capabilities are a complex concept to adopt in an empirical setting, however, the contribution of the dynamic capabilities approach is that it draws attention to intangible resources, while the resource-based view is more in line with the transaction approach in that it treats resources in more tangible and static way. Table 2 on the next page summarises the premises of the resources-based, knowledge-based and dynamic capabilities approaches, the motivational factors for

engaging in inter-firm cooperation, the concerns, the role of knowledge and its protection.

Table 2. Summary of the resource-based view of inter-firm cooperation

Theoretical approach:	**Resource-based, knowledge and dynamic capabilities**	**Sources**
Premises:	Firms function by exploiting their own resources (physical, human and organisational capital, routines, or knowledge) and the complementary resources of other firms	Williamson (1999), Kor and Mahoney (2004), Barney (1991)
Relevant questions:	How do firms gain access to additional resources while keeping control of their own resources? How do cooperating firms efficiently maintain competitiveness in the market whilst securing their internal knowledge?	Faems et al. (2005), Das and Teng (2000), Teece (1989)
Motivation to cooperate with another firm:	Complementarity of resources, building capabilities, gaining competitive advantage and learning	Das and Teng (2000), Inkpen and Tsang (2007), Helfat et al. (2009), Liebeskind (1996)
Primary concerns:	Complementarity of resources, creating and sustaining competitive advantage, absorptive capacity	Peteraf (1993), W. M. Cohen and Levinthal (1990)
Role of knowledge:	Firms should deploy the knowledge that is their competitive advantage; firms employ cooperation strategies that facilitate knowledge transfer between firms.	Grant and Baden-Fuller (1995), Teece (2007)

Theoretical approach:	Resource-based, knowledge and dynamic capabilities	Sources
Role of secrecy:	Companies need to maintain control of their own resources and protect them. If an organisation is unable to ensure the security of these particularly intangible resources by legal or other measures and prevent the leakage of their knowledge to a cooperation partner, the firm will undertake the development in-house.	McEvily et al. (2004), Teece (2007), Williamson (1999), Teece (1989), Helfat et al. (2009)

1.1.3 Knowledge Sharing in Inter-Firm Cooperation

Knowledge sharing between cooperating firms is one of the primary motives for engaging in inter-firm cooperation: by "transferring existing knowledge from one organisation to another, and of jointly creating new knowledge" (Faems et al., 2005, p. 3) – it allows organisations "to orchestrate the information assets and enhance the operational efficiency" (Chen, Wu, Chien, & Shiah, 2014, p. 2188). Therefore, it is appreciated as a positive and desirable effect (Tsai, 2001) of inter-firm cooperation. Along with the considerations of cooperation modes, resource complementarity and a firm's capacity to absorb external knowledge, literatures explore a variety of ways as to how knowledge transfer and co-creation may be more efficiently accomplished, which leads to identifying the groups of factors that positively affect how knowledge is being transferred, shared or created in cooperation, most commonly: building trust and social ties, managing the characteristics of partnering and knowledge and ways of sharing this knowledge between cooperating parties.

Building trust and social ties. Trust, as confidence placed in organisational relationships, is an important factor for success in inter-firm cooperation. As previously highlighted, trusting relationships start forming in the initial stages of cooperation and are a kind of "social contract" that increases willingness to share knowledge with a cooperation partner (Inkpen & Currall, 2004). Trust in cooperation partners also reduces the anticipation of opportunistic behaviour of the partners and

distrust around possible abuse of shared knowledge for their own sake (Faems et al., 2005). Much of knowledge sharing or protection is not possible to enforce by contract, and therefore, is fulfilled by implicit norms that are facilitated by trust (J. Roberts, 2000). Chen et al. (2014) find that trust and, consequently, more successful knowledge sharing are achieved by cooperation partners that have shared values and are more relationally embedded. Therefore, organisations that engage in repeat cooperation deals benefit from their continuous relationship – the trust and loyalty that they developed in previous collaborations allows them to reduce the time required to initiate co-work and reduce the costs of cooperation (Gulati, 1995).

Characteristics of partners and transferable knowledge. This group of factors refer to the selection of characteristics of future partners, such as similarity in social and cultural context, and the evaluation of knowledge that is intended to be shared. Technical knowledge tends to be localised in a specific industrial, organisational or individual context (Antonelli, 1999) and may be difficult to share across the boundaries of different organisations. Even when motivation for sharing is high, knowledge may be difficult to transfer due to its tacit nature (Meier, 2011), stickiness and embeddedness in the original context (Szulanski, 2008). Similarity of social and cultural context, including a shared spoken language, is seen as having a positive impact on successful knowledge sharing (J. Roberts, 2000) in such circumstances. Shared values, language and culture are viewed as a must to enable knowledge transfer, and radically different cultures or lack of other contextual similarities play a negative role in these transfers (Gertler, 2003). Therefore, proximity, shared culture and other common ground between the parties involved in knowledge sharing are viewed as important factors to consider when planning cooperation with an external firm.

***The ways of sharing knowledge*.** In this group, the focus is on selecting appropriate ways of knowledge sharing, in which co-presence and co-location when sharing are treated as more favourable than electronic means of communication. Experiences of cooperation partners and their technologies are often tacit and not fully reflected in manuals, specifications (Osborn & Baughn, 1990) or other easily transferrable forms of information. It is doubtful that success in knowledge sharing can be achieved without direct contact (J. Roberts, 2000) – technologies are helpful

but not able to sufficiently contribute to the sharing activities of partners (Ikujiro Nonaka, Toyama, & Konno, 2000). Therefore, face to face contact – visits and meetings – is critical in cooperation (Bresman, Birkinshaw, & Nobel, 1999). Face to face communication between cooperation partners is closely linked with the alignment of their socio-cultural backgrounds and creation of trust (J. Roberts, 2000)
.

1.1.4 Knowledge Protection and Secrecy in Inter-Firm Cooperation

The issues of knowledge protection in inter-firm cooperation are viewed as an inextricable part of the whole cooperation process. Knowledge is an intangible resource and the process of knowledge sharing is irreversible – once companies have shared their knowledge with an external party, they cannot take it back (M. H. Boisot, 1998). Therefore, companies communicate openly only to a certain extent and take protective measures, such as signing confidentiality agreements with partners, and secrecy procedures, which set the boundaries of what knowledge can be shared with whom and when (Alexy, George, & Salter, 2013; Foray, 2004). Thus, there are formal (legal, e.g. patents or confidentiality contracts) and informal (secrecy, e.g. trade-secrets or know-how) ways organisations use to protect their knowledge (Jorde & Teece, 1989; Leiponen & Byma, 2009).

Issues of formal protection of knowledge. The formal ways of protecting knowledge are well established and include protection through patenting (Leiponen & Byma, 2009; Teece, 1986) and confidentiality contracts. Patents protect the rights to the proprietary knowledge of a company through disclosing it (Veugelers & Cassiman, 2003), and together with confidentiality contracts they are well known and routine ways employed by organisations. However, such formal measures are not sufficient – the enforcement of law cannot change the consequences of a potential breach – if e.g. a leak made competitors more prepared for your upcoming innovation and reduced your profit (Yang, Phelps, & Steensma, 2010). Organisations need other ways to keep their confidential knowledge secret if it is not possible for it to be protected by formal means. When two organisations engage in cooperative relationships, the boundaries of these organisations' knowledge become less clear; thus, the companies fear leaking their proprietary knowledge and weakening their

competitive position (Moxon, Roehl, & Truitt, 1988). It is difficult to prevent accidental leaks and disclosures of an organisation's core knowledge (Brown & Duguid, 2001; Chen et al., 2014; Jorde & Teece, 1990), which may occur alongside the desirable kind of knowledge sharing: firms risk competitors using leaks for their own advantage (Helm & Kloyer, 2004; Teece, 1986) or losing their own independence (Chesbrough & Teece, 1996).

Secrecy in inter-firm cooperation. It is well known that the difficulty in maintaining secrecy is one of the main concerns for companies who are willing to engage in inter-firm collaboration (Brockhoff, 1992); and it is even common to assume a cooperative attitude to open sharing, while arguing that secrecy is detrimental to the firms' relationship (McMillan, Klavans, & Hamilton, 1995). Consequently, research into secrecy in cooperation focuses on the initial stages, "when firms determine which protection strategy to use" (Bos, Broekhuizen, & de Faria, 2015, p. 2626) and explore less the actual implementation of secrecy in the cooperation process. Better understood are the ways secrecy is applied to the relationship cooperating firms have with their environment: e.g. the fact of the cooperative deal itself may be kept secret if organisations are not obliged to report to the public as is the case, for example, with government-funded projects. Nevertheless, the firms may have their own internal interests to disclose successful developments for patenting or advertising purposes as well (Matt & Wolff, 2004).

Research on what firms choose – formal protection or secrecy – is contradictory. Patenting is seen to be used over secrecy in firms that are externally oriented in their R&D activities (Delerue & Lejeune, 2011); while strategic secrecy is more beneficial to the firms that concentrate on in-house development. However, secrecy is also found to be related to greater willingness to engage in specific forms of partnership, such as partnership-embedded licensing (Hagedoorn et al., 2009). A limited revelation of secrets may also have a positive effect on building cooperative attitudes: secrecy is "a form of social cement, and the glue of such alliance around the secret is that both parties know something that they committed not to reveal to another party" (Johnson, 2002, p. 26). However, it is obvious that not all proprietary knowledge can be legally protected, therefore, cooperation partners have to deal with the simultaneous enactment of secrecy and building an atmosphere of trust and open

sharing (Bogers, 2011; Coles et al., 2003).

Thus, one of the distinguishing properties of secrecy is that it creates a separation between those who are privy (insiders) and those who aren't privy (outsiders) to a secret, which may be redefined in due course. The limits of revelation may still exist to the insiders too, for example, based on when knowledge was created and whether that belongs to the scope of the cooperative agreement (Bogers, 2011). Furthermore, while the formal means of protecting knowledge is seen as an acceptable practice, secrecy is mostly seen as a negative and undesirable property of the cooperative process: the opposite to transparency and ethical behaviour (Adams & Balfour, 2011; J. Roberts, 2013) and something that cooperating firms need to avoid and minimise in their relationships to achieve success. Consequently, the need to protect knowledge by informal means and still be open with cooperation partners is seen as an important tension and one of the major issues in inter-firm cooperation, therefore, it is important to resolve (Bogers, 2011; Ritala, Huizingh, Almpanopoulou, & Wijbenga, 2017).

1.1.5 Issues of Knowledge Sharing and Protection Research in Inter-Firm Cooperation

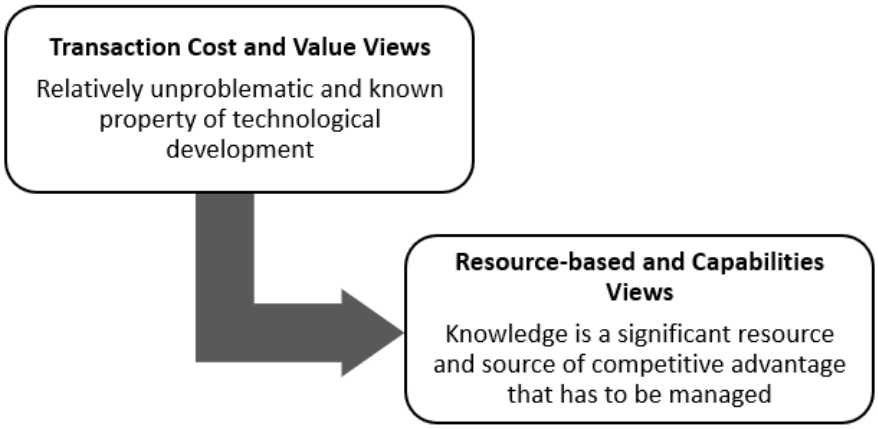
I further outline the current definition and theoretical approaches as to why and how firms engage in cooperation, as well, what role is granted to knowledge sharing and protection in this process. I identify four areas that impede current theoretical developments and explanations of the phenomenon of inter-firm cooperation, which include: the dominant analysis of the cognitive and, largely ignored, social and material aspects; the treatment of knowledge sharing and protection as two distinct phenomena; the structural approach to process; and, lastly, the normative and scientifically driven approach to what constitutes cooperation, knowledge and its protection.

Inter-firm cooperation is defined as a form of agreement between two independent firms – a middle ground between the in-house development of a product and the acquisition of another firm. It is characterised primarily by the need to partially integrate the structures, processes and coordination mechanisms of cooperating firms. Much of the research on cooperation tends to analyse the structural

characteristics and pre-conditions for the formation of a cooperative deal, often under the name of an alliance (as a synonym for cooperation), and is broadly split into two areas of investigation based on the contractual stages of cooperation development: the negotiation and commitment stage, and the execution stage of cooperation. It is now being acknowledged that cooperation between competitors in the same industry is inevitable and brings not only negative dynamics or issues related to asymmetric power, but also facilitates knowledge transfer thanks to a more similar knowledge background of the cooperation partners.

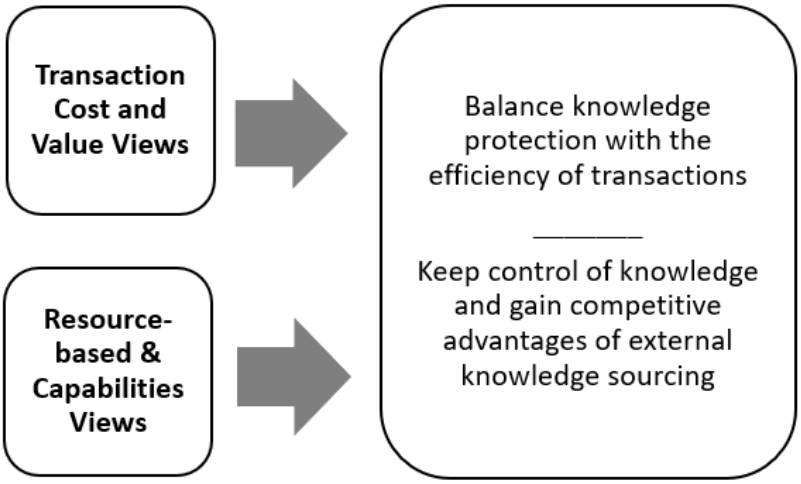
There are multiple explanations as to why firms engage in inter-firm cooperation, which depend on which theoretical view of the firm researchers take. The economic-based perspective attends to the exchange between independent companies; however, the company itself remains a “black box” (Mowery et al., 1998) – what is considered is the cost and value of the exchange between cooperating firms rather than the differences in dealing with organisation assets. Knowledge is also considered as an asset of known configuration and relatively unproblematic, treated as equal to other organisational resources. Whereas the resource and dynamic capabilities perspectives attend to various aspects of what a firm has and how that may serve as beneficial in an inter-firm relationship. With attention drawn to the inside of an organisation, it has become apparent that different types of resources require distinct treatment, and such analysis also brings out the importance of knowledge as one of the most difficult type of resources to manage; however, it is also one of the most important sources of competitive advantage. The social aspect of knowledge and a firm’s intellectual assets has been acknowledged too. See Figure 1 below for the comparison of the understanding of knowledge’s role in cooperation of two different groups of theoretical approaches.

Figure 1. The change in the theoretical understanding of knowledge's role in cooperation



While the role of knowledge has evolved from being relatively unimportant to a key resource in inter-firm cooperation, the understanding of the protection of knowledge in cooperation has generally remained the same in all discussed approaches. The economic approach to cooperation seeks to explain how companies balance the protection of knowledge with efficiency in cooperation, and the resource-based view looks at the ways companies could maintain the best control of their internal knowledge while nevertheless making use of the advantages of inter-firm cooperation (see Figure 2 below). It is the task of organisations to balance and control knowledge sharing and protection when they select their mode of operation.

Figure 2. The role of knowledge protection in inter-firm cooperation



The concern in cooperation research is typically centred around knowledge sharing and how the efficiency of knowledge sharing may be improved –implying that the more knowledge is shared, the better the efficiency. However, little consideration is given to the process of the secrecy of knowledge, and how it interacts with the sharing of it. Knowledge secrecy is treated more as a contextual factor, also, mostly negatively affecting the cooperation process and inhibiting openness and knowledge sharing.

The understanding of firm boundaries has also changed in the past few decades. If some time ago, in terms of economic theories of the firm, it was widely recognised that the firm has rigid boundaries and prefers to operate in-house, lately, with the evolvement of open innovation and networks theories, the boundaries of the firm have blurred – pushing towards more generous knowledge exchange between firms (Chesbrough, 2003) – and cooperation with external firms is now seen as a way to develop innovative foresight (Laursen & Salter, 2006); the significance of knowledge sharing and protection management in inter-firm cooperation has even been strengthened. In parallel, there is a growing stream of literatures that integrate multiple theoretical approaches. Different perspectives may successfully complement each other – research may be “best furthered by an integrative undertaking that draws on key ideas” of multiple approaches (Foss, 2003, p. 6).

Therefore, apart from research based on a single approach, the stream of literature that integrates existing theoretical approaches (Bogers, 2011) is increasing and it attempts to resolve the limitations of isolated views (Foss, 2003).

One of such research studies by Bogers (2011) addressed the tension between knowledge sharing and its protection, and how it is implemented in the competitive environment of cooperating firms. Research shows how firms balance – find an equilibrium – under different conditions: the varied characteristics and objectives of cooperation, shared knowledge, partners' relationships and the cooperation environment. The research proposes two strategies that help to cope with the tension of sharing and protection of knowledge, which include "open knowledge exchange" and "layered collaboration scheme", the second meaning bounded membership of who is entitled to know and learn of certain knowledge (Bogers, 2011). The other recent works by Ritala et al. (2017) study multiple tensions in R&D networks and find that the tensions that are related to openness and inclusiveness of knowledge sharing may be described as "dialectical", meaning such tensions create "either/or situations that need to be carefully managed" (Ritala et al., 2017, p. 1). These research studies attempt to approach knowledge management in cooperation from a multisided perspective and resolve the limitations of earlier studies. However, the research outcome arrives back at where it started – the binary choice for firms to choose from "either/or" alternatives – to share or to protect. This way, the research reproduces the same assumptions that are made in economic, resource-based and dynamic capabilities research, as well as their limitations that arise due to the focus on the cognitive and dual nature of knowledge sharing and protection, and the structural and normative approach to cooperation. Below, I clarify these issues, which serve as impediments to the progress of research exploring the complex phenomenon of inter-firm cooperation and identify other scientific literatures that may be helpful in resolving these limitations.

The Issue No 1: Individualist Approach. Current research on inter-firm cooperation mostly draws on the cognitive mechanisms of cooperation (Smith et al., 1995) and uses the individualist ontological lens, which attends to social as a sum of multiple individual motives. Cooperation is a dynamic and iterative process where parties may reconsider further actions and the implementation of agreements (Ring

& Van de Ven, 1994); therefore, both economic and social factors are important and should guide the analysis of cooperation between firms (Gulati, 1995). However, there is still little known about how material embeddedness and social structures transform inter-firm knowledge sharing and protection, as the explorations concentrate on the explanation of a cognitive dimension and do this with an assumption that these cognitive motives may be isolated from their overall (material and social) contexts.

The Issue No 2: Independence of Knowledge Sharing and Protection Processes. Current research on inter-firm cooperation treats knowledge sharing and protection as two interconnected, but distinct phenomena – they are not considered parts of the same development process (Bogers, 2011; McEvily et al., 2004). Similarly, as in the case of the cognitive, social and material aspects of inter-firm cooperation, the treatment of knowledge sharing and protection calls for a more holistic analysis approach.

The Issue No 3: Structural Approach to Process. Extant cooperation literature still fails to appreciate the social and political dynamics of the process "to penetrate the alliance "black box" and to distinguish different internal organizations of alliances." (Albers et al., 2016, p. 8). The structural approach to the cooperation process is prevalent and only a small number of studies attempts to explore the process in terms of "how" it evolved (Meier, 2011); even in the case of the dynamic capabilities research stream, which stems from the evolutionary and routine perspectives and claims to look into the dynamic process that accounts for the historical perspective, the studies explore "what" and "why" but not the "how" of the process. Despite some attempts to engage in the exploration of cooperation as a process e.g. the study by Doz (1996), there is still a lack of processual perspective on how firms develop their relationships and deal with issues in inter-firm cooperation, especially in the competitive cooperation context (Bouncken et al., 2015).

The Issue No 4: Quest for Objectivity. Contemporary theories of management largely focus on the development of true representation of the external world that permits value-free predictions (Dimov, 2018). Also cooperation literature looks to explain the way cooperation works and provides proper recommendations for practice; however, these recommendations are mostly based on the definitions of

concepts as conceived by scientists, and on the findings assuming simplified contexts, which are, therefore, too abstract and difficult to apply in complex practical environments (Garvin, 1993; Polkinghorne, 1992).

Recently, an acute question for cooperating firms is how they can deal with the tension and balance the need to share their knowledge with the urge to protect it (keep it secretive) at the same time in the competitive environment of inter-firm cooperation. The latest attempts of cooperation research to combine multiple theoretical views and cooperation motives into one bigger scheme do not produce the desired outcomes and warrant a different approach that would allow a holistic perspective on the social, material and cognitive nature of the cooperation process. Keeping in mind the issues identified in inter-firm cooperation literature and the key role that knowledge sharing and protection play in this process, in the next two sections, 1.2 and 1.3, I analyse how these concepts are theorised in the literatures of knowledge management and knowledge work, as well, in the emerging stream of research on secrecy in organisations, which covers the social and informal aspects of knowledge protection in organisations.

1.2 Knowledge and Knowledge Sharing Concept

As the organisational world has moved from an information to a knowledge society, knowledge management, organisational learning, retaining and sharing knowledge have become topical questions. Western societies are driven by knowledge in one way or another (Knorr Cetina, 1997), and there are multiple contexts in which knowledge is analysed, as well as multiple interpretations of the concept. Inter-firm cooperation is one of the contexts where knowledge sharing is critical to succeed and, at the same time, one of the most important organisational assets, which needs to be protected.

In the previous section, I identified that extant cooperation theories are limited in how they address the wholeness of the cognitive, social and material dimensions of knowledge sharing and protection in cooperation; as well, they are more preoccupied with structural characteristics and looking for an objective definition of the knowledge sharing process in cooperation, which hinders the capacity of these theoretical developments to be applied to the complex practical settings of organisational life. Thus, I further explore the literatures of knowledge management and knowledge work and identify how the issues of extant knowledge understanding in cooperation may be overcome. I start with the discussion of the definition of knowledge by the representatives of two schools of thought in knowledge management research, each having different epistemological assumptions and addressing organisational knowledge issues from different angles: one, coming from an economic and structural perspective, and the other based on social and processual worldviews. I find that the former, a structural view of knowledge, is what is explicitly or implicitly exploited in most knowledge management research; and that the latter, a social and processual understanding of knowledge, is gaining momentum but is still less common, yet it has the potential to deal with the issues that arise from a structural approach to knowledge.

1.2.1 The Concept of Knowledge

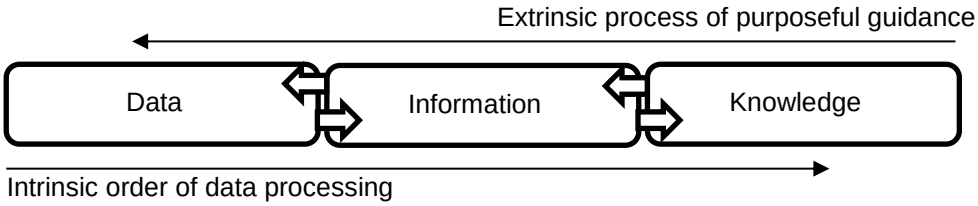
Knowledge is a complex and diversely understood concept, which is closely related to data and information both in theory and practice. As claimed by M. H. Boisot

(1998), it is common to treat “knowledge assets as if they were physical assets” (p. XIV) and interchangeably use the concepts of data, information and knowledge as if they would be replacing each other (Van den Hoven, 2001). For example, information and knowledge may refer to a common ground, where information only differs in that it is the action of informing, and knowledge – the result of having been informed (Machlup, 1962). Similarly, it is often the case when speaking about codification of technological knowledge as, for example, in the study of Balconi (2002) treating information as a structured message, while treating knowledge as a cognitive context of an individual agent (Cowan, David, & Foray, 2000). Such lack of distinction is then transferred to social organisational contexts, where knowledge has misleadingly become the focus of management instead of people and organisations (Kreiner, 1999). Only relatively recently, process scholars have drawn attention to intangibility and tacitness as properties of all human knowledge (Tsoukas, 2005b) and promoted the definition of knowledge as a context-dependent and ongoing social activity enacted in a collective practice (Haglund, Halldén, & Scheja, 2008; Orlikowski, 2002). Instead of knowledge being understood and managed as a physical asset, knowledge is being redefined as a socio-organisational activity embedded in physical (material) worlds and human practices (Newell et al., 2009). Focusing on the practice of knowing as a particular way of “understanding the world” (Reckwitz, 2002, p. 253) promises to grasp the fuzzy and intangible nature of human knowledge work instead of purely addressing tangible manifestations, such as data and information management.

It is therefore important to draw distinctions among the three interrelated concepts – knowledge, data and information, and such distinctions are typically made by ordering the three concepts in a sequential and hierarchical way. The mainstream approach places data first, then information and finally knowledge: here “data” means unprocessed facts, figures items or events (Bell, 1999; Zins, 2007); and “information” means interpretations or analysis, providing the meaning and contextualising these factual data (Tsoukas, 2005a); lastly, knowledge is at the top of this hierarchy and includes values, beliefs, judgment of events (Tsoukas, 2005a) and action (Gruber, 1988). Neither data nor information are knowledge but both are closely related to knowledge and are a necessary condition for creating it (Davenport & Prusak, 1998).

The reverse view considers data as more than knowledge and puts it at the top of the hierarchical order: in contrast to the previous explanation of the hierarchy, knowledge is seen as a prerequisite to information, and consequently information is needed to create data (Tuomi, 1999). Two opposing views stem from different perspectives: first, an intrinsic order of mental data processing, which results in a superior phenomenon – knowledge; second, an extrinsic process of the purposeful and knowledgeable guidance of creating information and data from individual knowledge, which highlights the primacy of knowledge and not the knowledge merely being the mechanical outcome of data processing (see Figure 3 below).

Figure 3. The order of data, information and knowledge



Although superficially the theories may seem to be contradictory as they line up the three concepts in an opposing order, nevertheless they both agree on the fact that knowledge is the most complex organisational phenomena among the three, and, therefore, deserves the most attention.

As we can see, the delineation between knowledge, information and data is ambiguous and defined in a contradictory manner and may focus on different aspects of its use in organisations. Following this fuzziness in the definition of knowledge, there are also multiple interpretations of where knowledge resides – is this an individual or collective phenomenon? In management research, the dominant perspective is a structural view of knowledge, which theorises knowledge as belonging to an individual person, and classifies even its collective properties as a distinct type of individual knowledge. There is also an alternative view of knowledge as embedded in social processes where knowledge is treated not as a possession of an individual or a sum of collective thought, but as a product of human activity and social interaction. Research projects based on these ontologically distinct positions bring value to organisational science and management practice in different ways. The

first, research based on a structural view of knowledge, aims to simplify the complexity of knowledge (Nicolini, 2016) and understand its structural parts – what kind of knowledge, where and how it serves certain purposes. The second, research based on an understanding of knowledge as a social process, fosters the complexity and embeddedness of knowledge in local contexts and looks into the enactment and material embeddedness of knowing (Newell et al., 2009). Table 3 below present the essential distinctions between the structural and social conceptualisations of knowledge. These two perspectives on knowledge deserve a more in-depth consideration, which is provided further.

Table 3. Structural and social views of knowledge

Structural View of Knowledge	**Social View of Knowledge**
Knowledge resides in the *individual*	Knowledge manifests through the *social activities* of individuals
Concerned with structure or entity	Concerned with process or action
Simplifies contexts for analytic purposes	Fosters embeddedness in *complex environments*

1.2.2 The Structural View of Knowledge in Organisations

The structural view of knowledge represents epistemology of possession (Cook & Brown, 1999), in which knowledge is treated similarly to other organisational resources and the aim is to simplify management of organisational complexity by standardising the treatment of different kinds of resources. Therefore, like physical assets, knowledge may be created, acquired, and possessed by an individual or transferred to another individual. Hence such terms as knowledge “acquisition” and “transfer” are typical signals of having adopted a structural knowledge perspective in a given research study. Knowledge is treated as residing in an individual person; and collective knowledge activities and terms such as “organisational knowledge”, are used and understood as metaphors (Bhatt, 2002) referring to the sum of knowledge of multiple organisational actors. The structural view of knowledge is driven by the assumption that dividing the concept of knowledge into several types and formulating rules to deal with each type of knowledge helps in managing knowledge in

organisations more efficiently (Bhatt, 2002). It contributes to the understanding of knowledge and its role in organisations through generating typologies of knowledge and modelling the relationships between these types (Blackler, 1995). There have been numerous attempts to classify knowledge, and in this paper, I do not pretend to cover all of these classification efforts, but instead, I demonstrate some prevalent principles of the construction of such theories of knowledge in management research. Hence, most typologies are based on two principles: first, on the easiness or difficulty of accessing knowledge (explicit and tacit types of knowledge); second, on the locus where knowledge resides (individual and organisational types of knowledge). The principles of knowledge structure, exemplar theories, applied typologies and principal ideas are summarised in Table 4 below and discussed further.

Table 4. The principles and examples of knowledge typologies

Knowledge structure	**Theory**	**Typology**	**Principal idea**
Based on ease of accessing knowledge	I Nonaka and Takeuchi (1995), knowledge creation	Tacit knowledge Explicit knowledge	Knowledge is shared and new knowledge is created through converting tacit knowledge to explicit
	Collins (2010), tacit knowledge	Relational Somatic Collective	There are three types of tacit knowledge that range from easily convertible to not convertible into explicit form at all
Based on both ease of access and locus of knowledge	Spender (1996)	Conscious knowledge Automatic Objectified Collective	Both explicit and implicit (or “tacit”) knowledge may manifest as individual or social phenomenon, thus, forming four knowledge types

The assumption under structural approaches to knowledge is that individual cognition is the basis of all knowledge (Newell et al., 2009) in organisations. The

differentiation between different kinds of knowledge is constructed based on the fact that some knowledge is quickly and easily expressed and shared with other individuals, but other types of knowledge are less easy to codify and more difficult to articulate. Such a distinction leads to the construction of two basic types of knowledge both in general and as applied to organisational contexts – explicit and tacit knowledge, also known as codified and non-codified knowledge. Explicit (or codified) knowledge represents what can be expressed in words and numbers, "transmittable in formal, systematic language" (Ikujiro Nonaka, 1994, p. 16); and tacit (non-codified) knowledge is difficult to express in conventional means of verbalising and "has a personal quality, which makes it hard to formalise and communicate" (Ikujiro Nonaka, 1994, p. 16). The process of knowledge sharing in organisations is seen as a conversion from tacit to explicit knowledge, which then makes it easily transferable to another person (Teece, 2000). Therefore, tacit-to-tacit knowledge transfer occurs through making it explicit: codifying tacit knowledge of the person transferring it and combining it with the knowledge of a recipient (J. Roberts, 2000), thereby forming a new kind of tacit knowledge (I Nonaka & Takeuchi, 1995). The possibility to explicate and create new knowledge as defined by I Nonaka and Takeuchi (1995) is one of the interpretations of tacit "knowing" (Gourlay, 2006), first introduced in the philosophical works of Michael Polanyi (1966) and defined as the personal awareness of something that is "more than we can tell" (Polanyi, 1966, p. 4), which we can only demonstrate by relying on the awareness of others to catch its meaning (ibid). While Nonaka's model largely draws on the existence and importance of tacit knowledge, it mainly stimulated research to look for the ways to explicate such knowledge and make it "manageable", for example, through information technology infrastructure (Cormican & O'Sullivan, 2003) or developing specific measures of tacit knowledge and incorporating these measures in performance reviews (Foos et al., 2006).

In contrast to the above described model of I Nonaka and Takeuchi (1995), where tacit knowledge may be converted to explicit knowledge, Collins (2010) treats tacit knowledge as threefold and differently convertible depending on its type. One type of tacit knowledge – called relational – might be easily converted to explicit form and thus transferred to another person. It is the simplest type of tacit knowledge to transfer, in fact, Collins even questioned whether it could be called "tacit" at all

because such knowledge is merely temporarily unavailable in our focal minds and may be called on as soon as the person realises it is needed to explicate to some other person. The second type of tacit knowledge – somatic – is also shared with other people in a tacit form and it is entirely possible to convert it into explicit form or create an analogy, however, it is not easily convertible and takes a lot of time and resources, which often cannot be afforded. Then, lastly, the third type of knowledge is called collective: this type of tacit knowledge is irreducible and only transferred through social interactions and practices. While Collins (2010) attempts to address the issues surrounding knowledge through dividing knowledge into distinct types, he also contributes to the development of knowledge theories by acknowledging that most knowledge is closely tied to the social and practical activities of individuals and to the ways they organise it in particular contexts.

The typologies that make a distinction between individual and organisational knowledge are mostly driven by the duality between the individual and their environment. They make an important leap towards acknowledging knowledge as existing beyond an individual (Newell et al., 2009). Based on such approaches, knowledge is classified into types by pointing to its "location": inside or outside of an individual. Individual knowledge is what resides inside people's heads (Gherardi, 2000) and is perceived by those individuals alone (Bhatt, 2002, p. 32). Organisations are also viewed as cognitive enterprises and systems of shared beliefs agreed upon by consensus are called organisational knowledge (Lyles, 1997). As the definition in this stream of research is based on a cognitive understanding of knowledge, it is still not clear how organisational (systemic) knowledge is defined in more specific terms. More often, though, the definition of organisational knowledge is not provided at all but used as a parallel concept to individual knowledge on an organisational level (e.g. Bharati, Zhang, & Chaudhury, 2015; Loebbecke, van Fenema, & Powell, 2016).

Spender (1996) attempts to transcend the classical structural definition of knowledge and builds a classification based on two dimensions: difficulty of accessing knowledge – explicit (also called "objective") and implicit (discussed together with "tacit" knowledge), and locus – individual and social (also called "organisational") (Spender, 1996). Using a two by two matrix, J.C. Spender bridges the two methods of knowledge classification, and from this follow four types of

knowledge: conscious knowledge (explicit individual knowledge, e.g. codified in personal notes or uncodified in an individual's memory), automatic (implicit individual knowledge, e.g. recognition), objectified (explicit social, which is sharable among people, knowledge, e.g. data, procedures, systems) and collective knowledge (implicit social knowledge, e.g. teamwork, culture). The two types that are a product of explicit and implicit knowledge types at a social level essentially clarify the distinction between the more formal and less formal natures of knowledge in organisations: explicit social knowledge, which Spender calls "objectified" (also, Spender refers to it as "organisational knowledge"), is the type of information that is "evaluated according to institutionalised standards"; whereas "collective" knowledge is "the outcome of the interplay between the conscious and automatic types of knowledge" (meaning, between the explicit and implicit knowing of a person), and "between the individual and collective types of knowledge as they interact through the social processes" (Spender, 1996, p. 71). Similarly to J. C. Spender, F. Blackler (1993) uses activity theory (Vygotsky, 1962) and bases the structure of knowledge on either individual or collective levels ("collective interpretation") of knowledge (Blackler, 1995); however, he departs from the typical individual and collective knowledge structures and attempts to develop the notion of knowledge as materially embedded and process-based "knowing" (learning). While the overall schemes of these knowledge structures are still largely based on individual cognition, one of the contributions of Spender's and Blackler's theorisations is that their theories acknowledge the social or, in other terms, collective dimension of knowledge, bringing structures of meaning and materiality into play and thus building a bridge to a new understanding of knowledge as a social phenomenon.

1.2.3 The Processual and Practice Views of Knowledge in Organisations

By the end of the twentieth century, management scientists were increasingly acknowledging that knowledge is not manageable in the same way as physical resources (M. Boisot, 2002). Two new streams of knowledge theories in organisational research, more commonly referred to as theories of "knowing" or "knowledge work", discard the explanation of knowledge as individual cognitive activity and proclaim knowledge to be fundamentally social: these approaches

represent the epistemology of action (Chiva & Alegre, 2005); a so-called “process” view of knowledge; the epistemology of practice (Cook & Brown, 1999) and a practice view in organisational research. Both process and practice views treat knowledge as a process and not as an entity and are helpful in analysing how knowing is enacted in particular contexts (Newell et al., 2009). They do not pretend to be creating generalisable ways of manipulating knowledge in organisations. The metaphors we use to express our ideas have “enormous impact on how we reason about knowledge” (Andriessen, 2008, pp. 5-6); therefore, researchers within these streams also use different terminology and embrace the use of “knowing” instead of “knowledge”, as well as “enacting knowledge” and “knowledge work” as opposed to “knowledge transfer” or “knowledge management”, which are common terms used to refer to knowledge from the structural points of view. Process and practice scholars approach knowledge as an undivided unity and inherently social, which first of all means asserting that knowledge is an integral phenomenon and is not separable into distinct types; and second, it means speaking of knowledge as a process – what people do in organisations – as opposed to knowledge as a static and compartmentalised concept (Blackler, 1995) which is owned by people or organisations. Process and practice approaches encompass complementary arguments of the equivocality, dynamics and context dependence of knowledge (Newell et al., 2009). The key characteristics of process and practice views are summarised in Table 5 below, and further the arguments for each of these two perspectives are discussed.

Table 5. Theories of social knowledge

Theoretical approach on knowledge	**Focus on** (Chiva & Alegre, 2005; Cook & Brown, 1999)	**Principal idea** (Newell et al., 2009)
Process view	Human action and the social nature of human knowledge	Knowledge is a dynamic, negotiated and relational process of sensemaking, which encompasses both cognitive and social dimensions
Practice view	Human action, the social nature of knowledge and its embeddedness in material arrangements	Knowledge resides and can be seen in what people do, say, believe and reflect through material artefacts (Newell et al., 2009)

Process scholars claim that structural theories of knowledge wrongly adopted the concept of tacit knowledge by Michael Polanyi (1966) (Tsoukas, 2005b) and instead of taking the tacitness of knowledge as a property of all human knowledge, assigned it only to certain kinds of knowledge. Explicit knowledge does not exist as a separate type, as there is always an element of tacit knowing underlying it. Even if we find a way of decoding tacit knowledge and stating it in an externalised manner – this decodifying process itself is more than we can describe in words and remains incommunicable. Process theorists do not reduce knowledge sharing to its "transfer" through articulation (Tsoukas, 2005b) and suggest that knowledge is not observable independently of its context and does not exist "out-there"; therefore, attempts to derive independent and separable parts of knowledge only bring partial and fragmented understanding of this concept. Additionally, treating knowledge as purely personal and residing inside of an individual is problematic too: assumptions behind the definition of "individual" or "personal" may even misleadingly attribute interdependent activities performed by multiple actors to the cognitive activities of a single person – to a personal "belief" (Gourlay, 2006). Instead of treating knowledge as a "thing" (possession of a person), process scholars define it as a dynamic, negotiated and relational process of "sensemaking", which helps to discriminate "within and across contexts" (Newell et al., 2009, p. 14). The process view of

knowledge implies attending to social nature and embeddedness of knowledge, which encompass both “the individual cognitive aspects of knowledge as well as its social nature” (Newell et al., 2009, p. 6).

Practice perspective has a lot in common with the process perspective, however, in addition, it focuses on how knowing is a part of human action, or in other words, human practice (Newell et al., 2009), and how it is embedded in materiality. Practice scholars view knowledge as enabled in practices and specific material and social contexts (Newell et al., 2009). Knowing is an action, which is “informed by meaning drawn from a particular group context” (Cook & Brown, 1999, p. 60) and “negotiated through social interaction” (Newell et al., 2009, p. 16). Sociality, as in the process view, is not the total of individuals’ knowledge but the interrelatedness of the social lives of those individuals, which emerge through their actions (M. S. Feldman & Orlikowski, 2011). Practice theorists ascribe an important role to materiality and material objects and “knowledge is conceived largely as a form of mastery that is expressed in the capacity to carry out a social and material activity” which also includes feelings, expectations and meanings (Nicolini, 2012, p. 5). Following this, organisational knowledge is a shared understanding and a set of norms that people develop while working in a group. Knowledge resides and can be seen in what people do, say, believe and reflect through material artefacts, which they use and produce (Newell et al., 2009).

1.2.4 Refining the Understanding of Knowledge in Inter-Firm Cooperation

The theories of knowledge management and knowledge work represent two distinct views of knowledge in organisations. First is a structural view of knowledge which is an approach to knowledge that aims to simplify and manage the complexity of organisational knowledge through reducing it to a few types of knowledge that can be created, stored, managed or transferred like any physical organisational resource. It promotes the individualist and dual natures of knowledge, and contributes to the scholarly conversation on the dichotomy and opposition of mind and body, as well the dichotomy of thought and action (Gherardi, 2000). The structural approach to knowledge is widely adopted in management research and tends to analyse knowledge as an isolated entity and prescribe a simplified “objective” definition of

knowledge when dealing with complex practical environments. On the other hand, the social view of knowledge as a socially embedded process refuses this partitioning of knowledge and treats it as one integral process. There are two broad streams of research that promote the social understanding of knowledge – the process and practice views – and which are very similar in how they define the concept. Knowledge as process is neither “out-there” nor individual property but is the process of knowing shared among organisation members. In addition to process, practice scholars stress the material embeddedness of knowledge in local contexts – knowledge as a socially and materially interwoven activity, which constitutes organisational practices, and which itself is constituted by these practices. Therefore, structural and social views hold fundamentally different assumptions about what constitutes knowledge, what constitutes social life and about the separability of knowledge from its contexts. The use of these assumptions in structural and social views of knowledge consequently give rise to different strengths and weaknesses, which have implications on the applicability of these theoretical approaches in empirical research and the potential to produce findings which could meaningfully explain knowledge practices in organisational contexts, as summarised in Table 6 below.

Table 6. The strengths and weaknesses of the structural and social views of knowledge

	Structural View of Knowledge	**Social View of Knowledge**	
		Knowledge as process	**Knowledge as practice**
Key assumptions	Knowledge is a cognitive activity, and is separate from bodily activities	Knowing is an integral cognitive and social process	Knowing is an integral cognitive, bodily and social activity
	Social is understood as a collective sum of multiple individual realities	Social is understood as a dynamic, negotiated and relational process	Social is understood as an inter-individual reality embedded in interrelated people's lives
	Knowledge may be isolated from other human activities and analysed this way	Knowing is embedded and cannot be separated from its contexts and therefore needs to be analysed within those contexts	
Strengths	Proposes the frameworks that make knowledge relatively easily empirically explored in organisations	Reflects the complexity of knowledge work and contextual embeddedness in organisations	
Weaknesses	Knowledge is reduced to a "manageable" resource and, therefore, it fails to account for more complex knowledge manifestations	Proposes sophisticated frameworks which are difficult to apply in empirical research	

Based on the analysis and the comparison of two theoretical approaches of knowledge, the practice view encapsulates a potential solution for the issues that impede current research progress in knowledge sharing and secrecy in cooperation:

1. It connects the social, cognitive and material dimensions, which constitute practices of knowing;
2. Treats knowing as an activity and is focused on “how knowledge happens” instead of “what knowledge is”;
3. Approaches knowing as produced and reproduced in a local context and by local actors; therefore, the local knowing and its meaning is superior to general conceptualisations and universal prescriptions of knowledge management practices in organisations.

As is apparent, even the proponents of structural knowledge theories, which concentrate primarily on the cognitive nature of knowledge, widely acknowledge that knowledge is not only individual but also of a social nature, which nevertheless they treat as a secondary issue and still define it differently from what is understood to constitute the social world in terms of process scholars. Moreover, empirical research studies tend to focus on the aspects that are easier to measure, so explicit and close-ended manifestations of knowledge work.

Therefore, the practice-based understanding of knowledge supplies a useful analytical lens: research on the tension between knowledge sharing and secrecy (informal ways of protecting knowledge) in inter-firm cooperation stands to benefit from the adoption of this perspective – the practice lens supports the more integral and holistic view that cooperation process research needs. Before concluding the extant literature review, in the next chapter I analyse the concept of secrecy as it is defined in the recently emerged organisational literature on secrecy and analyse how this research may help to deal with the limitations on the extant knowledge of inter-firm cooperation.

1.3 Secrecy in Organisations

Based on a review of cooperation literature, the contradiction between the needs and aims of sharing and protecting knowledge are hardly congruent; however, as I identified, a new understanding of knowledge as a fundamentally social phenomena

is needed to appreciate its complexity. Furthermore, secrecy – an informal way of protecting knowledge – also needs a different outlook that appreciates its social nature. Therefore, in this chapter, I discuss a secrecy research stream that has recently emerged in management research and which draws its inspiration from theoretical and empirical exploration in other fields of management and in totally different fields, sociology in particular, and provides the conceptual background for understanding secrecy as a social process.

1.3.1 Definition of Secrecy

Secrecy is the act of intentional concealment (Bok, 1982; Grey & Costas, 2016). When one uses secretive behaviour, another person or a larger group of society is being misinformed – gaining a misconception about some fact or the intention of the person who holds the secret (Simmel, 1906). Human relationships are based on the idea that we all "know something about each other", however, such knowledge is always partial (Simmel, 1906, p. 441) and secrecy contributes to the incompleteness of this knowledge.

Secrecy is the process that sets apart the hidden from the non-hidden and the "keepers of a secret from those excluded" (Bok, 1982, p. 6). When new product strategies are hidden from company competitors, confidential customer and employee data are hidden from the public, or a private agreement takes place between co-workers during lunch (Costas & Grey, 2014), a boundary is drawn between the information that is available to all and the information that is restricted to the group of people entitled to know the secret. Such a process is inherently social (Marx, 2016), as there is always more than one person involved for the secrecy to make sense: secrecy implies some "other" person (an outsider) being excluded from knowing. It may be that a single person has a secret that nobody else knows or a group of people shares some secret information that is prohibited to be shared with anyone outside this group (Grey & Costas, 2016).

While the content of the secret remains hidden, the pure fact of the concealment may be accessible to the outsiders: Burkhard Sievers (Riese, 2014) refers to such secrets as "simple" and Erving Goffman (Grey & Costas, 2016) as "manifest". However, in the case of "latent secrets", the mere fact of the existence of secret

information is hidden to outsiders (Goffman, 1978; Simmel, 1906). Furthermore, the boundary between the secret holder and the outsider may not always be clear (Grey & Costas, 2016), as it happens, for example, with public secrets: multiple persons may treat the same information as secret and not speak about it (Taussig, 1999).

The essential characteristic of secrecy is intentionality of concealment. Secrecy is distinct from unintentional or accidental omission of information: “simple error” (Simmel, 1906, p. 445), in other words, “accidentally forgetting to mention something would not be secrecy, nor would be the omission of irrelevant information in a particular interaction” (Grey & Costas, 2016, p. 3). Organisational secrecy is a social act that is distinct from and not to be confused with privacy or confidentiality, which refer to the rights or obligations to maintain a secret (Harwood, 2006; Margulis, 2011), rather than the process of concealment in a more general sense.

Secrecy is “characterized by the way communication is controlled” (Bellman, 1979, p. 2) and the content of secrets may not be important on its own. The value of a secret may lie in the mere fact of being hidden and holding “symbolic value” (Costas & Grey, 2014, p. 1429). The content may be accidental, but secrecy attracts people because of its mysteriousness (Simmel, 1906). For some organisations, such as diplomatic services or secret agencies, secrecy is their very defining characteristic (Costas & Grey, 2014) and plays a visible role in their operations and relations with the public. Such organisations are seen as having “pervasive organizational cultures of secrecy” (Grey, 2014, p. 107) and they experience public pressure to increase the transparency of their operations (A. Roberts, 2004).

The other types of organisations may not be directly associated with secretive behaviour: in their cultural environment, secrecy may be “regarded as anomalous and even illegitimate” (Costas & Grey, 2014, p. 1434). When secrecy is viewed through a moral prism, and as opposed to transparency, it appears in a negative light as unethical and illegitimate (Keane, 2008) behaviour and is associated with “ethical failures and administrative evil” (Adams & Balfour, 2011). Analysing the “dark sides” of secrecy leads to conclusions that secrecy mainly limits an organisation’s proper functioning (DiFonzo & Bordia, 1998; Vredenburgh & Brender, 1998) and is not its regular activity. However, such studies overlook other organisational phenomena, such as rumours (DiFonzo & Bordia, 1998), the fight for power and control (S. P.

Feldman, 1988) or identity work (Creed, DeJordy, & Lok, 2010; Van Manen & Levering, 1996), which are carried out through secretive behaviour.

1.3.2 Empirical Research on Secrecy as a Social Process

Social theorists have accumulated rich scientific knowledge on how secrecy is being used in intra- and inter-group relationships. A secret may matter on its own but may also be the catalyst for a change in social dynamics (Simmel, 1906), trust, inclusion in or exclusion from a group, and games of power (Bok, 1982; Grey & Costas, 2016; Simmel, 1950). Secrets determine relationships among teams who are preserving secret knowledge (Simmel, 1950), play a role in defining who is in a group and who is not (Schein, 2010), and shape organisational identity (Costas & Grey, 2014; Schein, 2010).

Empirical studies focused on secrecy as a process in organisations are nevertheless still rare. One of such studies by Christopher Grey (2014) explores secrecy at an intelligence services company and identifies ignorance, silence and surveillance as key parts of the organisational secrecy process. Gusterson's (1998) ethnographic study showed how a military laboratory preserves secrecy though compartmentalisation of social and geographical space. Steven P. Feldman (1988) studies secrecy in telecommunication company managerial practice and the intentional distortion of information in order to manipulate the behaviour of employees. The practices of secrecy in a specific military and intelligence context may partly hold in commercial company contexts but as secrecy as a process is difficult to observe, it is hard to draw broader conclusions from one study in a narrow context and more empirical evidence is needed in different organisational settings (Grey, 2014).

1.3.3 Economic and Social Understanding of Secrecy in Organisations

Organisational research that draws on economic and legal theories mostly concerns secrets – an informational component (Costas & Grey, 2014), what to hide, where and when. However, social theories provide a richer understanding of secrecy, where its function extends further than simply the need to hide certain information – it is used to exhibit power and control or play social games. However, such social

processes are underexplored in the context of organisational research, including the research on inter-firm cooperation.

Economic empirical investigations also more often treat secrecy as a fixed industrial or institutional context (Delerue & Lejeune, 2011), or an unfavourable factor tightly connected to competitive concerns. One of the contexts, where the need for the secrecy is obvious and this requires firms to specifically attend to the secrecy as a focal process, are the relationships between firms and, especially, cooperation between companies, where the need to share knowledge wins out over the need to protect it. In inter-firm cooperation, companies cannot maintain absolute secrecy as they can when developing their innovation exclusively in-house; thus, the companies need to revise the boundaries of how much they can disclose and an economic understanding of secrecy as residing in the environment is not helpful.

An economic view on secrecy treats it as an independent process and, through a moral lens, as an opposition to transparency (Horn, 2011). The social theories of secrecy highlight that the contradiction between openness and secrecy stems from the perception of these social processes as being parallel to transparent and non-transparent behaviour (Neyland, 2007), and, therefore, even in the cases where secrecy is an obvious functional behaviour of organisations, it is perceived as negative and demanded to be reduced. Secrecy is a routine and necessary organising activity, however, deriving from a preconceived notion of secrecy based on its moral value, research on secrecy is biased towards looking for ways to identify its wrong-doings and how to combat them; while the understanding of secrecy as a social process, embedded in contexts, offers the view of secrecy as a common and daily function, which currently remains largely unexplored.

1.4 The Need for a Social View of Knowledge Sharing and Secrecy in Inter-Firm Cooperation

In previous chapters, I have discussed cooperation literature and how it identifies the critical importance of successful knowledge sharing in inter-firm cooperation; however, the actual practice of overcoming knowledge sharing issues is still vaguely understood, and one of the issues is that organisations deal with cooperative and competitive concerns simultaneously, which is a common contemporary cooperation

setting. This way, a major tension surrounds inter-firm cooperation – the need to openly share knowledge with a partner and the need for the protection of knowledge at the same time. Therefore, it is challenging for organisations to reconcile how much to share, in the hope of successfully accomplishing innovative development with an external firm, with how much to keep secret in order not to damage the value of their own organisation.

Below, I reiterate the four issues that I identified in the analysis of the research on inter-firm cooperation and that pertain to the economic outlook on knowledge and secrecy as well:

1. First, an ***individualist-***oriented analysis of interaction between organisations isolates the cognitive perception from the social and material dimensions of the same process, in this way prohibiting a more holistic outlook;
2. Second, the dominant economic approach to knowledge and secrecy in cooperation treats them as distinct and ***independent*** entities, and in this way also limits the possibility of analysing it as a more holistic process;
3. Third, looking at knowledge and secrecy through their ***structures*** and classification does not allow for the details of the process to be captured, as well as how they are practiced and accomplished in actual organisational environments, and potentially conceals important details;
4. Fourth, ***objective*** and ***context independent*** scientific knowledge is produced primarily in the community of academics and experiences difficulties when applied to complex practical environments.

These four issues currently prohibit more fruitful explorations of the challenge of cooperation: the willingness of cooperating organisations to contribute to a common outcome and exhibit openness and a cooperative attitude, and, at the same time, their need to reconcile this openness with the protection of proprietary knowledge and a defensive attitude.

The practice-based perspective offers a favourable framework for the analysis of this issue and addresses the limitations of economic theory in the understanding of knowledge sharing and secrecy in inter-firm cooperation. The practice theory:

1. holistically approaches the social, material and cognitive dimensions of the process;
2. treats sociality as ongoing, negotiated and interrelated lives and refuses the dual structures;
3. attends to activity as central to the phenomena instead of treating it as an entity;
4. draws on human practices as context dependent and situated in their complex environments.

The practice lens promises to address the issues that are identified in the extant research on inter-firm cooperation knowledge sharing and protection, therefore, I explore its assumptions, characteristics and ways of application in more depth in the next chapter.

2. PRACTICE THEORY LENS

Knowledge sharing and secrecy is a social phenomenon, and to appreciate the complexity of this phenomenon, it needs to be approached with the fundamental concept of the social. Extant literature on inter-firm cooperation predominantly approaches knowledge sharing and secrecy from an economic standpoint – "individual purposes, intentions and interests" (Reckwitz, 2002, p. 245) and the maximisation of individual utility. However, the social view of knowledge offers an alternative approach that conceptualises knowledge as a social activity residing in human practices (Cook & Brown, 1999). This view supplants the duality between the individual and social structures, and enables theories to consider agency, social structures and materiality conjointly. The social view of knowledge is a part of a broader stream of theoretical approaches that create scientific knowledge through attending to practices – to the ways people do things. The social lens is not a refutation or replacement of the economic or sociological accounts of organisation: it is a complementary and holistic view of organisation as a complex social phenomenon. It is therefore useful to inquire as to what the principles of practice theory are in general, and how it can be used in empirical research.

Further in this chapter I present the definition of practice theory and practice concept, explain key characteristics of practice as used in management and organisation science and outline how these together help the organisational scholar theorise organisational practices differently than research on the dominant economic-based approach.

2.1 Conceptual Roots of Practice Theory

As often noted, attention to human practices in science is not new, but rather forgotten and regaining its momentum in the past few decades (Miettinen, Samra-Fredericks, & Yanow, 2009; Nicolini, 2012; Schatzki, Knorr-Cetina, & von Savigny, 2001). Practice as a distinct kind of knowledge has received attention since Aristotle (Nicolini, 2011) but was isolated as independent from theoretical epistemic objects and from the human mind (Nicolini, 2012; Van Inwagen, 2001) until the extreme idealist immaterialism was challenged by a new conception of materiality and

questioning the distinction between mind and bodily activities. Karl Marx proclaimed an interest in activities that people do in their everyday life (Bernstein, 2011): mind is not superior to substance and "thinking is only one of the things people do" (Nicolini, Gherardi, & Yanow, 2003, p. 8). The entirety of mundane human actions, which interplays with emotion and cognition (M. D. Cohen, 2007), is important in order to appreciate the human existence. Contemporary theories of practice owe much to the works of Martin Heidegger and Ludwig Wittgenstein, whose significant achievement is pointing to the primacy of practice that is "prior to any explicit interpretation" (Sandberg & Tsoukas, 2015, p. 187). Heidegger's philosophical works brought new understanding of being in the world – not as an external observer to reality but both subjective and objective coexisting as one inseparable world (Nicolini et al., 2003); whereas Wittgenstein's philosophical investigations stimulated a new understanding of how language is embedded in human social practices (Hendry, 2000). Building upon the works of these philosophers, Pierre Bourdieu developed the framework of social ontology that connects cognitive and social in the fields of symbolic structures (Everett, 2002), and Ted Schatzki elaborates on practices as nexuses of activities comprised of doings and sayings, which enable us to understand who we are and what we do (Sandberg & Tsoukas, 2015).

As it stands, practice theory grew from the critique of scientific rationality (Sandberg & Tsoukas, 2011), the ontological duality of body and mind, and detachment of individuals and their social environment. Given the richness and variety of philosophical and sociological investigations of sociality, there is no one unified approach as to what stands behind social activities and practice – like Spaargaren, Lamers, and Weenink (2016) suggest, it is more a family of interrelated approaches than a single theory of practice. Also, there are different ways and criteria of how to demarcate the domain of practice theorising (Schatzki, 2016). The organisational research that is ascribed to practice theorising ranges from the kinds of theories such as actor-network theory (ANT) (Gherardi, 2000), which views social action as constantly shifting networks of relationships (Latour, 2005) but does not conceptualise activities as practice, to other kinds of theories such as situated learning, which focuses on learning, thinking and knowing as "relations among people engaged in activity in, with, and arising from the socially and culturally structured

world" (Lave, 1991, p. 67), or strategy-as-practice, which treats strategy as microlevel action (Jarzabkowski, 2005) and explicitly refers to these activities as practices. It may also be confusing that there are other approaches which claim to focus on practices, but which follow an economic view and fall outside of the scope of the social theories of practice (Jarzabkowski, Kaplan, Seidl, & Whittington, 2015); for example, the practice-based approach used by Bromiley and Rau (2014) or, in part, ethnomethodology (Sandberg & Tsoukas, 2015). One general idea unifying practice theorising in organisational science is that practice theories share interest in human activities rooted in social practices (Schatzki, 2016), while there may be disagreement on how those activities are conceptualised and what, in addition to activities, comprise those practices (Schatzki, 2017).

2.2 The Definitions of Theory and Practice

The traditional notion of "practice" suggests that "practice is what theory is not" (Hirschauer, 2017, p. 91). For this reason, the joint use of "theory" and "practice" may be perceived as an oxymoron. Such a perception comes along with a common-sensical understanding of practice-oriented organisational research, which provides a descriptive account of some phenomenon and of what people do in selected contexts (Sandberg & Tsoukas, 2015), or, in other words, the empirical account of practices in organisations (M. S. Feldman & Orlikowski, 2011). It is a popular misperception that studying practice can only reach as far as the descriptive accounts of what people do. The transition from mundane organisational activities to a higher level of abstraction nevertheless is a distinct characteristic of practice theory approach – practice "theorising makes theory derivative of practice" (Sandberg & Tsoukas, 2015, p. 188). Therefore, practice concept is not the opposite of theory, but a source of theoretical conceptualisations in practice theorising.

What is commonly claimed to constitute theory in management research are middle-range theories – generic and ordered assertions (Whetten, 1989) which allow to explain and predict certain phenomena, events or behaviour. Such understanding of theory is close to what was long accepted as the only way to contribute to theory by using a "'causal functional' approach of the natural sciences" (Schutz, 1954, p. 259) and what has been pushed forward as an ideal to be adopted by social sciences.

In sociological language, the meaning of theory is more polysemic: it can include the "construction of propositions" or explanation of a particular phenomenon, but may also infer an "ongoing dialogue with some classical texts" or the "lexica and schemata" of the social world (Abend, 2008, p. 175) among other uses of the concept. In the case of practice theory, what I infer by theory is a type of social ontology (M. S. Feldman & Orlikowski, 2011) – the "general and abstract account" (Schatzki, 2001a, p. 12) of the social world. Defining such a notion of theory, Abend (2008) aptly uses a German word "Weltanschauung" (English: "worldview") – a general perspective through which we interpret the world. This way practice theory in organisational science is not a set of explanatory or predictive statements, but a perspective (Sandberg & Tsoukas, 2015) that serves as a general epistemological and ontological background to research and it is not tied to any specific organisational phenomena or research method.

As it is apparent, the focus of practice theory is organisational practices, defined as human actions that are embodied in material worlds, i.e. "arrays of human activities", which depend "on shared skills or understanding" and "mediated by artifacts, hybrids, and natural objects" (Schatzki, 2001a, pp. 11-12). Practices could be understood as the retention of particular ways of how we select and control those selections of perceived possibilities – the choices we make and the other potential ways that we exclude (Fairclough, 2003). In both Lithuanian or English languages, there is no linguistic distinction between the broader phenomenon of practice and specific activities – the word "practices" (Lithuanian: "praktikos") may imply one of those meanings depending on the context. However, I would like to make this important distinction by using the example of German language, which has two distinct words linking practice to two different meanings – "Praxis" and "Praktiken". Practice as a "Praxis" implies "the whole of human action" (Reckwitz, 2002, p. 249) and refers to the actual and ordinary activities of humans, "what people do in practice" (Whittington 2006: 619). Whereas practice as "Praktiken" is a set of multiple "praxis" that are performed, and refers to more interconnected elements of organisational activities, such as material objects used in those activities, knowledge, emotions and motivation (Reckwitz, 2002). The socio-ontological concept of practice as "Praktiken" refers to social activities based on shared understanding (Schatzki et al., 2001): the

ways of doing and social “collectively constructed orders” (Rasche & Chia, 2009, p. 6) drawing on “unconscious tacit understanding” (Langley & Abdallah, 2011, p. 220). It varies nevertheless in different theoretical approaches to practice how they conceptualise activities that constitute human practice: it may be that only routinised and patterned activities are viewed as being a part of social practices; alternatively, routines are no different from irregularities and unique activities and all of them are part of social practices (Rouse, 2007; Schatzki, 2001b).

Based on those two understandings of practice – as “Praxis” and as “Praktiken” – in the first, narrower sense, the concept of practice would entail activities, routines, situated actions (Gherardi, 2008) and a wide range of human activities in contexts; in the second sense, practices comprise interconnected and organised actions (Spaargaren et al., 2016) and form bundles (Schatzki, 2002), which are the product of bodily movements, understanding, desiring and using material objects (Reckwitz, 2002). The specific context in which scientists place their explorations of practices points to more subtle characteristics of practices, and such an open-ended definition may even be promoted in the name of plurality of worldviews and ontological constructions (Nicolini, 2012). Nevertheless, most of practice theorising goes beyond the “praxis” alone and bases their analysis on the nets of practices embedded in contexts and collectively maintained over time.

2.3 Socio-Ontological Characteristics of Practice Theorising

Organisational practices are situated in material, social and individual interconnectedness, and there are three important characteristics that define them – activity, sociality, and embeddedness in the material world; thus, further I discuss them in more detail.

Activity. Human activity is commonly perceived as reducible to visible physical movements. However, there is more to social practice than what we explicitly see in human actions (Sandberg & Tsoukas, 2015), Practices build on “symbolic structures of meaning” (Reckwitz, 2002, p. 244). Different meaning may be implied behind the visibly similar human activities and similar meaning may be expressed by different actions. However, it is not only bodily movements which count as activities – what we do and what we say are both inherent parts of practices (Schatzki, 1996). Words

carry the meanings, and, same as with bodily activities, different meaning may be implied within the same linguistic expression. Language itself may be the tool for performing certain actions (Fairclough, 2003) and this could only be interpreted within its context and by paying attention to other phenomena that organise it. Schatzki (2005) distinguished three types of social phenomena that organise and hold practices together: understanding, rules and teleo-affective structure. Practices are organised by practical intelligibility, or, the so-called "understanding" of how and what it makes sense to do and say. Social practices are centred around shared understanding (Schatzki, 1988), which is "grounded on taken-for-granted background practice" (Taylor, 1993), as cited by Sandberg and Tsoukas (2015, p. 186). These are explicit principles of practicing (Schau, Muñiz Jr, & Arnould, 2009), which we accept as a proper way of doing things and which are not a matter of interpretation but "following a rule" (Wittgenstein, 2009, p. §202). Lastly, teleo-affective structure is the phenomenon that organises practices through emotional engagement and commitment of people to their activities – "ends and purposes" (Schau et al., 2009, p. 31). General beliefs are part of the teleo-affective structures, but sometimes are separated as a fourth distinct organising phenomenon – "general understanding" (Schatzki, 2002).

Sociality. Practice theories take a middle ground view on sociality between subjectivist and objectivist explanation of the social (Spaargaren et al., 2016), or in other words, between rational choice and norms-oriented approaches (Reckwitz, 2002). What the theories of rational choice (purposeful action) define as social order is a combination of individual motives; whereas norms-oriented theories of action treat sociality as a matter that is agreed by consensus – "collective norms and values, i.e. to rules which express a social 'ought'" (Reckwitz, 2002, p. 245) and does not depend on human will. The social as viewed through a practice lens moves away from such opposition between agency and structure to the totality of the concept, which "has an existence beyond that of its parts" (Schatzki, 1996, p. 2). In the vocabulary of practice theory, sociality is dynamic and interrelated coexistence of human beings – "interrelated ongoing lives" (Schatzki, 1988, p. 243) emerging "through people's recurrent actions" (M. S. Feldman & Orlikowski, 2011). The social world is interconnected human existence shaped by their engagement in the

community (Schatzki, 2017) and by the performance of shared practices (Schatzki, 1988). Social orders are shaped by practices but also are those which constrain the practices themselves (Ortner, 2006). The individual and the social do not reside as distinct but as one single level of reality without higher (social structure) or lower (individual) domains (Schatzki, 2016) and without separation of individual interests and collective reality. Social life is what we do and experience as a part of coexistence with other human beings.

Materiality. Materiality is the other important consideration of practical activities and may be encompassed in practice theorising in several ways. One, materiality may be treated as equally relating to human agents and material objects. Such understanding is associated with the webs of material objects and humans that are carried on by practices as conceived in the actor-network theory approach (Law, 2009). Materiality is part of the whole of practices, which are combinations of "materials, competences and meanings" (Shove, Pantzar, & Watson, 2012, p. 24). While on a different account, material objects are relevant to practical arrangements as a mediating part of human practices, i.e. practices are "construed as materially mediated nexuses of activity" (Schatzki, 2001a, p. 20). Material objects and the sensations which are attached to those objects may activate or represent human experience and articulate virtues (Ger & Kravets, 2009); additionally, material objects and their distribution may determine the limits of the infrastructure of human activities as well as where and what material arrangements may be anchored in organising human lives (Schatzki, 2009). What is nevertheless important to highlight here again is that there is no duality between thought and bodily experiences and there is no separate identity of body from that of mind (Rorty, 1979). Materialism, as treated by practice scholars, is dynamic experience of the matter that surrounds us, in which we are immersed, and of which we are composed (Coole & Frost, 2010).

2.4 Applying Practice Theoretical Lens

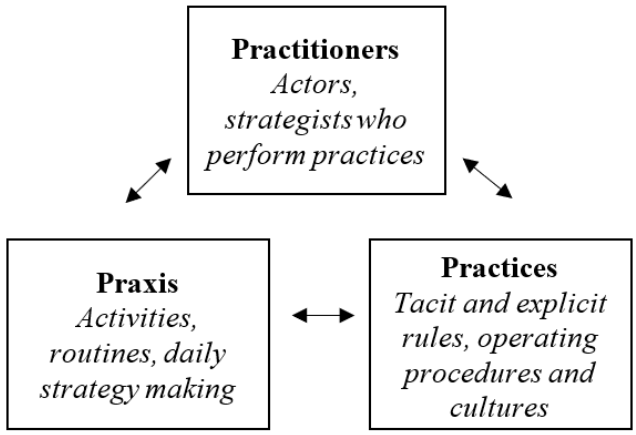
There are a few fields of organisational research, which adopted the practice theory lens more extensively than other areas: these are strategic management (strategy as practice field), organisational learning and knowledge research. Additionally, in a broader area of management disciplines there are notable examples

of applying the practice lens in the field of consumer research. Further, I provide examples of a few empirical studies that use the practice lens. It is not the aim here to present a full range of practice-based research but instead to demonstrate a selection of papers that represent a variety of micro and macro practice theorising, analytic frameworks, methods of analysis and data sources. It is worth noting, though, that all these examples are based on qualitative data analysis and that, as it stands now, practice-based studies consider qualitative research to best satisfy the need for an in-depth look and contextualisation.

Strategy as practice is probably the best-known area in organisational research that employs practice theorising. It relates to a wide range of dimensions of strategy formation (Langley, 2007) and focuses on micro-level activities and on what people do in their daily strategising in connection with a broader phenomenon of strategy (Whittington, 2006). The view on strategy through the practice lens enables more complexity and diversity of scholarly perspectives, and for practitioners, a way of thinking about strategy as an ongoing socially embedded change (Hendry, 2000). One of the frameworks that strategy-as-practice scholars adopt in their empirical studies is based on the vocabulary suggested by Whittington (2006) – a trio consisting of practitioners, practices, and praxis, also referred to as "3P framework" (Paroutis, Heracleous, & Angwin, 2016) (see Figure 4 below). 3Ps identify practitioners (actors, strategists who perform the practices), praxis (activities, routines, daily strategy making) and practices (tacit and explicit rules, procedures, cultures) and their interconnections as key areas that strategy-as-practice scholars focus on in their analyses. for example, Angwin, Paroutis, and Mitson (2009) studied strategising activities of senior strategy executives and whether these activities "help organizations become more agile" (p. 75). The authors used in-depth interview and archival data and the 3P framework to structure their analysis and identified how UK strategists' work differs compared to their US counterparts in terms of their embeddedness in business, involvement in implementation, wielding of power and the trajectories of their carrier. What the practice lens here helped do was to uncover the actual activities and capabilities of strategists and their interconnectedness instead of preconceived scientific notions. I nevertheless would to like to emphasise that the 3P framework itself is more a vocabulary and a highlight of the units of

analysis to pay attention to; it may be used in different ways and the framework itself does not constitute the practice lens.

Figure 4. 3P framework (Whittington, 2006)



The strategy-as-practice study by Jarzabkowski and Seidl (2008) used observations, documents, interviews and thematic analysis to trace the process of how strategy meetings stabilise or destabilise strategic orientations and demonstrated how meeting routines shape strategic outcomes. In yet another research study, Seidl and Werle (2018) drew on the data from two longitudinal case studies of inter-organisational sensemaking and looked at how actors are selected and how the selection then affects the sensemaking process of strategic meta-problems; they identified the mechanism of inter-organisational sensemaking processes, which helps to explain the outcomes of such processes. Both studies represent examples of how micro-processes at the ground level of "doing strategy" may help to understand substantive processes at the organisational or inter-organisational level.

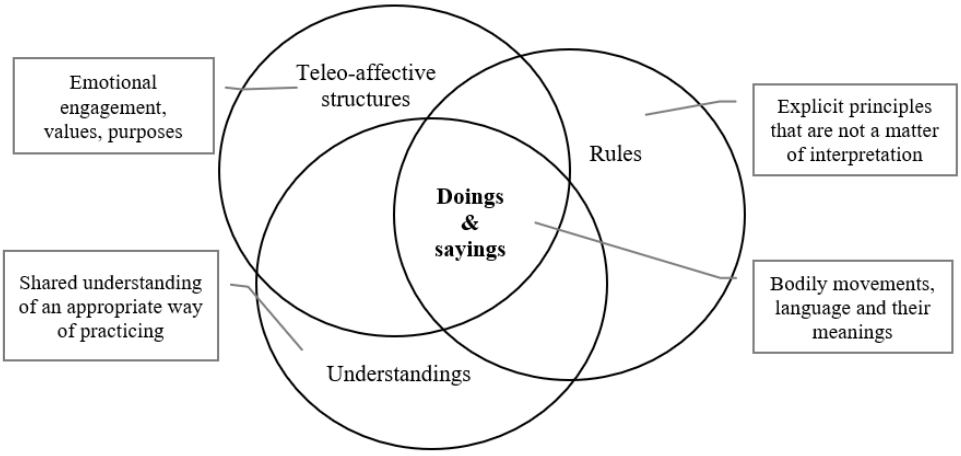
Organisational learning and knowing. How organisation actors work and learn in practice is often purely reflected in how these processes are described in documents (Brown & Duguid, 1991): there is much more tacit and contextual knowledge in practices than what may be written down on paper. Knowledge is not what people have in their heads (Gherardi, 2000), but what people do by working together and what they create through negotiated meaning (Gherardi, 2008). It is a

discursive process mediated by material objects (Gherardi, 2006) and practice-based theorising of the creation of organisational knowledge enables those contingencies and that situational wisdom to be captured (Gherardi, 2008). A book chapter by Dvora Yanow (2015) draws on the analysis of an autobiographical account of a person who was learning to deliver newspapers when he was a boy, as well as the analysis of other secondary sources. This paper uses the "very material, bodily, and social elements" (p. 277) of the texts to enhance the understanding of learning as practice and show how the conception of a novice learner of his future practice is a part of the practice itself. Furthermore, Yanow's analysis allows for the transformation of the concept of "*being* a master" from the illusionary stability of being competent to practise to a continuous return to novice-ry: when any issues arise, practitioners must interrupt their regularised practices and bring the elements of their practising to focal awareness to continue their mastery. Yanow articulates the lifecycle of mastery-learning and urges us to rethink the notion of organisation from treating it as a container for practices to organisation being a practice itself. Another example of studying organisational learning and knowing is an ethnographic study by Nicolini, Mengis, and Swan (2012), which contributes to the understanding of the role of socio-material practices that these practices play in interdisciplinary collaboration. These authors use a pluralistic framework of four theoretical lenses, which complement each other and help to identify how material objects support collaborations but also how they create tensions and misunderstandings: the objects used in collaboration have no given meaning but gain and change it in the contexts, times and in relation to the people who use them, and these findings directly address practitioners – managers, who may benefit from expecting objects to have no universal meaning and probe for understanding of those meanings in order to manage conflicts in collaboration.

Consumer research. Lastly, I provide an example from consumer research, which is a management discipline outside of organisation studies, however, I see it as useful to familiarise us all with how Schatzki (1996) social ontology of practice may be employed in an empirical study of practices. Schau et al. (2009) studied brand community practices and used the analytical framework built on the three phenomena that hold practices together: rules, understandings and engagements (i.e. teleo-

affective structures) (see Figure 5 below). Through the analysis of nine netnographic research studies and connecting them to the extant research of value-creation practices of brand communities, the authors come up with a list of practices organised under four themes “through which consumers realize value beyond that which the firm creates or anticipates” (p. 30). The examination of practices through their binding phenomena helped this study to reach the depth of the understanding of the mechanism how “value is manifest in the collective enactment of practices” (p. 41). Having a large empirical database in conjunction with meta-analysis of the extant research studies allowed authors to generalise beyond the activities of single cases. Like in the case of this example in the consumer research field, the analytical disentangling of social practices and the phenomena which organise them finds use in organisational research too, e.g. in the study by Rosenberg and Keller (2016) on making sense of structural change in a public organisation.

Figure 5. Three phenomena that hold social practices based on Schatzki (1996)



Practice-based empirical papers use varied sources of data, of which observations and ethnographic methods is an important but not the only source of insights (see the summary of the papers discussed in this section in Table 7 on the next page). It is apparent that qualitative and interpretative research dominate when studying social practices as they concern not only activities but also the meaning structures behind visible action and language.

Table 7. Empirical studies using practice lens

Empirical study	**Perspective /research field**	**Data sources**	**Data analysis**
Angwin et al. (2009)	Strategy as practice	In-depth interviews and archival data	Inductive identification of recurrent themes and structuring based on 3P framework (Whittington, 2006) linking practitioners, praxis and practices
Jarzabkowski and Seidl (2008)	Strategy as practice	Observation, documents, interviews	Thematic analysis, process tracing
Seidl and Werle (2018)	Strategy as practice	Longitudinal ethnographic case studies: observation, interviews, documents and pictures of artefacts	Processual analysis of actors, actions, motivations, reactions and their change over time
Yanow (2015)	Organisational learning	Secondary data: a book and other texts	Narrative analysis
Nicolini et al. (2012)	Organisational knowing	Focused ethnography: observation, interviews, videos and visuals	Inductive and iterative analysis
Schau et al. (2009)	Consumer behaviour	Netnography, meta-analytic literature review	The analysis of practices as sayings and doings linked through procedures, understandings and engagements (Schatzki, 1996)

Empirical study	Perspective /research field	Data sources	Data analysis
Rosenberg and Keller (2016)	Organisational change	Interviews and documents	Rules, practical understandings and teleo-affective structures (Schatzki, 1996)

The empirical examples of the research studies using the practice theory approach demonstrate that eliciting explanatory accounts are not superior to the development of the understanding of an organisational phenomenon. Such theoretical understanding is more than mere empirical description: it is an evaluative analysis which infers the meaning beyond the description of empirical material. Instead of concentrating on prediction, practice theorists use the language and the framework that helps "one decide what to do" (Rorty, 1981, p. 4). The world cannot be explained, but instead, the meaning may be inferred, and the evaluative description can be provided. The challenge for a practice scholar is that engaging in practice theorising means observing, gaining in-depth understanding of practices and making sense of what people do in practice over time, and in many cases that requires long-term engagement, such as ethnographic or longitudinal study. However, practice theorising provides more sensible results to complex and dynamic organisational environments, therefore, is more easily absorbed in practical arrangements. Practice theorising offers helpful framework and enables us to redirect our attention to mundane human activities, which otherwise tend to be taken for granted and analysed through more distant and abstract concepts. Practice theory speaks to both economic theorists, who are concerned with individual motives, and with those having sociological accounts, attempts to affirm the significance of both society and individual (Whittington, 2006) and engages them in a new agenda. It closes the gap between the flawed distinction of practitioners' work and academia, picturesquely named by Donald A. Schön as a "swampy lowland" of messy practice and "high ground" of well-defined academic issues (1987), and unites the two through a more holistic understanding of complex organisational and managerial activity arrays.

2.5 Knowledge Sharing and Secrecy in Inter-Firm Cooperation through the Practice Lens

A common understanding of a theory in management research is a set of causal assertions that allow for the explaining and predicting of some phenomena. Practice theory is a different kind of theory: it is a broad perspective – a socio-ontological lens that is not concerned with any specific phenomenon, instead serving as an ontological perspective.

The acute question that is raised in the research studies based on individualist ontology exploited in economic theories is: how do cooperating firms deal with the tension between openness and secretiveness? The framing of the question itself carries the assumption of competitive and negative dynamics between sharing and protection. In addition, it presumes that the goal of scientific research is to carry out an investigation that would help practitioners balance these conflicting needs. Looking at it from a socio-ontological practice theory perspective, this juxtaposition of sharing and secrecy prohibits a holistic understanding of the phenomena, and instead, the question may be rephrased into a more productive inquiry: **how are knowledge sharing and secrecy intertwined in inter-firm cooperation practice and how do they bring joint contribution to cooperation outcomes**?

Therefore, in this research, I employ the practice theory lens to provide a holistic account of knowledge sharing and secrecy as socially and materially embedded practices enacted in complex inter-firm cooperation environments. I choose to anchor my analyses in the social ontology of practice developed by Schatzki (1996), which similarly to other practice theoretical approaches:

1. Maintains the centrality of action;
2. Enables the meaning of this action to be localised in socio-material practices rather than just in individual cognitive considerations.

Based on the social practice ontology as elaborated by Ted Schatzki (1996, 2001a, 2005, 2016), I define:

1. ***Practices*** as what people do and say and the underlying meanings of these doings and sayings, which are organised according to several phenomena – rules, understandings and teleo-affective structures. Nets of practices are

embedded in contexts and collectively maintained over time;

2. ***Sociality*** as what we do and experience as a part of coexistence with other human beings;
3. ***Materiality*** as a dynamic experience of the matter that surrounds us. Material objects are relevant to practical arrangements as a mediating part of human practices.

In this thesis, I analyse knowledge sharing and secrecy practices in inter-firm cooperation, which I define in the following ways:

1. ***Inter-firm cooperation*** refers to a form of formal inter-company partnership agreement, in which two or more independent companies collaborate, and which is characterised primarily by the need to partially integrate the structures, processes and coordination mechanisms of cooperating firms (Contractor & Lorange, 2002; Gulati et al., 2012; Hagedoorn, 2002);
2. ***Knowledge*** is a particular way of "understanding the world" (Reckwitz, 2002, p. 253); and ***knowledge sharing*** (or knowledge work) is a socio-organisational activity of knowing embedded in physical (material) worlds and human practices (Newell et al., 2009). Activities of knowledge sharing in this thesis may also be expressed in other practice theoretical terms and used interchangeably, such as the practice of knowing, knowledge work and knowledge enactment;
3. ***Secrecy*** – is an intentional act of concealment and a social practice of protecting some secretive content, which may have immediate or symbolic value (Bok, 1982; Costas & Grey, 2014; Grey & Costas, 2016; Marx, 2016).

I use the analytic categories of the "anatomy" and "physiology" (Schau et al., 2009) of knowledge sharing and secrecy practices: the anatomy includes what people do and say, as well as how rules, understanding and teleo-affective structures organise these doings and sayings; the physiology of practices conveys the way these practices connect in a process model – the negotiated order of the recursive and iterative performances in the inter-firm cooperation process. To capture the complexity of the inter-firm cooperation context and unfold the meaning that

practitioners ascribe to their practices, I adopt a case study research approach and qualitative data access and analysis techniques.

3. RESEARCH DESIGN

There is a vast amount of research in the field of cooperation, however, the majority of such research studies take an economic perspective and treat knowledge sharing and secrecy as distinct processes; this limits the understanding of the interdependency of these processes, and the complexity of the environment provides a limited account of the complexity of the phenomena. Therefore, in this research, I use a practice theoretical lens to theorise the process and draw on the complexity of it instead of simplification, and aim to answer: **how do knowledge sharing and secrecy as interdependent activities in inter-firm cooperation bring joint contribution to cooperation outcomes**? I show how sharing is a part of secrecy and secrecy is a part of sharing, and how practices are intertwined and jointly contribute to the desired cooperation outcomes. I employ a single case study, which was feasible and practical for capturing a holistic picture and the complexity of the cooperation process and use interpretative qualitative data analysis to answer this question.

Further in this chapter, I present the design of my case study and the methodology, which I used to access the necessary data and analyse the issue. I present it in several sections which explain the case study design; its emergent and iterative nature; the justification for the use of historical data; the context of my research; data access and the interview process; how I ensured the rigour of the qualitative research; and how I analysed the data.

3.1 Case Study Design

This study is a single case study of inter-firm cooperation practices at a biotechnology firm, which is an R&D centre and a subsidiary of a larger corporation (hereinafter referred to as “BioCL”). I look at the cooperation practices of this firm from two angles: one – from the perspective of internal managers at this company, and second – from the perspective of their partners. Inside the case, I look at multiple

large-scale cooperation projects and smaller incidents of co-work that were run by BioCL and their partners. The case study design emerged from the exploratory phase of this research, where I interviewed the managers of a few smaller biotechnology companies. The initial interviews and interaction with the industry players helped me gain access to the company that is the focus of this research. As well, the analysis of pre-case interviews helped me define the context and set the relevance of my research question.

Case study was chosen for this research as it is particularly useful when looking at the process and answering the questions "how" and "why" (Yin, 1994) and capturing "the particularity and complexity of a single case" through a detailed and interpretative account (Stake, 1995, p. xi), which is in line with my research aims. Case study is an approach that is suitable for collecting information about a large number of features, which may not even be predetermined; as well, it is suitable for observing naturally occurring features in their context (Gomm, Hammersley, & Foster, 2000). As I am exploring the practices of knowledge sharing and secrecy in inter-firm cooperation, which are complex and multifaceted processes, the case study design allows me to capture a large number of details that may contribute to the in-depth understanding of the process.

The case is a bounded system of its internal features and surrounded by external features – the context (Stake, 1995). Internal features are, without a doubt, important in studying the case, however, the context also plays an important role: it helps capture the complexity and particularity of the case and "to understand its activity within important circumstances" (Stake, 1995, p. xi). The boundaries between the phenomenon and the context may not always be clear though, and it is not always easy to define where the case ends and context begins (Stake, 1995; Yin, 1994). In this research, I chose to look at the cooperation practices of one firm; however, since multiple external players are involved in this process, the boundaries of this case go beyond the boundaries of the firm: the partners from outside the firms are involved, as well as the employees who are from a parent company or other subsidiaries of the same parent company. This builds a wide and fuzzy network of actors, their practices and social interactions, which all form a complex system, in which it is difficult to even draw a line between the phenomenon and its context, as it changes depending on

the cooperative activities in which the firm engages. I therefore draw conditional boundaries based on data access and the major cooperation cases that the company was involved in between 2005 and 2017.

3.2 Emergent Research Design

As mentioned earlier, my research started with a preliminary exploration, which then emerged as a case study design. My research question was shaped following the secondary data analysis and expert interviews conducted in 2014 – 2015 with several consultants and managers working in the pharmaceutical and biotechnology fields: from initially concentrating on one type of cooperative deals (licensing), I have refocused my research to the broader context of inter-firm cooperation, as knowledge sharing represented a more generic process than the narrow context of licensing agreements. It also directed my theoretical literature explorations to analyse the issues of competition and the withholding of knowledge as they appear to be potentially important aspects of inter-firm relationships and co-work. Furthermore, the exploratory interviews with experts and the secondary data analysis helped me to master the specific language used in this industry and its correspondence to the conceptual language used in science.

The initial research design when I started my fieldwork in 2015 included conducting a process study, including real time observations and historical accounts of several cooperation deals, that would cover different types of cooperation and the full continuum of the stages of cooperation. However, one of the two firms that I had started interviewing and observation discontinued their participation, which triggered the revision of the research design based on the expected access for and the limitations on observation at research sites. The design ended up changing from mixed real time and historical process tracing to a historical study at the end of 2015, when I reached the agreement with BioCL top-management to interview their employees; though I did not receive prolonged observation access due to strict confidentiality rules at BioCL premises.

Just like the overall framework of this research, the sampling, data access and analysis were also developing throughout the study and were conducted in iterative circles: based on the initial interview data, I spent time directing my search and

analysis of secondary data and extant theoretical literature, reviewing my research question and identifying the type of research participants that would work best for continuing my exploration; in turn, the next few interviews would trigger another iteration of working on secondary data, reviewing theoretical literature and adapting sampling strategy. Such iterative cycles continued to be guided by insights received during interviews, data analysis, reading and rereading the literature, and, based on the references received from my research participants, "continually focusing" my data analysis and research process as I "gain ideas and define patterns" (Charmaz, 2014, p. 205). Conducting interviews, data and document analysis and development of the theory were performed simultaneously and in multiple iterations until a sufficient saturation of the analytical data segments was reached.

3.3 Historical Data

A prevailing method of studying practices is a real-time process (ethnographic or observational) study, in which the practices may be observed directly and evaluated by a researcher. However, access to direct observation is challenging in an environment as secretive as the biotechnology sector. The additional challenge in employing direct observations when studying such complex processes as knowledge sharing and withholding is that these processes are not easily directly observable overall; in inter-firm cooperation they are also spread out in time and space. When the object of analysis is physically dispersed, as in this study, and the aim is to project the findings to more general organisational practices, present or future oriented ethnographical case studies are problematic to conduct (Langley & Tsoukas, 2010) – the process can more efficiently be captured by tracing it backwards. Limitations on access and method also restricted me to using mostly historical data (interviewing and secondary data analysis, described in the next section) and complementing it with a small amount of real-time data (observations).

To use the historical method in a way that would allow me to reach an understanding of organisational practices, I have employed interviewing techniques (described in the later sections) that helped me learn about the perceptions and experiences of my research participants. I therefore learned about knowledge sharing and withholding practices through the experiences and constructed meaning of the

social interactions, work routines and practices as (re)constructed by research participants who recalled their active participation in the inter-firm cooperation process. Although the practices were not directly observed, only analysed through histories as told by process participants and documentary sources, I could still adopt the practice view of knowledge as an enactment and focus my analysis on activities and the associated phenomena such as tacit rules, know-how and purposes of action. While the drawback of historical data is that I cannot observe the practice myself, the advantage is that the outcome is partially known and guides our understanding of the phenomenon.

Historical research is known to have the limitation of faulty memories (Golden, 1992) and rationalisation (Langley & Tsoukas, 2010), however, in this research, this limitation has less significance due to the fact that the aim of this research is not to reconstruct what has "truly" happened. For example, in interviews, research participants may present what they think happened in a specific situation and provide their interpretations of the process, which are intertwined with their actual activities. These interpretations become part of "fact", as well as research participants may want to present what has happed in a certain way, often justifying their own or other people's actions and providing them in what they see as presentation in a "positive light". Also, during document analysis, I uncovered the industry-specific discourse – the language acceptable in the biotechnology industry and the regulatory environment – and saw how actual activities may be hidden behind the curtain of what "has to be written" and how. Such subjective and discursive accounts are a valid source for analysis: even if the retrospective interview data does not tell the objective history of the research participant's experiences, it allows me to see how the participant perceives what was going on in her or his interactions with a partner, what meaning it had for the person and how the person was (consciously or unconsciously) willing to present it. The documents presented the necessary background for the understanding of the common discourse and deviations from it. Additionally, the sharing or hiding of knowledge is a subjective perception per se, which cannot be objectively evaluated. Therefore, the value of the historical data lies not in the recall of the events and actions, but in the "meaning with which (the) narrator endows the events or moments" (Fujii, 2010, p. 234) that they narrate.

3.4 Research Setting

3.4.1 The Biotechnology Industry

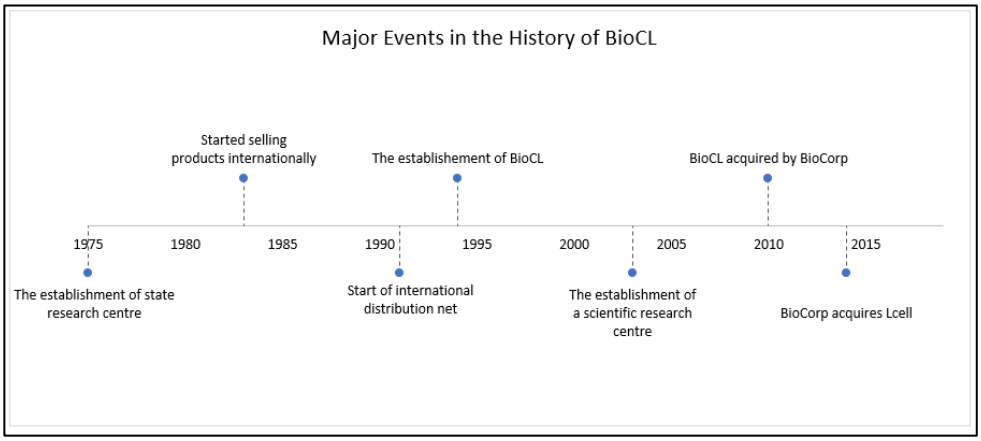
As I am interested in a general phenomenon of knowledge sharing and withholding – practices that are difficult to observe – I needed an intense context where these processes would play a significant role and would be practiced relatively frequently. Such an intense environment is favourable for a researcher to collect detailed descriptions and in-depth data. The biotechnology industry is one of the high-tech industries that rely a lot on a variety of sources of knowledge and complex technologies and, at the same time, the industry has deep roots and a long history of being concerned with top secrecy especially in inter-firm relationships; therefore, it served as a favourable context in which to explore the phenomenon of knowledge sharing and secrecy.

3.4.2 The Company: BioCL

Besides the intense secretive environment and need for knowledge sharing across the boundaries of firms, I also looked for a company that would have a rich and diverse experience of cooperation with external parties, which would allow me to explore a wider scope of experiences related to the same company context. I therefore took advantage of an opportunity to work with BioCL, a biotechnology firm that is currently a large and mature company which develops and sells biotechnology tools and materials for business and research use. The company has extensive experience in cooperation with external partners in various settings, both locally and internationally, and has cooperated with other firms at different stages of its growth.

The major events in the history of BioCL are depicted in Figure 6 below. The roots of BioCL stem from the establishment of a state research centre in 1975 – the company was created by a group of people who worked together at this centre. While the company was not yet a separate legal entity, it started selling products with the BioCL brand and went international. Then, finally, in 1994, BioCL was registered as an independent private company and by this time the BioCL team already had extensive experience of working together, as well as a few proprietary biotechnology products and experience in international trade.

Figure 6. Major events in the history of BioCL



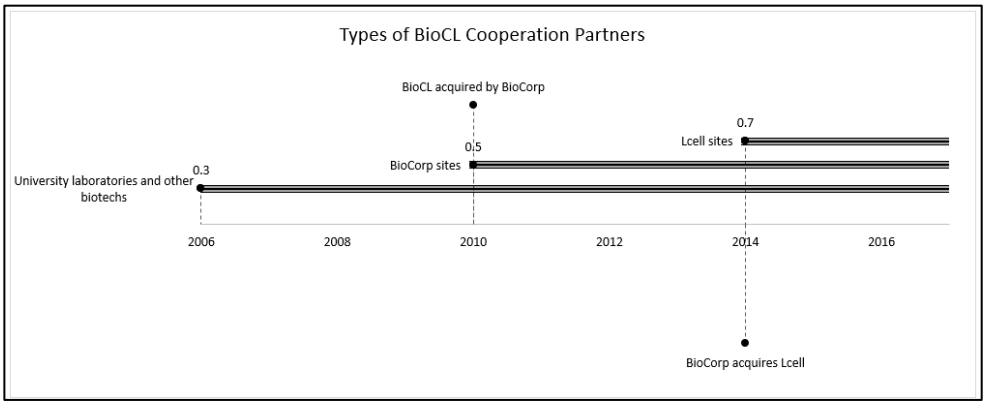
At the end of the 20th century and at the beginning of the 21st century, BioCL augmented their sales by expanding their international distribution network and by establishing enterprises in North America, Europe and Asia. A huge breakthrough came with the establishment of a scientific basic research centre in 2003, which soon became the primary competitive advantage of this company. Successful scientific development activities were one of the reasons why BioCL received an offer to become part of a large international corporation (hereafter referred to as BioCorp), a worldwide leader in biotechnology, and was acquired by them in 2010.

3.4.3 **The Partners of BioCL**

My report about the background of BioCL's partners is based on the data accessed about the period from 2005 to 2017. Among the partners of BioCL, there are other large biotechnology companies, biotech SMEs, university laboratories, private laboratories, other sites of the parent company and recent acquisitions (e.g. the recent acquisition of a large life science company, hereinafter referred to as Lcell). The development of partnerships at BioCL is tied to the history of its growth as a firm and it has gone through multiple transformations. First, when BioCL was still a relatively small and inexperienced company, it mostly worked with local and international university laboratories and biotech companies. Since 2005, BioCL also engaged in several large projects financed through EU Structural Funds, where they collaborated with other companies in biotechnology and related fields from several

continents. Then, in 2010, when BioCL was acquired by BioCorp, it became one of the multiple sites of BioCorp around the world. Some BioCorp sites terminated their production and transferred processes to BioCL. Then, BioCL was busiest with such transfers from other BioCorp sites, but also continued to collaborate with university laboratories and other biotech companies. Just a few years later, in 2014, another big acquisition of Lcell by the parent company changed the course of operations at BioCL. Transfers from other sites continued, but some of BioCL businesses were also transferred out to the newly acquired Lcell or to other sites. The managers of BioCL defined partnerships with these so-called “other sites” of their parent company as external cooperation, due to the fact that the process of these deals closely resembled cooperation with any other company outside of the BioCorp network and was therefore different from internal company collaborations. Figure 7 below presents how the timeline of the composition of partners has changed since 2005.

Figure 7. Types of BioCL cooperation partners



Currently, BioCL is a large company with more than six hundred employees which holds a strong leadership position in the biotechnology market. It remains an independent site of BioCorp. It has a lot of autonomy, but also maintains close relationships with some other global company sites due to a matrix structure and teams spread across different sites of BioCorp. It runs collaborations with firms and universities, works on transfers and negotiates several potential in-licensing deals.

3.4.4 The Types of Cooperation Projects

The cooperation agreements of this company come in various forms, for example: large multi-company alliances; licensing agreements; contractual R&D or beta-testing agreements with external laboratories; pre-distribution agreement collaboration; and technology transfers from BioCL or to other independent subsidiary firms acquired by the same parent company.

Figure 8. BioCL cooperation projects 2005 – 2017

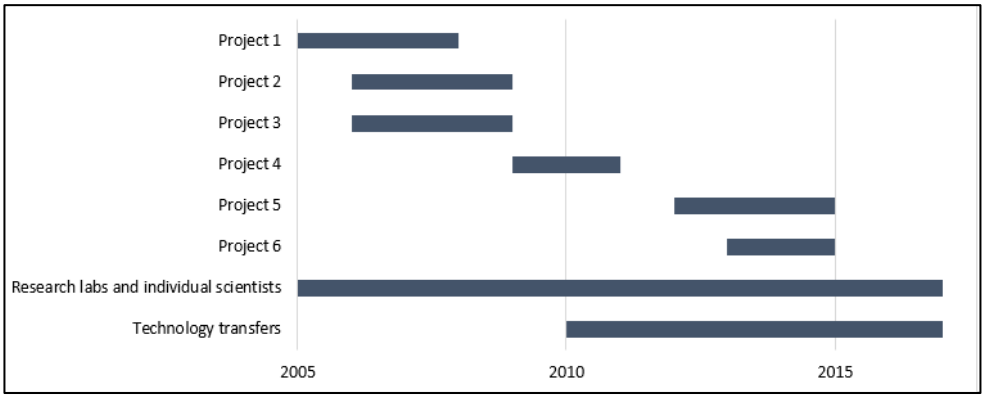


Figure 8 above outlines six major cooperation projects that BioCL ran from 2005 to 2017 – projects 1 to 6 were co-funded by private companies, including BioCL and EU Structural Funds and aimed at innovative developments. Throughout the analysed period between 2005 and 2017, BioCL was continuously engaged in smaller projects with research labs, biotechnology SMEs and individual scientists based at university labs; these cooperative projects were mostly technology testing or sourcing of complementary competences initiated by BioCL, or cooperation in order to support innovative development by SMEs and potentially sign a licensing contract in the future. Lastly, since 2010, as mentioned earlier, BioCL also engaged in technology transfers with other sites of their parent company, BioCorp.

3.4.5 The Forms of Inter-Firm Cooperation at BioCL

Research participants described cooperation with external partners at BioCorp as being developed in two ways: engaging in quick development projects with other

laboratories in biotechnology or related fields, or larger and longer-term cooperation projects. Also, there are a few specific types of external parties that serve as cooperation partners for BioCL: small biotechnology companies or laboratories, university laboratories and other companies ("other sites") that are part of BioCorp, just like BioCL.

BioCL cooperates with a large number of different research laboratories and individual scientists, which may come from the same field of biotechnology, but not necessarily – some of BioCL's cooperation partners come from physics, medical diagnostics, life science and other related fields due to the multidisciplinary approach that is required in their innovation process. Such agreements are characterised by the fact that they are small-scale and short-term (a few months) developments aimed at a relatively small development or idea check which does not require a lengthy set-up before starting the project. Also, many of the laboratories and individual scientists BioCL works with are now long-term partners: they develop a shared understanding of needs and competences, as well as trust, and it is convenient for BioCL employees to come back to the same companies and people they worked with previously and ask for a "favour".

BioCL is now a well-known and established firm which also receives offers of co-development and in-licensing from small biotechnology start-ups and considers such deals from time to time. Based on interviews with research participants, it seems there are significantly more deals that are turned down that those that go ahead, however, the experience of evaluating potential deals and testing technologies is also useful in terms of learning both about new trends in technology and their own company's market value.

Larger scale and longer term (two to five years) cooperative agreements are less frequent but require significant knowledge exchange both in the preparatory stage and when the contract has been signed. Such cooperative cases include projects which have received EU Structural Funding and involve more than one cooperation partner. Also, typically, this type of cooperation would have multiple agreements under its umbrella, such as co-development, out-sourcing, licensing, etc. The type of partners involved in such a cooperative project varies greatly – from small biotechnology firms, laboratories and university research labs to large and prominent

biotechnology and life-science companies. A few cooperation partners that participated in this research are firms that BioCL works with on a continual basis; there are also other partners with whom they only have a one-time cooperation affair.

Lastly, technology transfers are cooperative projects with other sites of the parent company, BioCorp; they are of medium duration (0.5 – 2 years) and vary in size with regard to how many technological product lines are being transferred (from only a few to hundreds). The deals only partly depend on the choices of BioCL, but otherwise are strategically planned by the parent company, BioCorp. The specific nature of these projects is that they include technologies that are already sold on the market, but also R&D processes related to adapting these technologies to BioCL manufacturing processes, improving their quality or modifying them based on client specifications.

3.5 Data Access

In this section, I cover the question of how I accessed my data, as well as how I selected participants and other data sources and methods of inquiry. I use the term "data access" here and purposefully refrain from using "data collection" because the former is a more helpful term, which reflects my relationship with data as an interpretative researcher. Following the definition by Yanow and Schwartz-Shea (2006), I understand data as generated by me, the researcher, independently or in cooperation with my research participants; the data in this qualitative research is not "collected" and "brought home" as it is possible in experimental research – I don't collect the actual events and persons and not always even the original documents, and at the core of my material for analysis are the interpretations of the original sources.

I conducted the fieldwork between November 2015 and June 2017. First, to establish contact with BioCL, I contacted the person who is responsible for their external communications and received permission to interview BioCL managers. The fieldwork was split into two phases: first, I mainly interviewed managers from BioCL, and second, I interviewed BioCL cooperation partners and returned to some BioCL managers for a second interview. In the second phase of interviews, I used a handout with some initial findings from my interim analysis. For the repeat interviews, I also

conducted checks and sought clarification on what had been previously discussed in the first interviews. I conducted 26 interviews in total with 23 BioCL managers and their partners: 12 interviews in the first phase and 14 in the second phase. In between these phases, I had a period of a few months, during which I put a hold on the interviews and analysed the data. Also, I spent time looking for and reading secondary data sources both during the interview phases and in between them.

I interviewed 13 managers from BioCL (two BioCL managers were interviewed twice) and 10 managers from 9 partner companies (one manager was interviewed twice), who were all part of multiple cooperation projects, representing all their largest projects (Project 1 – Project 6), a subset of cooperation projects with research labs and individual scientists, and technology transfers; therefore, the sample covers a variety of cooperation projects that BioCL ran between 2005 and 2017. I also reached out to interview both BioCL and their partners on the same project in order to get a bilateral view on the process, which I succeed at in most cases, except Project 1 and 4, and the technology transfer cases, where I only got the one-sided perspective of either BioCL or their partner only. Table 8 on the next page summarises the number of participants who provided their answers in each project or group of projects (note that one research participant could have been involved in multiple projects and provided their experiences of each). The sample also covered a range of local and foreign partners of BioCL (see Appendix 1 for detailed information).

Table 8. Research participants per project

Project	**Period (Years)**	**No. of BioCL partners**	**No. of research participants from BioCL**	**No. of research participants from partner companies**
Project 1	2005 – 2008	6	1	0
Project 2	2006 – 2009	16	2	4
Project 3	2006 – 2009	3	1	1
Project 4	2009 – 2011	2	0	2
Project 5	2012 – 2015	4	1	1
Project 6	2013 – 2015	2	1	2

Research labs and scientists	Multiple projects during the whole analysed period	1 (most of the cases)	8	2
Technology transfers	Since 2010, multiple projects	1	2	0
	Total		13	10

I personally conducted all interviews (25 – 95 minutes long), which were held at the interviewee's office whenever possible or conducted via internet conferencing (GoToMeeting, Zoom or Skype), and sound recorded them with the advance consent of research participants. One research participant refused to be sound recorded and, in this case, I took notes during the interview and then completed them in as much detail as possible after the interview. Interviews were conducted in two languages, either the local language or English, depending on the preference of the research participant. After the interviews, I recorded my analytic notes as well and kept logs of contact, data access and sources in Excel. Although I was not granted access for prolonged observation at the company, I tried to engage with them and learn about the organisational structure, culture and get a feel for it. I visited the company multiple times for a formal tour or informal lunches and walks around the company premises with managers and wrote notes and reflections after the visits. Table 9 below lists the type of data source, the number of the document and the amount of data in each of them.

Table 9. Types of data sources

Data sources	No. of Documents	No. of Pages
Interviews with BioCL managers	15	243 single-spaced pages of interview transcriptions
Interviews with BioCL Partners	11	
Documents from secondary sources: - Cooperation project reports - BioCL history - Other	 18 10 20	 145 307 110
Analytical and reflective notes (taken after interviews, observations and during data analysis)	105	114
Memos (notes attached to a specific data segment during transcription and coding)	155	N/A

3.5.1 Interviews with BioCL Managers

I interviewed senior managers from BioCL who have experience in cooperating with external companies. Some of these managers have been with the company since its establishment. I started with the person recommended by the gatekeeper (the manager of the communication department, who approved my access to interview BioCL employees), and at the end of each interview with a BioCL employee, I asked for recommendations as to who the best person(s) to contact next might be – perhaps somebody the research participant mentioned in their interview, or someone they know also has experience of cooperation with external partners at BioCL. This snowball sampling technique (Noy, 2008) proved an efficient way to access target respondents when their official job title does not reflect the qualification criteria for participation in this study. I had not set out to interview employees from the managerial level only, but as I continued my fieldwork, I learned that employees

from a non-managerial level are less aware of when their work is a part of a cooperative project and they are less involved in direct communication with external partners. Naturally, the recommendations that I received were to talk to employees at a senior managerial level, those who are most involved in communication with external parties. The total number of employees at BioCL involved in inter-firm cooperation projects is not known, however, I terminated my interviews with employees at BioCL when I started getting duplicate names and repeated recommendations to speak to people I already interviewed. Table 10 on the next page includes a full list of research participants from BioCL, their job function and department, years with the company, number of interviews with this particular manager and the types of projects that they were involved in.

Table 10. Research participants from BioCL

Ref No.	**Job Function and Department**	**Years with BioCL[1]**	**No. of interviews**	**Informant about Cooperation on/with**
M1	Director, IP	16-20	1	Project 2, Research Labs
M2	Senior Manager, Product	26-30	1	Research Labs
M3	Director, Product	30+	1	Research Labs
M4	Director, Business Development (Global)	6-10	1	Research Labs
M5	Director, R&D	11-15	1	Project 1, Project 3, Technology Transfers
M6	Group Manager, R&D	11-15	1	Research Labs
M7	Vice Director, R&D	20-25	2	Technology Transfers
M8	Manager, R&D	16-20	1	Research Labs
M9	Senior Group	11-15	1	Project 6

[1] At the time of the last interview

	Manager, R&D			
M10	Senior Group Manager, R&D	16-20	2	Project 2, Project 5
M11	Group Manager, Quality Assurance	2-5	1	Technology Transfers
M12	Vice President, R&D (Global)	2-5	1	Research Labs
M13	Director, R&D (Global)	11-15	1	Research Labs

3.5.2 **Interviews with BioCL Partners**

During the interviews with internal employees, I heard multiple cooperation stories and used this information to choose managers or other key contacts from BioCL partner companies. I therefore contacted specific people I knew worked with BioCL either from my interview material, or from secondary sources. As with the BioCL employees, most research participants were either the owners or managers of these companies, or held other managerial positions, all except one person, who worked at assistant level but was interviewed because of her intense involvement in the process of a specific case of cooperation. Partners came from different company types and regions: two from local biotechnology start-ups, five from local and foreign European-based research institutes, two from European university research centres and one from a private research laboratory in North America (see Table 11 below).

Table 11. Research participants from BioCL partner companies

Ref No.	Job function	Company Type	Region	No. of interv-iews	Informant about Coopera-tion on/with
P1	The founder	Biotechnology start-up	Local	2	Research Labs
P2-1	Head of Research Group	Research Institute	Local	1	Project 4
P2-2	Junior Researcher	Research Institute	Local	1	Project 4
P3	Managing Director (previously: manager at BioCL)	Biotechnology start-up	Local	1	Project 2, Project 3, Research Labs
P4	Head of Research Group	University	Foreign (Europe)	1	Project 2
P5	Director, Head of Department	Research Institute	Foreign (Europe)	1	Project 2
P6	Director	Research Centre at the University	Foreign (Europe)	1	Project 2
P7	Head of Research Group	Research Institute	Foreign (Europe)	1	Project 5
P8	Department Manager	Research Institute	Local	1	Project 6
P9	The Founder and Director of Research Centre	Private Research Laboratory	Foreign (North America)	1	Project 6

3.5.3 The Use of Secondary Data

In addition to the interviews, I also analysed secondary data sources. Various publicly available secondary sources were collected: press media releases, popular and scientific papers, company reports, cooperation databases, company websites, personal CVs and similar (see Table 9 in 3.5 Data Access section).

These secondary data sources were used for three major purposes:

1. To define the company context
2. To define the personal context of the research participant
3. To gather more contextual details about the cooperation projects

I used secondary data to set a historical timeline and organise the data received from interviews – learning about the context, specific agreements, reports of the events and their outcomes. However, due to the nature of my research question and because my secondary data was limited to publicly available reports, the primary source of the interpretation comes from the interview data and how research participants situate their reports "in time and context" (Portelli, 2010, p. 14).

3.6 Interview Process

Interviews helped me to explore the experiences of research participants in their cooperation with external partners and the construction of their knowledge sharing and secrecy practices. During the course of the interviews, I endeavoured to preserve the natural flow of conversation and followed an informal conversational interview technique (Turner III, 2010), which allowed me to collect naturally constructed stories while still clarifying the concepts of my interest (Conrad & Schober, 1999; Patton, 2002) related to the concerns surrounding cooperation, knowledge sharing and secrecy. Since I personally have extensive experience in running business interviews in my business practice and inquiring into issues of both wide scope and uncertain origin, I felt most comfortable running unstructured interviews in this scientific research too. This kind of open-ended inquiry was also most suitable to learn about a wide scope of variables involved in the process to be analysed and helped to reach research objectives. Therefore, the conversational interviewing technique, which is not structured in advance but is guided by research questions while responding to

the natural flow of research participants' stories, both met the research aims and was a comfortable way to begin my empirical research inquiry.

In the first phase of my fieldwork, I have used a "reminder sheet", which served as a checklist of topics I needed to learn about during an interview, and included the points presented in Figure 9 below. The "reminder sheet" helped me select appropriate probes during the interview that would help me learn about the research participant; their company; their experience in cooperation projects; the process involved in these projects; the tensions surrounding competition and cooperation, knowledge sharing and keeping (not-sharing); and the practices for dealing with explicit and tacit knowledge.

Figure 9. Interview "Reminder sheet"

[1] Historical cases [2] Ongoing search for a partner/investor cases

1. Tell me about your company
2. Tell me about yourself at the company
3. Tell me about the history of a deal in which you have participated

While collecting histories, based on interview flow, probe for

- Competition – cooperation
- Keeping – sharing knowledge
- Explicit/coded vs hidden/implicit/tacit knowledge

In the second phase of my fieldwork, the research narrowed from a wide scope exploration to a more focused inquiry and I, therefore, expanded my "reminder sheet" to a semi-structured interview guide addressing the questions on cooperation experience, knowledge sharing and secrecy, uncertainty and knowledge tacitness (see Appendix 2). There was a longer list of questions than is feasible to ask in 45 minutes (the expected interview length), and this was designed intentionally with the thought in mind that not all research participants would have the relevant experience or the degree of reflexivity to answer all the questions and I needed to have different questions that would ask about similar aspects of cooperation from slightly different angles. I stuck to the guide whenever it was feasible but modified the flow of questions based on the research participant's involvement and the flow of the interview. In some cases, I also needed to rephrase things in a way that I saw as

clearer and more relevant to the research participant.

As a part of the interviews, I showed participants a hand-out which outlined secrecy practices – these practices were derived from the data analysis in the first phase of the main fieldwork. I first asked unaided questions about secrecy practices and only then probed additionally by showing the handout. The interview guide varied slightly for different groups of research participants, as I needed to adapt it to different situations and contexts: BioCL managers, repeat interviews and BioCL partner companies. However, the essential inquiry remained the same, except that in repeat interviews I had the additional step of providing a summary of information that I learned from the previous interview, and then asking for some feedback on how managers saw my understanding, as well as what additional information they could provide me on some of the points, which I raised to them. As well, some partners came from a university research laboratory, and here I also had to make minor adjustments to the wording to customise the interview guide to their institutional context. Table 12 on the next page outlines the categories of research inquiry, topics and interview questions that served to clarify them (see

Appendix 2 to read the full questionnaire): descriptive, follow up, knowledge sharing, secrecy, unintended omission and uncertainty related questions.

Table 12. Questionnaire items by topic

Category	**Filter**	**Topics**	**Questions**
Descriptive	First interviews	Research participant's work experience, their company and cooperation experience	Q0.1, Q0.2, Q0.3, Q0.3a
Follow up	Repeat interviews	Follow up on the cooperation cases discussed in the first interview	Q0.4
Knowledge sharing	Ask all	Knowledge sharing process, the need and ways to share	Q1, Q2, Q3
Secrecy (sponta-neous)	Ask all	Knowledge that needs to be protected, the ways to protect, knowing when someone hides intentionally and dealing with it	Q4, Q5, Q12, Q13, Q13a
Secrecy (aided)	Ask all	Secrecy related practices that research participant, company or partners use	Q6, Q7, Q15, Q16, Q21, Q21a
Sharing and hiding	Ask all	Knowledge sharing and hiding at the same time	Q20
Unintentional omission	Ask all	Unintentionally omitted knowledge, understanding of "knowledge between the lines", perceived issues and ways of dealing with it	Q9, Q9a, Q10, Q10a, Q14, Q14a
Uncertainty	Ask all	The feeling of uncertainty	Q11
Other	Ask all	Anything else that research participant thinks important, references, follow-up inquiry	Q17, Q18, Q19

In all phases of the interviews, I encouraged research participants to provide examples of actual events and experiences. Besides specific stories, research participants also told me about general company practices – "how it is done at our company", which served as valuable information for the understanding of the rules associated with those practices. A potential shortcoming of the semi-structured interview guide is that some wording about secrecy practices placed significant

emphasis on the intentionality of those practices, and may not have been a helpful way to trigger research participants' memories about their experiences in cooperation practices and, as mentioned earlier, it may be the reason I had to use some flexibility: rephrasing the questions in other words or adding probes to facilitate discussion for some of the research participants. Nevertheless, as I had a selection of questions that aimed at revealing experiences about similar processes, I was able to access sufficiently rich data in all interviews.

3.6.1 Establishing Contact with Research Participants

I base my research on the assumption that the research participants are knowledgeable agents (Gioia, Corley, & Hamilton, 2013): people may be differently inclined to self-reflection and only provide partial reports of their actions and experience, however, I can still trust they know and "can explain their thoughts, intentions and actions" (p. 17). Therefore, when I talked to the managers, I did not provide them with specific definitions of what the key terms of my research entail. Instead, during the conversation, I asked them to explain how they view those concepts (i.e. knowledge, knowledge sharing and not sharing, secrecy, cooperation). Naturally, there were some exceptions, when a person asked what I meant by this terminology, I needed to be helpful and I tried to provide a few hints or examples but also tried to highlight that I value how they define and experience the process, and what I provide as an example may only be partially applicable to them, or not applicable at all.

Secrecy and openness in inter-firm cooperation is a sensitive topic, therefore, I considered the strategies of interviewing and presenting my research topic to research participants, which would allow me to establish a rapport with them. First, when presenting my topic for the first phase of interviews, in informational emails sent to agree on the interview time, I introduced the study as "*a study about licensing and cooperation between firms in biotechnology and related industries*", and the topic as related to "*knowledge and technology transfer*". This research question for the first phase of fieldwork was formulated as a query about knowledge sharing and not-sharing; therefore, secrecy was not a predefined discussion topic, but discussed when research participants introduced this term spontaneously in their story. In the

second phase of fieldwork, I revised my scientific research question vocabulary from knowledge "sharing and not-sharing" to "sharing and secrecy" practices, and therefore, I used these new terms in interviews. In introductory emails, I presented the topic as being "*about your experiences and practices of knowledge sharing and protection between project partners*": I refrained from using the word "secrecy" because I expected that the use of such terminology might trigger a negative perception of the study topic, associated with the commonly held negative connotation of the word, and I anticipated premature rejection of cooperation in the study. In the second phase of fieldwork, as I already knew about the specific cooperation projects and had sampled participants based on their participation in those projects, I was also provided the relevant project name on which I wanted to receive their input.

During interviews, I first talked about a research participant's experiences overall, his or her company and knowledge sharing practices, so by the time we reached the questions about secrecy, most research participants were comfortable enough speaking about this without visible defensiveness. In rare cases in which a participant did not yet feel comfortable speaking about secrecy, I returned to the topic after allowing him/ her to speak of other research related questions.

3.6.2 **Research Ethics**

Ethical data treatment is a legal obligation and helps in developing a trusting relationship with research participants. During a qualitative study a researcher may be exposed to highly sensitive information about a research participant and his or her work, therefore, it was important to preserve confidentiality and demonstrate my ethical approach to the information that I gained access to as a researcher, as well as, to demonstrate an ethical approach to ensuring the privacy and security of this data. Therefore, in this sub-section I provide an account of how I followed ethical standards in this research study based on the areas of research ethics suggested by Miles, Huberman, and Saldana (2014): the information given to the research participant before the study, the research participation agreement, anonymity and confidentiality, using research results in interviews, feedback provided to research participants after the study and the use of research results.

In this study, I targeted specific people and met with them in person or online through sound or video conferencing. Contextual details were important to the data analysis, therefore, I could not keep research participants' data totally anonymous. However, I preserved the confidentiality of their data by using pseudonyms or reference numbers instead of real names in research reports. At the beginning of the study, when permission from the gatekeeper at BioCL to contact managers was received, I sent an email to the recommended people with an introduction of the research study and informed them that they could ask me further questions if they wished. At BioCL, I only contacted the people that I received as references and who had already preliminarily agreed to participate by talking to their manager or colleague, who later supplied me with their direct contact details. I had only some soft references (no pre-agreement with a referee) to talk to BioCL partners and I looked up the contact details of other key partners myself and I then reached out by email and, in some cases, followed up by phone. I then arranged the date and time of the face-to-face or online meeting by email, and I needed to be patient in waiting for some people to find time to dedicate to the interview and not demonstrate excessive pressure to participate in the study. I also included a statement in the emails that the names of research participants and companies will remain confidential and will not be mentioned in my PhD thesis and publications, and I follow this in my practice.

At the start of an interview, I explained that the sound recording I would like to make will only be used for my data analysis and will not be shared with any third parties and I only recorded the interview if a research participant agreed with this. Some research participants inquired as to how long the recording would be stored, and I explained that I would keep it for as long as it was needed for analysis and publication purposes only, and that it would be several years until I submitted my thesis and then several more years for my publication process. During the interview, I did not refer to specific research participants by name or in other way that would reveal their identity and did not cite any of their specific answers to any other participants. I could nevertheless provide some generalised references, as for example "several research participants mentioned to me", or "based on the results of the previous study". Some research participants inquired about the research results of this study and I promised to send them a summary report of the research findings

when the PhD thesis had been completed. This report will also contain only general details about the major study findings so as to preserve the confidentiality of the participants.

3.7 Rigour in Qualitative Research

Typically, validity and reliability are discussed when looking at the rigour of a research study: terminology that stems from the tradition of quantitative and positivist research. Qualitative and interpretative studies in the constructivist paradigm work based on “multiple constructed realities” as opposed to a “single tangible reality” (Lincoln & Guba, 1985, p. 295), and the criteria of validity and reliability are not consistent with the “truth” criteria (Seale, 1999), which stems from the positivistic paradigm. When validity and reliability are used in qualitative studies, this serves as an indication that the researcher is likely to be following realist tradition. Therefore, in order to be consistent in the method and its evaluation, I use an alternative set of evaluative criteria that are used to establish the trustworthiness of a qualitative study: credibility, transferability, dependability and confirmability, as set by Lincoln and Guba (1985). These criteria correspond to the rigour criteria that are used in quantitative research (validity and reliability) but are relevant to the process of conducting an interpretative qualitative study. Furthermore, these criteria extend “beyond simply methodological adequacy” (Cassell & Symon, 2011, p. 635) and are not meant to serve only as a replacement for the positivist criteria of research rigour – “qualitative research leads to different kinds of knowledge claims than those resulting from the use of quantitative methods” (Morrow, 2005, p. 252) and focuses on studying the structures of meaning inductively and in specific contexts rather than obtaining confirmatory statements based on the researcher’s operationalisation.

3.7.1 The Credibility of the Research

The trustworthiness criterium of credibility runs parallel to internal validity – it reflects how credible research findings are, and how adequately the findings represent the multiple constructions of research actors (Lincoln & Guba, 1985). Multiple measures can be taken by a researcher to increase the credibility of the research and, in this research, I maintained the credibility of my research by engaging

in the BioCL company environment, doing partial member checks, triangulation and external checks.

Although there were no participant observations as a part of the main case study method, I still used other ways of engaging in the environment and learning about the company culture. First, before starting my fieldwork, I attended an event at the company premises, which presented BioCL to the public: the history and achievements of BioCL, the field it operates in, a visit to some of its laboratories and some demonstrations. During the fieldwork, I did the interviews with BioCL employees and local partners at the company premises, in their usual environment, which also allowed me to get a feeling for their physical environment. Interviews at people's workplaces also triggered some of the employees to show and speak about some of the artefacts in their workplace; these explanations about their artefacts were beneficial for their own engagement in the study, also, they could easier illustrate some of their points to me as an external person. I also willingly accepted invitations to go for lunches, for example, before an interview, as well as to walk through the building and just talk with the managers about the company in general: its history and routine matters. I also attended a large one-day conference organised by BioCL, where I could meet multiple company representatives, see their presentations about company products and innovations, and meet their foreign guests. Such a prolonged engagement helped me to get a better feeling for the company culture, as well as to receive a more favourable attitude from and build trust with research participants.

As another measure to increase the credibility of the research, I have done several member checks. I carried out second interviews with one partner (Partner 1) and two internal BioCL managers and, in addition to the common interview questions, I also sent them a description of 2-3 pages, which contained brief narratives of cooperation stories that the research participants recounted to me in their first interview. I provided the initial findings relating to what that person told me during his or her first interview only; I also highlighted some of the points, which I probed during the interview – I probed only about the points which contained some incomplete information or about which I was interested in knowing more. I also asked for general feedback on how they saw this information and received no reports of concerns regarding its accuracy or misinterpretation. I found the comments of those three

research participants consistent with what I learned from them during their first interview. Besides the confirmation of the data from the first interviews, there was relatively less new information that I could glean from our conversation in the second interviews. Therefore, I have counted such checks as sufficient proof of credibility of the findings and I did not contact other participants for a second interview; nevertheless, during data analysis, I kept asking myself if I felt confident that the results of my analysis would appear truthful to research participants in case I showed them to them.

In case studies, it is important to present multiple perspectives and views on the process that is being studied (Stake, 1995), which is achieved through triangulation of the data. Triangulation in interpretative and qualitative research is being questioned as unattainable because it is not a single "truth" being studied but multiple realities (Seale, 1999). In this research, I aimed at getting different people, both from BioCL and their partners' side, to speak about the same cooperation case, as well as to find written sources that would report the case, whenever it was possible, because I wanted to see how different participants construct the same processes and how these constructed stories correspond to what is being documented. Thus, I could see the multiplicity of "truths", triangulating these multiple views and also sometimes check facts. What I succeeded in using was triangulation among different types of data from the same person's interview: stories of cooperation, explanations of general practices – "how we do it at this company", generalisations about "how it should be done" and the reported purposes, which also served as a background for eliciting organisational practices. Making sense of consistencies and inconsistencies between those types of data, as reported by the same person, helped me gain insights and a more granular understanding of a participant's discourse. I particularly paid attention to distortions and misperceptions of my questions, which could indicate the aspects of the process with which a research participant's mind was most preoccupied, and therefore, provided useful sources for interpretation.

Lastly, I did multiple external checks – presentations and discussions with scientists and practitioners who were not involved in the study and work in biotechnology or other unrelated fields, from whom I received valuable questions and feedback on my interpretations.

3.7.2 The Transferability of the Research

Lincoln and Guba parallels transferability (or applicability, in other words) to external validity (Guba & Lincoln, 1994; Lincoln & Guba, 1985), however, they also point it out as being very different: external validity is simply not possible in its truest sense in qualitative research. Therefore, the task of this research was to capture the complexity and richness of the field site and contextual details, in order to provide detailed descriptions and theoretical insights, which would allow readers to relate the findings to other contexts in which such findings are applicable (Lincoln & Guba, 1985). As Robert Stake emphasises, I designed this case study "to optimize understanding of the case rather than generalization beyond" (Stake, 1995, p. 135); nevertheless, the focus on the particular brings "concrete, practical (context-dependent) knowledge" (Flyvbjerg, 2006, p. 3) and reveals broader processes which underlie the specific practices used in the case of this firm and its partners.

3.7.3 The Dependability and Confirmability of the Research

Dependability in interpretative research serves as a replacement for consistency (Seale, 1999) and is achieved through the "explicit and repeatable" (Morrow, 2005, p. 252) process of deriving the findings. Confirmability is an acknowledgement of inherent subjectivity of the qualitative interpretative study findings and is achieved through similar procedures like dependability (Morrow, 2005): it is an attempt to represent "the situation being researched, rather than the beliefs, pet theories or biases of the researcher" (Gasson, 2004, p. 93). It is impossible to completely ensure the dependability and confirmability of this research; however, I tried to achieve it by tracking and reflecting on the way my emergent research design was evolving; by keeping journals of my interview scheduling, timings and associated notes; and recording my thoughts of emergent themes in memos and reflective notes. In addition to research notes directly related to the research data, I also kept a research diary of my general research agenda, which helped me to stay reflexive – through introspection. I continuously revisited my subjective stance, ontological and philosophical assumptions – and their changes; rethought my research agenda at multiple angles; and reflected on how it was shaping my research and is being

shaped by my research activities.

3.8 The Process of Data Analysis

I chose a qualitative approach, which helps in accessing rich and detailed data about the phenomenon of interest (Langley & Abdallah, 2011). I worked with two different types of data sources – primary (interviews) and secondary (documents) – but, as recommended by Baxter and Jack (2008), different sources were used not individually, but conjointly: the data was accessed iteratively or simultaneously based on the needs of the data analysis. When planning and conducting my data analysis, I used an iterative process that is close to the principles of grounded research (Charmaz, 2014): I analysed data in cycles and developed my research design, revised data access and researched questions based on the interim findings. I used MaxQDA 2018 to transcribe, code and analyse my interviews and secondary data, as well as to store and analyse my reflective notes and memos. As I fluently speak and read both languages in which interviews were conducted, and I dealt with the transcripts and translations of codes into English myself.

During the exploratory fieldwork phase, I was transcribing, coding, analysing and preparing descriptions after each interview was conducted. I revised and designed the next step based on what I found in my accessed data; I also worked on theoretical literature whenever I had some clues or interesting findings in my data and I read existing literature that might discuss similar processes or patterns. When I began the data access for my main fieldwork phase, the BioCL case study, I transcribed and coded the data in batches. When I saw that the data was becoming “unsurprising” and I was getting little new insights from a new interview, I put a hold on the fieldwork to do a more in-depth analysis. I then analysed both the empirical data and the theoretical literature intensively and searched for a more focused field of inquiry with which I could return to fieldwork and gain richer insights for my research inquiry. In the last stage of fieldwork, I carried out partial transcription, coding and analysis during the interview period and finished it after the closure of fieldwork.

3.8.1 Interpretative Research Stance

I see myself as a congruent part of the fieldwork situation and I use an

interpretative approach to research design and data analysis, which I base on the experiences and meaning as provided by research participants without evaluating them for truthfulness or factual precision, but through paying attention to the context (Yanow & Schwartz-Shea, 2006). As a researcher, I subscribe to the constructionist account and do not attempt to detach myself from the phenomena or give independent meaning to what I observe or capture. On the contrary, I admit that I play an active role in my research: I look for how respondents construct their practices and, through my interpretation, I construct a meaningful theoretical evaluation of the process (Guba & Lincoln, 1994). I choose not to "objectivise" the data or minimise the impact of my or the research participants' interpretation of the data, but rather acknowledge it and assign it a separate role. When recording interviews and observations, I may in parallel record my own emerging thoughts on what is going on in this process and, in this way, I promote the reflection and understanding of my own involvement and subjectivity.

3.8.2 Data Coding and Analysis

The first phase of my data coding and analysis was inductive and went through multiple transformations, until it reached a sensible structure. I started the interview data analysis simultaneously with the data collection. I first coded meaningful segments of text by asking "what it is about?" and used in-vivo coding (Charmaz, 2014) to stay close to what participants were saying. I translated non-English language phrases to English at this stage with some exceptions where I wished to preserve the details of discourse, which I could not translate efficiently. I explored themes, actions, actors and their contexts. Based on the initial coding, I focused on fewer categories, which I preliminarily identified as relevant to cooperation, knowledge sharing and concealment. I have structured data based on whether research participants spoke of specific cooperation cases, general company practices or reflected on their partner companies' practices. As well, I have coded incidents of processes of interest and periodically reorganised in-vivo codes into second-order analytical categories.

Simultaneously with the interview data analysis, I used secondary data to situate interview data in specific timelines and factual contexts. I have used my analytical

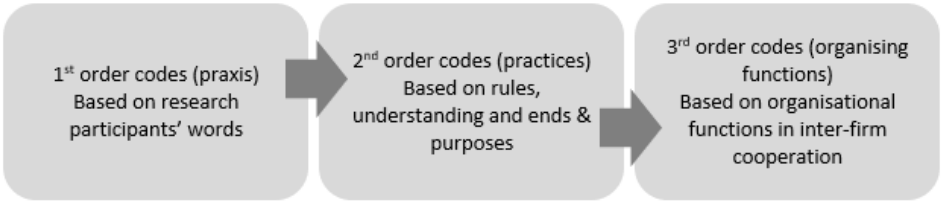
memos to find patterns and differences in my data and identify significant discourses. There were multiple iterations and re-examination of previous data coding and analysis until the key concepts emerged and I concentrated on specific categories of secrecy in knowledge sharing. I then selectively coded these categories in all data. As research progressed, I started looking for similarities and differences in my codes, and how they could come together. At this stage, from the previous fieldwork attitude in which I trusted my research participants to be the knowledgeable agents, I pushed myself to become the knowledgeable agent myself, the one "who can (and must) think at multiple levels simultaneously" (Gioia et al., 2013, p. 20). Still, while analysing, I continued to reflect on how my research participants would see my analytical outcomes – would they agree with the interpretation and would that resemble their personal experience?

The last coding and analysis stage consisted of three parts – eliciting the categories of practices by their function ("anatomy"), relating the practices of openness and sharing, and then analysing their interrelated functioning ("physiology"). The first part was guided by building the structure through progressive abstraction from what research participants were saying and doing to more abstract practices serving certain inter-firm cooperation functions. The qualitative methods have often been known and even accused of having little guidance or "the lack of a boilerplate" (Pratt, 2009). However, there are at least two relatively established templates in qualitative research (Langley & Abdallah, 2011), and I used one of these templates – sometimes called the Gioia method, which refers to the originator of the template. My final coding structure is based on the inductive way of structuring data (Gioia et al., 2013), which is inspired by grounded theory (Gehman et al., 2017) and fits the overall inductive and iterative process of this research and single case study method (Langley & Abdallah, 2011).

The data was first coded into the first order organisational activities (praxis) expressed as closely as possible to the research participants' words, which further progressed to the second order codes – social practices. This second level code analysis and presentation was based on three social phenomena that hold practice together: rules, understanding and teleo-affective structure (Schatzki, 2005). Due to my method that mainly draws on interviews to elicit practices, I had limited data on

emotional engagement, and the third phenomena that guides practices mainly draws on the partial understanding of emotional engagement – the purposes of those practices and values; therefore, in my findings, I used the following labels to point to three social phenomena: “rules”, “understanding” and “ends and purposes”. Lastly, the practices were aggregated into several dimensions based on the organisational function they serve. This served to elicit the structure – the anatomy (Schau et al., 2009) – of knowledge sharing and secrecy practices (See Figure 10 on the next page). It should be noted though that in addition to coding data, in a few cases I used conversational turns and elements of discourse analysis (Fairclough, 2003) to enrich the interpretation of the meaning of the text.

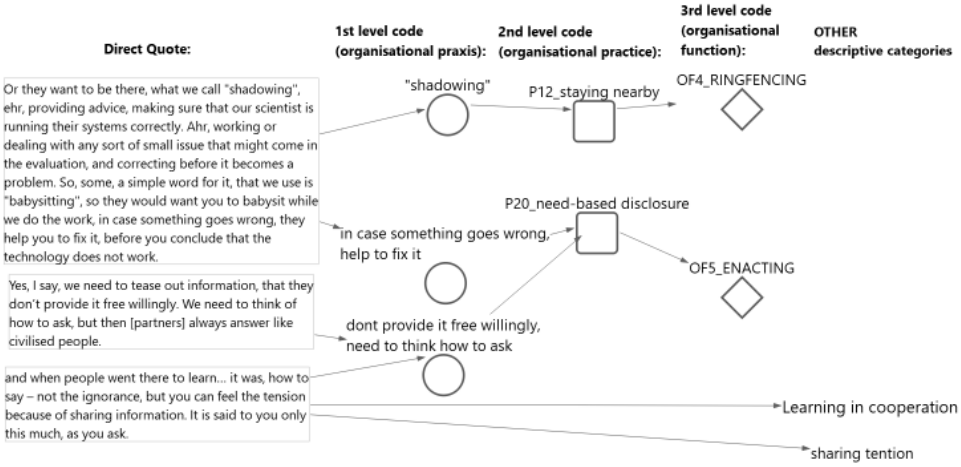
Figure 10. The anatomy of practices



During the analysis, I have found that the focal process – knowledge sharing and secrecy – is intertwined with other organisational arrangements, such as drawing boundaries or building social glue, and I therefore included them in my analysis of knowledge sharing and secrecy.

Examples of how the coding progressed from the original text, to first, second and third order codes, are provided in Figure 11 on the next page. Please note that the text was also coded with “OTHER, descriptive categories” – these are the additional coding categories that do not belong to the main coding tree but serve aid in the understanding of specific descriptive points or concepts; these categories have one, two or three levels of codes, depending on their complexity.

Figure 11. Example of the progression of first, second and third order code



For the final coding structure of knowledge sharing and secrecy practices and representative quotes, please see Appendix 3.

Further, in the second part, I have analysed knowledge sharing and secrecy practices to understand how openness and secretiveness interplay in different purposes and goals of a practical accomplishment. In Figure 12 below, I provide an example of the analytical division and description of the phenomena that together hold practices.

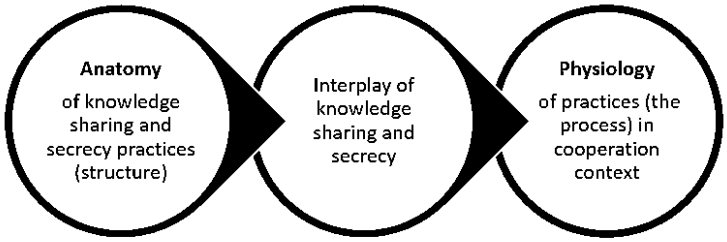
Figure 12. Example of the analytical division of practices

Organising function	Practice	Rules	Practical Understanding (intelligibility)	Ends and Purposes	
				of sharing	of secrecy
Bounding	Legal protection	If knowledge is possible to protect in a legal way (i.e. patenting) this is first done before it may be considered for sharing with external parties	The understanding is that legal protection is only a partial measure of protection and exposes you to the risk of losing your profits from commercialisation of the future product. The sharing of invention details in the form of patents is imposed on companies by regulators, therefore, what is being shared as an actual invention is being modified to protect its essence	Organisations expect regulatory support in profiting from their invention in exchange for sharing, and claim rights before working on it with an external party	It is a necessity and the only way of protecting their inventions from dishonest uses.
	Internal policies	There is knowledge that cannot be protected in legal ways, therefore, this knowledge is classified using internal company procedures as confidential and non-sharable with external parties, as well, as having limited access for internal employees	Everyone at the company should understand what is or isn't a company secret and act according to the rules.	N/A	To clarify to employees and regulate the use of knowledge that exposes company to risks of losing their competitive advantage

Lastly, the structure of practices needs to be converted into dynamic relationships among the practices (Gehman et al., 2017) to show the way in which the practices build in a cooperation process timeline. Therefore, the last part of my

data analysis includes constructing the process of how the elicited knowledge sharing and secrecy practices interrelate and function together throughout the cooperation process through forming an inner cooperation circle and being embedded in outer space, and I call this dynamic process the “physiology” of practices. Therefore, the overarching analytical framework builds on first arriving at the structure of knowledge sharing and secrecy practices, then disentangling the relationship between sharing and secrecy, and lastly, arriving at how these practices interact in the process of a cooperative arrangement (see Figure 13 below).

Figure 13. Sequence of data analysis



4. RESEARCH FINDINGS

"We are often misled by our expert opinion, we don't go to the place and don't look at the process itself; [we] don't ask people, who lay their hands on [developing new technologies] every day. We, managers, [think that we] know everything and [this way we] fool ourselves.

By thinking that we know everything without learning the facts [from our employees], we make all these decisions and try to prescribe to people, who work on it every day and see these matters completely differently; and the employees know, that the reasons [of what is going on in their organisation] are different at all. They lift their eyes up [to their managers] and say, 'guys, you, come down to earth'."[2]

This chapter is dedicated to the presentation of the findings based on the analysis of the data from the cooperation case study of BioCL and their partners. I start this chapter by exploring what meaning the research participants ascribe to sharing and protecting their knowledge during the process of cooperation. Then, I present knowledge sharing and secrecy practices – their anatomy (the structure of practices) – discuss how openness and secrecy are part of the same practices and introduce the physiology (the relationship and organisation of the practices) of cooperation.

4.1 The Field Definitions of Concepts

Before talking about cooperation and knowledge sharing and hiding practices in this process, I first present how research participants themselves make sense of what these practices entail. In one of the online interviews, the General Manager of BioCL expressed that major issues come from the inclination of managers to have no time to talk to employees, so they just make decisions on their own: "*[w]e are often misled by our expert opinion*" (Apr 2018). The ideals expressed by the manager resemble the epistemological background of this research which tries not to impose scientific

[2] From an online media interview with the General Manager of BioCL, April 2018

definitions on how research participants should understand concepts, but attempts to understand their perspective and definitions. Therefore, I start my analysis with the definitions of cooperation, knowledge and secrecy as provided by research participants, and try to uncover the underlying assumptions of research participants with regard to these concepts as they use them in their interviews and work. I discuss the definitions in three parts: the first part speaks of the definition of cooperation; then, how research participants define the knowledge that they share in the process of cooperation; and, lastly, what the meaning of secrecy is in their work.

4.1.1 The Nature of Cooperation

In the first phase of this research, when one of my primary aims during interviews was to learn about the stories of cooperation with external partners, I had a poignant question asked to me by research participants: what do I mean by asking about cooperation? What would qualify as cooperation? What I have learned by turning the question back on the research participants is that they qualify cooperation using several criteria: the need to discuss the final outcomes of inter-company relationships, the need for complementary competencies or resources and to what degree inter-firm relationships are driven by an interest in innovation as opposed to a monetary reward.

One way research participants explain what they call cooperation, as opposed to other forms of relationships with external firms, is based on the need to share an outcome, so, the deals that research participants qualify as cooperation are those that have the end purpose of producing some shared outcome; whereas other deals, which are expected to have important outcomes in development only for BioCL but not the other firm, would not be called cooperation projects. Therefore, BioCL and their partners discuss, preferably before becoming involved in any actual work, the expected innovation outcomes and who owns the intellectual property (IP) under different scenarios of discoveries: "*you may expect the rights to the IP, where you directly do some work, find something unique and patentable*" [M5:112], or "*it could be that we share [IP] between partners if a partner applied his unique competences and doing this created something that is of interest to us*" [M5:139]. In cases where BioCL purely outsources the tasks in their innovation or production process, it is

defined as non-cooperative relationship with another firm. However, the line between pure outsourcing and a cooperative relationship is thin: it may be just one task that requires cooperation with some external company out of many other tasks performed as a part of an in-house development project, but if this task includes the need to discuss who owns the potential outcome and its proprietorship, then this indicates a potentially collaborative process and requires communication between the companies.

On the other side, the need to work together, meaning physical co-work, for example, in a laboratory, is not always necessary in cooperation: some deals with other companies may require only one of the parties – either BioCL or their partner – actually perform the development activities; however, in what research participants call a cooperation project, there would still be an exchange of ideas about what to do and how, and a calibration of the understanding of the required outcome. Therefore, the shared outcomes of cooperation closely correlate with the degree to which cooperation partners are involved – for firms to work together, it may mean not only physical but also social or cognitive exchange, or all of these, and firms seek complementarity of the resources of both (or more) firms.

Lastly, cooperation is different and not uniform across cases – it is rather the continuum between the degree to which monetary reward drives the process and the level of interest that drives a company's work: "*the more collaborative it is, the less money flows; and the more it is outsourcing, the more money flows.*" [M12:16] Shared aims, resources, outcomes and interests as opposed to direct monetary return for a service is what distinguishes cooperation.

To summarise, as perceived by the participants of this research, cooperation between firms means aiming to produce some outcome that has to be important in some way to all cooperating parties – these aims may be different for each cooperating firm, but companies would consider their interests alongside often uncertain monetary rewards. As well, a partnership is formed based on complementarity of the physical or non-physical resources that provide the background for collaborative work. Since interest in cooperation is about more than just a monetary reward, in other words, the contractual payment for a performed service, expectations of non-monetary rewards and innovative outcomes are the

characteristics that qualify deals between companies as cooperative affairs.

4.1.1.1 Motives for Cooperation

When BioCL was still a novice in cooperation (around 2005–2009, the first five years of the period analysed in this research), learning from other companies was one of the primary motives for the company's attempts to engage in cooperation. What BioCL expected to learn was technical knowledge, novel approaches to innovation and the expertise of social relationship management with other companies of varied profiles and based in different countries. Therefore, as the local (the same country) environment and available partnership options were more familiar and established, BioCL actively sought new relationships with foreign partners and applied for EU financing that would help them build cooperation networks and engage in innovative co-work. On the other hand, being a novice, it is difficult to engage with more experienced companies: "*when you are a small company, oftentimes nobody is interested in cooperating with you*" – the company has to have something to offer that would entice other companies to partner with them. BioCL could not be selective in choosing their partners and simply engaged in any kind of venture that would allow them to gain more experience of cooperation and which, in turn, would increase their chances of being more successful in engaging in further cooperation affairs. Therefore, the primary motivation was then to begin working with other companies and to learn from the process of partnership itself: the need for a specific outcome (product and invention) was a secondary goal.

When BioCL became part of a larger company, BioCorp, in addition to large international projects and cooperation with smaller laboratories, BioCL started working on technology transfer projects with other sites of BioCorp, which has now become a routine activity – the necessity imposed by BioCorp, which nevertheless helped BioCL to reorganise their resources and use their knowledge more efficiently. At first, technology transfers were primarily incoming – that is, technologies transferred from other parent company sites to BioCL. There was considerable similarity of development and products being transferred – "*there were no unique technologies, unique instruments that were not used before [at our company]*" – and BioCL was able to enjoy an expansion in a few core areas of their work. After a few

years, when BioCorp acquired another large business, Lcell, BioCL was forced to review its business structure as well and outsource some of their products to other sites; therefore, since that time, they became involved in both incoming and outgoing technology transfers, which were now of a larger scale than in previous years. At this time, the technology transfers became more complex: BioCL worked on "*technologies, which [BioCL] had never used before. This automatically triggered the need for learning*". BioCL employees had to expand their knowledge and "*it was quite a challenge indeed*". As a part of a biotechnology giant, BioCL was now receiving more offers to cooperate, however, it was no longer that interested in sourcing external knowledge, as it had now become more of a passive recipient of such information from other parts of the larger company. It was no longer always necessary for them to engage in cooperation with external parties: sometimes, even the process of considering a deal would satisfy their learning needs and the cooperation contract would then become redundant.

Cooperation was a part of company life – "*going out*" and "*learning from others*" when the company was growing yet remaining local. It was a way to learn about other markets and how other companies operate. When BioCL was a younger company, they sought cooperation in order to explore new areas and look for new ideas (exploratory nature) and BioCL invested a lot into participation in cooperative deals. Later on, the company became larger and gained more internal capabilities, and is now less eager to engage in deals with other firms – often, BioCL learns enough from the other party before the deal is even signed and does not need to continue negotiations. The learning, which was once just one of the motivations for engaging in cooperation, now became a necessity and the condition for it. When the company became more mature, cooperative activities were more clearly and firmly tied to their business strategy and used with the more predefined purpose of efficiency development.

Also, acquisition of a company became an easier way to acquire knowledge. BioCL has moved to the "*power side*", they are more knowledgeable of how to speak to partners, what to expect, and what benefit they can get from cooperating with external parties. It has become a more routine and common process. They do not suffer from others refusing to work with them; they are comfortable reviewing an offer

and refusing it. This kind of non-cooperation is a part of their learning about market movements, and the company accepts this as a way of learning about the market, competitors and industry innovation trends. As a summary, cooperation as such, with changing motivations, still involves learning as one of the primary components.

4.1.1.2 **Competitive Concerns**

In one of the interviews, I was having a hard time inducing a manager to talk about a specific case and probing as to if there was anything else she remembered from her experience working with external companies. In one of these probes, I asked "*and with competitors, probably, it happens that you work with them*?" and this made the manager pause. It seemed I had dropped the question recklessly, and perhaps the definition of what it means to be a competitor was not straightforward to the manager, as she started asking me questions in return, after some time spent in thought. After a brief conversation, the manager finally exclaimed "*would somebody give their flag to the hands of competitors? I think it is never the case*" (M8:119). However, in the very next sentence, she said what seems to be the opposite to her previous statement: "*it could be that we worked. That we cooperated, with our competitors, only with competitors, I mean, they are our largest clients*" (M8:119) This manager's first exclamation refers to her current experience working on technology transfers, the ones that BioCL accomplished with other sites of BioCorp. It did not make sense at all to the manager to envision somebody working on a similar technology transfer with a competitor. Belonging to the same parent company seems to be perceived as a non-competitive position, whereas before the acquisition of a given company by BioCorp – the same company with whom BioCL now cooperates on internal technology transfers – they may have been competitors in the same industry, with similar products or clients. The second statement, in which the manager switches to agreeing with the possibility of cooperating with a competitor – she did not have any of her own experience but started thinking of the work that has been done by other departments at BioCL. This interview situation illustrates how who exactly is a competitor is a constructed meaning and may be perceived as a less relevant category when the distance with people at another organisation is smaller.

Another manager, a partner of BioCL, illustrates a similar notion of putting aside

competition at the time and in the place where collaboration was taking place: "*we don't conquer, we collaborate. We know the aim; we know we can't do anything alone*" (P1-2:78). Competitive thought interferes with co-work – the aim drives the structure and the way partners work together and aligns their other motives. While in a different cooperation project case, where multiple cooperation partners were working much more independently, "*there was network building effort"* (P4:37), but at the end most of the partners worked either independently or in pairs on a so-called "working package"; one of BioCL partners called the situation: "*we were more the competitors than collaborators on the project*" (P4:32). Partner companies on this project proposed several proprietary technologies to develop, and "*in that regards we may have been seen more as competitors than collaborators, [partner's name] was my partner and he had a technology, which was called […] which he wanted to commercialise, I had something [to bring to market]"* (P4:32). These competitive goals could have induced competitive attitudes, and a lack of persistence in network building effort could have maintained the feeling of distance and perception of competition.

4.1.2 Knowledge: Embodiment in Tangible and Social Practices

I probed managers about how they would define the knowledge that they needed to share or hide during a specific cooperation deal. Not surprisingly, the definition of what was called "knowledge" varied in different contexts; however, there were a few major domains to which research participants referred: it is information, data, material artefacts or technologies, and social knowledge. The process of knowledge exchange with some potential partner starts with documented information. In the early interest phase, the patents, together with scientific publications, may be sufficient or, indeed, the only kind of information, which helps in evaluating the potential of patented technology to fulfil expectations. Publications provide a "*so-called core competencies field*", while patent information provides the sense of applicability to context – "*what is reality and what is practice*". When BioCL is interested in gaining a more in-depth understanding, it initiates contact and, after signing a confidentiality agreement, it may receive partial data about the technology but detailed documentation on technology would not yet be disclosed. Only a limited

understanding can be gained by using the knowledge that is being accessed at this stage – it is experimental data, presentations or market data. Subsequently, when BioCL signs a cooperation contract or moves into experimenting with or developing a product with their partner (sometimes even before signing the actual deal), partners share multiple documents, which serve as an important medium for communication between cooperation parties: "*First of all are documents. No process can begin without them*". The challenge at this stage is reading "*something [that is hidden] between the lines*" and aligning the differences in the partners' know-how and the assumptions used in the process of development – when talking about competences, know-how and similar concepts, these refer to social processes. Table 13 below summarises the domains and examples of sources which research participants used in their narrative when referring to the "knowledge" that they need to share, protect or hide.

Table 13. Definition of knowledge by research participants

Domain	**Types of sources of knowledge**
Information	Documents, patents, publications, technical guides, presentations, intellectual property
Data	Experimental data, market related data
Material	Prototypes, samples, materials, instruments
Social	Know-how, competencies, expertise, knowledge which is "between the lines"

One common notion in the use of the concept of "knowledge" was that there is no separation between knowledge as a mental process and information or tangible resources. The word "knowledge" implies some tacitness, and it was a complicated task for research participants to formulate and communicate what constitutes pure knowledge in their work. Instead, research participants used different kinds of artefacts or documented information as an indicator of knowledge related to this artefact/information. As in one of the examples provided below, a research participant is tracing the process of where the knowledge was used and, in this way, tries to convey the answer to what this knowledge needed in cooperation is:

Me: Can you tell me, what knowledge you need to share with [BioCL and the name of another partner]?

Partner: I need to think. Because it is scientific [knowledge] mostly. Sure, there were… to perform the collection of a specimen correctly, we needed ... that specimen, so it was also done by [BioCL], they created those mediums. Further [...] we needed to freeze them nicely, and to deliver it in a freezer, and then we also needed feedback [from partners]. And basically, it was only scientific knowledge. (P2-2:23-24)

In a similar vein, knowledge is attributed to social relationships, which may be observed in how research participants refer to the examples of face-to-face interactions when explaining about the knowledge that they need to share. An example taken from one of our conversations shows how the forms of sharing are given priority in the response, and only then does the conversation change to address the content of what is being shared:

Me: What is the knowledge that you need to exchange with your partner?

Partner: […] what you have to do is, and this is scheduled when these meetings take place. Meetings, it means, when everybody comes and talks what are the achievements. It is a clear plan when you need to exchange such information. […]

Me: During these meetings, what did you share?

Partner: it was scientific research information. (P3:27 – 28)

Nevertheless, in yet another conversation with a BioCL manager, I probed several times and the participant kept coming back to explaining the role that live meetings have and that they were an important and exciting part of the project, even after he himself reflected on how he had deviated from answering the question. It felt that the social situation was more important to explaining the content that is shared in such situations than the definition of the content itself.

4.1.3 Secrecy: Open versus Secretive Activity

When talking to research participants, in many cases introducing the question about secrecy triggered two distinct reactions – one was "no, we don't do this, we are completely open" and the other: "it's natural, we all engage in secretive behaviour". During further discussion, it became apparent that initial reactions to the question about hiding knowledge and secrecy in cooperation are somewhat defensive, which, at least partially stems from the difficulty in explicating and describing intuitive activities, as one participant expressed it: "*it is a very natural process, it is like asking how I breathe*" (P5: 20). In one of my other interviews, I was showing a hand out with types of secrecy extracted from my interim findings to my research participant, to which he reacted: "*it sounds rather bad when you write it like that, but it is a temporal thing*" (P4: 55). This quote reflects an attempt to justify the fact that although the widespread approach towards secrecy in general is inherently negative, such an unacceptable practice which lacks transparency does play a part in biotechnology inter-firm relationships, and what secrecy is in this context is more a natural part of organisational life and is used temporarily until the concealment has served its purpose and then the hidden content is revealed. The word "secrecy" itself triggers negative feelings, however, "*all need to play this game*" (P4: 78) and "*learn very quickly that not everything can always be shared*" (M12: 45). It is an implicit understanding that some external companies, your partners, may not be telling you all they know about the topic – "*there is never a situation that there are no hidden corridors"* [BioCL manager]. As well, it is perceived as a common practice that both employees of your own company and your partner company must stay alert and not suggest to their respective partners any ideas that would give the partners a competitive advantage over your firm even if these partners are not your direct competitors.

Open vs secretive. The important distinction that research participants made was between how secrecy is being practiced: openly or secretly. As one BioCL manager defined open hiding: "*you say, we just talk about this and everything else is secret*" (M12:63). An open statement when the discussion touches on areas of non-disclosure is perceived as a common practice: "*they tell you straightforwardly, […] I know it but cannot say. And don't say it. And everybody understands you. […] it is*

normal communication" (P3:99). However, there are instances when BioCL managers remembered uncovering things that were hidden secrets, and there were no signs or communication from their partners about the existence of such information. Managers attributed the open and secret ways of hiding to both personal characteristics of their partners and cultural differences between companies, or even the temptation to hide something when the information is perceived as negative. The act of secret hiding is only possible to learn about through its consequences and consequent revelation, "*it turned out that they did not disclose that they had to adjust every instrument individually before every experiment; and they did not want to do that [to disclose] because it made the whole thing look more complicated, which it is*" (M12:125). The incidents of secret hiding that I heard about from research participants implied that what constitutes knowledge relevant for sharing is unjustly defined – partners use their own judgment and don't provide the opportunity for another company to revise and negotiate access. However, due to the nature of secret hiding, presumably, only some cases of secret hiding come to light, and it is difficult to clearly attribute the cause and intentions behind them: "*they made fools of us, but I don't know, accidentally or by purpose*" (M6:95-100).

4.2 The Anatomy of Knowledge Sharing and Secrecy Practices

Further, I present the findings of my analysis of the knowledge sharing and secrecy practices of BioCL managers and their cooperation partners. Based on inductive data analysis, I have identified twenty practices and then grouped them into the five organising functions in which these practices take part (the "anatomy" of knowledge sharing and secrecy practices). The organising functions are: bounding, courting, bonding, ring-fencing and enacting relevant knowledge. Table 14 below provides a list of these practices (themes) grouped by organising function (dimensions). See Appendix 3 for representative quotations illustrating the identified themes.

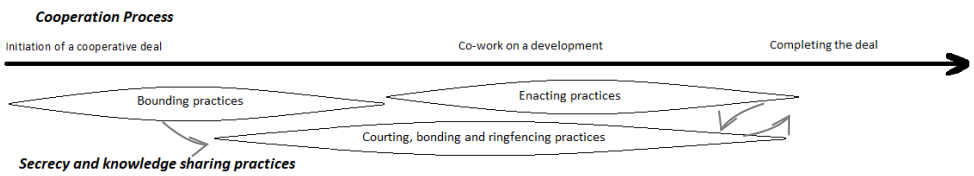
Table 14. Knowledge sharing and secrecy practices by organising function

Organising functions (3rd level codes) and their descriptions	**Practices (2nd level codes) and their descriptions**	
Bounding: Bounding internal teams and cooperation partners within a shared understanding of knowledge sharing and protection rules	Legally protecting	If knowledge is possible to protect in a legal way (i.e. patenting), this is done first before it may be considered for sharing with external parties
	Internal policing	There is knowledge that cannot be protected in legal ways; therefore, this knowledge is classified according to internal company procedures as confidential and non-sharable with external parties, it also has limited access for internal employees
	Revising	Before shared with a potential partner, communication materials are reviewed by a manager or legal team representative, who decides if this material can be shared with external parties and in what format
	Building commitment	Signing a confidentiality agreement, NDA, MTA and aligning the rules of communication to “start the open discussion”
	Temporarily prohibiting	When it makes sense to keep certain information secret only for a limited time, the contract between partners or within the company is drafted to agree on temporary restrictions on public discussion and/or publishing
Courting: attracting partners to commit to a joint project	Showing a little	Showing “just a little bit” of the development or technology to potential partners to whet their appetite and entice them to engage in cooperation

Organising functions (3rd level codes) and their descriptions	**Practices (2nd level codes) and their descriptions**	
	Creating a misleading area	Creating a wider range of possibilities around the essence of inquiry
	"Empty talk"	Talking in such a way that it does not provide any new or publicly unavailable information
	Overselling	Making the technology look even more attractive
Bonding: creating and maintaining the social contract of a joint project	Trust building	Creating an atmosphere of trust and confidence
	Defining membership	Defining membership in communication circles
Ring-fencing: maintaining the boundaries of secrecy and sharing through physical and material confinement and engagement	Staying nearby	Keeping the technology or other sources that may reveal sensitive information physically close, at the company premises
	Limiting access	Limiting physical access to technology
Enacting: defining, enacting and maintaining relevant knowledge in the co-performance of a project	Staying on topic	Controlling communications so they stay within the boundaries of topics pre-agreed with colleagues and/or partners
	Leaving it unanswered	Providing no answer or limited answers to inquiries
	"Black-boxing"	Revealing the specifications of a technology in an anonymised or generic form
	Stripping out the detail	Sharing the outcomes without any detailed information
	Categorising	Categorising knowledge and its availability within the project
	Avoiding contamination	Not sharing the development with partners, as it may be too similar to the developments of their partners
	Disclosing on a need-to-know basis	Disclosing only when a need arises

The practices of knowledge sharing and secrecy in cooperation partially reflect the formal phases of a cooperation deal but are non-linear and not completely simultaneous with how the cooperation process evolves. Knowledge sharing and secrecy work starts even before any discussion of it with a potential partner; only once any internal measures are carried out do firms initiate discussion about the potential cooperative deal and begin the work that will further serve as a basis for the later co-activities, which are enacted through bounding, courting, bonding and ring-fencing practices. When firms reach an initial agreement to cooperate, they begin co-activities and perform the development of a technology within one or more secrecy circles; in this analysis, this cooperation phase corresponds to "enacting" practices. However, work in secrecy circles (enacting practices) may precede the final cooperation contract, and firms may regularly return to practices from the previous phase and reconsider a partner's membership in secrecy circles and/or the relevance of specific knowledge to cooperation (see Figure 14 below). Lastly, firms may change their minds about what was previously secret information and reveal it when appropriate to their partners or to the public. This communication to public audiences may be initiated at the end of a cooperation project, or multiple times during the cooperation project, as well as never happening at all and, therefore, the content of the co-work may remain confidential to anyone outside of the secrecy circles, to other companies or even to other members of cooperating organisations.

Figure 14. The phases of formal cooperation and the enactment of secrecy and knowledge sharing practices



BioCL and their partners choose how much to disclose to each other based on general rules of operation, their understanding of the specific contexts and the end purposes, which are reflected in the descriptions of these practices. The same

practices may serve multiple purposes and be part of different practice bundles, not only as it relates to knowledge sharing; however, in this work, I describe these practices as they relate to the purposes of knowledge sharing and protection in inter-firm cooperation and how they are used in this process.

4.2.1 Bounding practices

The bounding practices include both formal and informal ways that help companies kindle their understanding of what the legitimate cooperation practices they agree and subscribe to are. Bounding includes five practices for organising knowledge sharing and secrecy: legal protection and internal policies on how a company's knowledge is supposed to be shared; revision of materials before they can be shared with people outside the company; defining the commitments of cooperating parties; and temporary prohibition of sharing. These practices help to create a shared understanding of the rules of sharing in a cooperative project and ensure that the employees of cooperating companies are guided in how to recognise and treat sensitive information and how to provide sanctions for breaches of the agreed knowledge sharing and secrecy rules. The importance of this practice is the highest at the set-up phase of a cooperation deal, however, the bounding function still needs to be maintained throughout the cooperation, and therefore cooperating companies regularly return to bounding practices.

Legally protecting. In cooperation, BioCL and their partners exchange some sensitive material that includes intellectual property (IP) of those companies; disclosing such materials puts companies at risk of losing their competitive advantage. During the interviews, several managers demonstrated their open attitude towards sharing both through examples of their cooperation experiences, and through sharing confidential details with me during interviews. However, the same managers admitted that openness does not preclude careful consideration of the legal status of a company's IP. It is an implicit assumption that the company has to take care of the safety of specific knowledge before disclosing it: "*You know, I personally, don't keep such [hidden] knowledge and I share everything. […] However, if that patented compound, which is being developed, would not be patented, and someone wouldn't have the ownership of that compound, this is the end. It is dead.*"

(P1-2:69). Patenting (gaining exclusive rights to an invention) is one of the most common ways to claim the rights to ownership of IP in the biotechnology sector, which managers perceive as a measure for safeguarding ownership of the knowledge about an invention. However, protection of IP ownership does not automatically come with claiming IP rights. Managers see patents as incomplete protection of their company's IP: patents are publicly accessible and, therefore, other firms may copy the invention or find legal ways around the patent and release a competing product: "*there are so called work-arounds. If your patent clearly says what you cannot do, then you can reach the same result by doing somewhat differently*" (M2:82) Therefore, when patenting, BioCL and their partners use strategies that make it more difficult to copy their invention: "*one thing is what is written in the patent, and the other thing is how to do that what is written in the patent; and in the patent, there is not necessarily [..] detailed information*" (M5:83). The team working on a patent document may lose or omit the most critical specifications; they may also include more information than the actual invention concerns – the widest possible area of specification of associated compounds or the broadest definitions – which prohibits at least some of the work-arounds: "*you add more potential improvements circle, but only some of them are in your product, that is, you, kind of, create some misleading area around*" (M5:84)

Internal policing. Not all valuable knowledge belonging to BioCL and their partners may be patented, therefore, some of it is kept secret, inaccessible to anyone outside the company: "o*ur business logic is that we don't share our know-how*." (P3:55). Therefore, BioCL managers routinely work on creating an accurate classification of company knowledge and employing internal company procedures which would support secretive information. There are internal company training sessions, in which employees get familiar with "*what is know-how, what is confidential company information"* (M1:160) and how the employees are expected to treat such information. Leaving your table clean and keeping working documents of any type hidden in drawers may be one example of the type of protection from accidental leaks built into daily work routine practices. As well, new and unexperienced employees are not allowed to engage with an external contact without their manager's supervision: "*employees coordinate everything with managers and for God's sake, never [communicate alone]. Those eight – nine years of experience… then they*

learn, know what to say, that is, how to filter the information" (M6:145).

Revising. The classification of internal company knowledge and ways of communicating it are routinely taken examined, but they are still not straightforward and communication outside the firm takes years to master. Therefore, written documents are not only reviewed by managers, but also by the manager of the intellectual property department – "*all what crosses the company boundaries is being reviewed*" (M1:172). With regard to BioCL's partners, which are mostly small-sized companies, managers take care of secrecy themselves by gaining personal expertise and seeking help from internal or external consultants, e.g. "*the founder of our company is very experienced person and we always talk to him about such questions*" (P3:116). Additionally, some of this know-how may appear to be necessary to the development conducted with an external partner, and may consequently undergo a more scrutinised evaluation process of what is allowed to be revealed to partners and how to do this. Furthermore, a cooperation partner or investment fund may require the public communication of certain knowledge. The company or their partners may be required to participate in conferences or publish papers or be interested in doing so: BioCL operates in an industry in which science and business are closely intertwined, and publishing scientific papers is encouraged in business just as it is in science. However, companies publicly communicate only partial outputs, if they do so at all: as with patenting strategies, the companies publicly provide only the necessary minimum or as much as is beneficial to businesses and they keep everything else secret: "*you show it works this way. It is the same as saying nothing. There is a huge number of compounds, if you didn't show the formula, nobody knows what the compound is*" (Partner 1-1:111). This type of communication requires revision and approval.

Building commitment. Knowledge sharing does not start without contractual bonds: "*what we do first is confidentiality agreement*" (M12:12). This way the limits of sharing outside the partnership are set, which often means complete confidentiality and sometimes even prohibiting partners from revealing that negotiations are taking place or that the partnership itself exists. The agreements take different forms, but an essential property of them is that they draw the boundary of disclosure: "*we do a material transfer agreement, which is basically CDA [confidential disclosure*

agreement], just with some changes that you are exchanging materials and that material is protected and under secrecy." (M12:12) It is understood as a norm to comply with such agreements in order to begin engaging in inter-company discussion: "*that is why you do the contract, so that the people who work together can share openly and that everybody knows the rules of engagement*" (M12:45). Compliance is a tacit rule not only due to legal obligation and responsibility, but also because any breach may damage the company's reputation and damage future relationships with current partners and other firms.

Temporarily prohibiting. Managers organise activities around the tension between the hidden state of secrets and their revelation even before any discussion has started with external partners; the tension may again arise in the midst of the cooperation process, as well as when the cooperative development comes to the end and they need to decide on when the information that is kept secret may become sharable to the public. The amount of detail and the boundary between what is secret and public is negotiable and based on the individual case: in some public reports, the structure of a compound may be required and published and in others, they might only require you to state the success or failure of your general project goals. The companies also schedule and control the timing of the revelation to the public: they set the number of years that their partners are prohibited from talking about or publishing the co-development outputs and this is treated as an inevitable obligation and is honestly preserved, even compared to "*oath*" (P1-2:61); alternatively, the amount of detail reaching the public may be revised at different times during the cooperation and the number of secrets may be gradually reduced. Future events, such as the end of product development, may change the definition of what is secret or sharable outside the confidential circle of cooperating firms – "w*e just don't want competitors to get the wind of what is coming*" (M4:63), but after the release of the product on the market, the previously agreed secret may become irrelevant.

In summary, bounding practices help firms build a shared understanding and organise their formal responsibilities in protecting both their and their partners' knowledge in a way that would not weaken either firm's competitiveness. Such boundedness helps ensure that the employees of the company and of external partners are aware of the limits surrounding the proprietary knowledge, that they

follow the rules and that they assist in preventing inappropriate sharing of this knowledge.

4.2.2 **Courting Practices**

The next group of practices is related to how partners attract each other's attention and engage in a dialogue. Through these practices, the potential partners or cooperating companies aim to encourage the growth of their relationship but are still careful not to reveal too much of their proprietary knowledge. I will further discuss four courting practices, which are mostly used in the stage before a cooperation deal is signed and which characterise the practices of pre-partnership: showing a little, creating misleading area, overselling and "empty talk".

Showing a little. Potential partners work to encourage each other to participate and to align who is trusted to join the cooperation circle. As both processes develop simultaneously, managers perceive it as a gradual process, where they try to engage their partners by showing the potential of their development through revealing only a minor part of the details about this development or potential for development: "*if we are talking to companies, our potential partners, if we really like them, we are sharing a little bit. We have probably thousands of, probably, interesting variants […], but we are showing a little bit just to increase their appetite*" (P6:59). Attracting a potential partner by showing them some small fraction of the potential source of the innovative co-product is typically a part of pre-contractual negotiations: "*well, I say, when we listened what they were demonstrating to us, in initial stages, they did not show much of secretive information."* (M3:68) The initiating party is generally the one most interested in attracting the other company, so they need to give them a sneak peek to pique their interest and show them something they know would grab the other company's attention in order to continue the discussion: "*we show here, you get these results, and we get much better. Would you be interested?*" (P3:58)

Creating a misleading area. Usually at the start of a new engagement in a cooperative deal, but also sometimes during the collaboration process, companies want to show their willingness to be cooperative, but they still do not feel they have sufficient guarantee that their sensitive information would not be leaked to the public. In such situations, the companies may communicate in a way that creates a

"*misleading area around*" their development (M5:84): by calling it a "*misleading area around*" the information about a development, biotech managers mean more information is provided than the actual technology concerns – like a smokescreen created to hinder direct attention to the most sensitive details in the information. It may be some knowledge that partners do not want to reveal before starting to work together or perhaps not even throughout the whole development, if understanding of this camouflaged information is not necessary for the success of the co-project. An example of such knowledge may be certain ideas about commercialisation that the company wants to implement; however, the partner could potentially use them independently if they learn of BioCL's plans. The company may still need more information about their partner's, however, by asking their partners, BioCL might reveal the purpose behind their questions: "*I think, how to ask [our partner] about certain application aspects […] so I don't give an idea?*" (M6:165). A BioCL manager told me how he found a way around this issue by hiding the question which was essential to him in a pool of other irrelevant questions for the partner: "*and then after long discussions, I started talking about the sensitivity of the system, and started talking if there is sufficient sensitivity if I would like to isolate something, […] I muddled it, so they did not understand why I am asking this question*" (M6:159). The manager masked the essential question in a wide range of questions and specification changes. The metaphor of a "misleading area" also implicitly refers to the type of knowledge that is developed during the process of co-development but separately, at one of the partner's sites: in this case, it is not one of the project's aimed for results but a sub-product of the development, which can be used to move forward a different innovation project, so it is kept secret (or at least is not intended to be shared).

*"**Empty talk**".* Research participants spoke about owners of small biotech start-ups and scientists who are novices in building inter-firm relationships, who try to attract another firm's attention and provoke discussion by providing a lot of information about the development for which they are looking for a partner's support. It is typically a larger firm that managers of small-sized companies are talking to, and since they have less experience, they do not have a good understanding of what is disclosable to external companies and what is dangerous to say – "*we say it 'rounded'*" (P3:110). Therefore, they fear telling too much and restrict what they share

to the publicly available information: they share lots of information, all of which does not say anything specific about the development at all; as a BioCL partner who used to work at BioCL himself, views it, the owners of biotech companies may "*say in the way that they don't say anything*" (P3:108). The same research participant shared an example of such communication: "*it is from BioCL times, cooperation with such a man, who is very innovative, has a lot of his inventions patented, and offers his technologies […], and he has a lot of patents, here, here and here is good, and here is good."* (P3:128)

Overselling. Similarly to creating a misleading area around the essential information or covering a lack of specific details with "empty talk", partner companies may oversell when presenting their experience of their technology to BioCL: they may attempt to appear more experienced in cooperation by making "*the statement that these have been collaborators with the company, when it is difficult to assess how deep or meaningful those collaboration may have been*" (M13:62) or "*amplify in some ways their technology or what they are doing with it*" (M13:55). In a sense, the companies avoid telling lies about themselves, but hide the point of interest by providing more information around the essence; because of this masking, it is difficult to identify what is the true focal point.

To summarise, the practices for attracting partners are used to attract a potential partner's attention and engage them in conversation. By showing another company "just a little bit" – providing no essential information or providing a lot of information that would still not be sufficiently clear to a person from an external company to make any difference – companies are able to protect their knowledge while giving the illusion of being open about it. The degree of fear of being too open and the extent of the secretiveness here may depend on how experienced the manager is in inter-firm relationships – with more experience comes greater confidence in disclosing the particular details of a potential development or technology without creating a threat to the company's competitive advantage.

4.2.3 **Bonding Practices**

At the same time that boundaries of disclosure are being defined and the partners are trying to engage in conversation, companies also need to work to

develop social bonds: they work on building an environment of trust and defining the circles of people who are entitled to share confidential information.

Trust building. Legal contracts alone are not sufficient measures for the protection of knowledge, as they can still be breached; therefore, building trust is an important part of inter-firm cooperation: "*this trust building – I don't mean trust in like the sense of love or anything, but trust in the contractual sense."* (M12:112) Such trust in a partnership implies honest conversation – "*I trust you if I tell you I sell you horse, it is really a horse and not a rabbit.*" (M12:112) Once you learn something, you cannot give your knowledge back, therefore, confidence in the honesty of your partner is critical: "*well, you cannot throw it out from your head. And well, there is some risk. However, there is such thing as honesty, so they don't use such [knowledge]*" (M3:68). Trust is gained gradually and depends not only on the perception of partners as trustful, but on one's own sense of confidence in the co-developed technology, perception of its uniqueness and importance to the company: trusted sharing of secret company knowledge "*very much depends on how trust between [us] and the company is establishing, on the confidence in the very essence of the invention, does the company plan to apply the invention to multiple areas, and, is this the only thing what they do. It is a very specific thing, when ties between [us] and the company are establishing" (*P7:35). Like this BioCL partner company manager highlights, trust means creating ties and social bonds between two companies that are trying to carry out co-development.

Defining membership. Sharing occurs in dedicated teams, which may be called "circles", and which define both membership and access to the information – "*limit the base who can know"* (M12:148). Only a limited circle of individuals participates in the sharing of knowledge about the technology development. Even at the internal company level, "*only a couple of people will be involved*" and "*the rest of the employees of the site are generally kept out of any discussion"*. Teams are formed of members from both/all partner companies; but also, there are teams dedicated to internal secret keeping inside both companies' boundaries: "*so, even on our own end, we have many people in a, particular location, [...] hundreds of employees there, but only a couple of people will be involved with the evaluation of new technology, so the rest of the employees of the site are generally kept out of any discussion"* (M4:61).

Defining membership in confidential circles is even trickier when there are more than two companies involved in the cooperation: "*if there are several partners, and I communicate to this [partner]. And another [partner] maybe doesn't want me to tell them [the information]. Maybe they feel they are [in different countries – too distanced], and I work with them both. And they all are important to me. There may be such little conflicts"* (P1-2:95-97). As in the cited interview with a BioCL partner, failure to clarify which participants of the cooperation information flows to, or is expected to reach, leads to a conflict situation.

To summarise, cooperating companies and those that plan to engage in co-development work need to develop a sense of trust and confidence in their partner, as well as to earn trust from the other party; honest treatment and clear definition of confidential circles helps them to achieve this aim.

4.2.4 **Ring-fencing Practices**

Even when bound by legal obligations and after gaining confidence in trusting relationships with an external partner, the companies still stay close to aid not only with the proper understanding of their technology by partners but also to watch out in case the other company's use of their technology steps outside of the limits of confidentiality. Alternatively, the company may keep their partners at a distance from any source that could potentially leak the core knowledge of their invention. Doing this typically entails material and social arrangements, such as limiting physical access to technology and keeping your own personnel near the technology to control its use.

Staying nearby. In cases where the potential partner is interested in the technological knowledge reaching BioCL properly, they take measures to ensure that the evaluation of the product by BioCL will proceed in a positive manner. However, they are also wary of big companies that may steal their ideas before their rights are claimed. For this reason, the company may wish to be nearby, "*shadowing*" or "*babysitting*" the testing process at BioCL's site: "*they want to be there, what we call "shadowing", providing advice, making sure that our scientist is running their systems correctly. Working or dealing with any sort of small issue that might come in the evaluation and correcting before it becomes a problem. So, a simple word for it, that*

we use, is "babysitting", so they would want you to babysit while we do the work, in case something goes wrong, they help you to fix it, before you conclude that the technology does not work" (M4:59). The potential partner is investing effort in order to prevent negative conclusions about their technology by being nearby at the time of testing, when issues with the technology could arise. Additionally, this way they can only reveal the information that becomes necessary in the testing process, and they do not provide other details that were not requested.

Limiting access*.* There may be some knowledge that is too sensitive to share, particularly in the early stages of development "*they have just one or two [prototypes], and […] it is not something that they ship to another laboratory*" (M4:55). In such a case, even physical access to the technology is limited, and BioCL representatives do not receive the technology for testing themselves, but instead observe the testing process at their potential partner's site. One additional reason the technology owners "*can be very sensitive, and they should be very sensitive, to the secrecy"* is because "*there is no control of who might be visiting [BioCL] laboratory, maybe from a competitor's company even, without anybody even realising that, all of the sudden we reveal something that's confidential.*" (M4:61). It is more difficult for BioCL to grasp the future potential of a development, but they share their partner's interest in keeping the technology safe from leaks.

4.2.5 **Enacting Practices**

Companies either share or withhold their knowledge based on their consideration of this knowledge's relevance to the cooperative project. It is one of the major tasks in cooperation to define whether or not knowledge is relevant to the specific cooperation project and whether it will be excessive – any sharing that is not necessary and is not relevant is a risk for the company or its partners of facing negative consequences. The relevance of what to share may be determined by the company alone, by their partners, or in negotiation: as previously defined, the cooperating companies may be open about their decision to withhold some of the information or keep the fact of this withholding secret itself. Below, I present seven enacting practices of knowledge in cooperation, which BioCL and their partners use to reveal what they treat as relevant knowledge for their partners: staying strictly on

topic, leaving it unanswered, "black-boxing", stripping out the detail, categorising, avoiding contamination, and disclosure on a need-to-know basis.

Staying on topic. Managers see partial knowledge sharing as a norm in cooperation. Work on eliminating irrelevant knowledge is a continuation of the boundary work of defining relevant and irrelevant knowledge. Companies do this by limiting their discussions with partners to only as much as they promised to communicate and staying strictly "on topic": "*you balance between how much you committed to disclose based on [your] contract, and how much your background know-how is, which you did not commit to give out*" (M1:166). Such scrupulous monitoring of contractual obligations helps a firm to stay friendly with another firm and refrain from unnecessary sharing at the same time.

Leaving it unanswered. More tension arises when companies provide no answer or limit their answers without an obvious reason, as in the case of one of the technology transfers, where the partner site was undergoing organisational changes, and, presumably, the partner's managers had less time for carefully considering what was sharable with BioCL: "*when you ask internally, it means it is really urgent [and you get urgent help]. When you ask them [partners] – [you get the answer] maybe tomorrow, maybe in one week… and all the time it was – you ask, ask again […]. Come on, we need it, we really need it, we have a timeline*!" (M11:42-43).

*"**Black-boxing**".* The protocols of processes are not shared, but when BioCL needs to communicate the results or partial process details to their partners, the names of the components and assays will be coded: *"we said, we did with protein X1, and the other protein is X2*" (M10:244) and the partners are comfortable working with such anonymised data "*they tell, we give you protein X; and that is it. You do it. With protein X you got 16, with protein Y you got 18, and with protein Z you got 25*" (P1-2:79). The partners work on discussing the modifications, results and issues, while operating with only partial knowledge about the partner's technology – the essential core of both parties' intellectual property remains in the "black box". Especially with small biotechnology companies, which have only one or just a few projects, so the stakes of every project are high, the protection of their technology is very scrupulous, even "*paranoid*" (M12:53), and the codified specifications and general experiment results may remain the only shareable material between two

companies "*nothing is shared. We just get some […] and [the results] either it works or not*" (M12:22).

Stripping out the detail. Internal protocols of experimental activities on a project are rich in proprietary information – "*protocols, how to say, they are know-how*" (M10:82). Therefore, the reports on the results and outcomes of the experiments are additionally stripped of some detail before they can be shared with partners. The degree of completeness that remains varies from nearly nothing being told except that it was a positive or negative result to "*where everything is shared*" (M12:22). For example, where the technologies of partners are very different and there is no need to know the details of their development to produce the combined result, BioCL says "*we need, very little actually. It is more like outsourcing. We need to say it works or does not work*" (M12:22). Also, their partners provide the same kind of limited information about their experiments with the developed substance: "*they just need to say it works on our assays or not*" (M12:22). What one manager referred to as "everything is shared" is still just a limited portion of the knowledge that has been gained in the process of development and experimentation; for example, it could include sending the materials, the sets of substances, the pros and cons of certain methods of work with these substances, or an explanation as to "*why the compound is not working*" (M12:22).

Categorising. Sharing knowledge with anyone outside the company, or even outside the group of trusted people within a company, is a risk of losing control of how this knowledge is used. BioCL and their partners are aware of this risk and share only what they consider as relevant and necessary to their project. Any excessive sharing would increase the undesirable risk of leaking sensitive company information. The companies define what is relevant contemporaneously with beginning the process of deal negotiation, however, they may return to the definitions of knowledge relevant to the cooperation project many times at later stages.

The companies determine the relevance of specific knowledge by classifying the knowledge based on its purpose and when it was created: "*so we tried to have a consocial agreement that we don't automatically share, you know the terminology, background, foreground, side-ground, we tried to limit that as much as possible."* (P4:42). The partner of BioCL here refers to bilateral discussion about when the

knowledge was created – so, background knowledge, which was created before the companies started co-work, as well as foreground and side-ground knowledge, which is created during a cooperation project – and its location, i.e., foreground knowledge is created as a part of the co-creation process so it lies within the project, whereas side-ground knowledge is relevant and produced during cooperation but is outside the bounds of the co-project. *"Background was made available within the project, but not beyond the project. And side-ground was available only by arrangements. So, there was no automatic access for the company to IP, and, between companies or between labs and companies"* (P4:42). As this partner explains, the knowledge categories based on the time and location of knowledge creation are helpful in setting the boundaries between what is shared and what is secret.

Avoiding contamination. Seeing too much overlap between your own and another company's developments is one of the reasons to withdraw from a partnership. Similarly, it may happen when cooperation is already in process: the companies working on a co-development may file their patents separately and intentionally or unintentionally include some claims that could prohibit their partners from patenting all or a part of their invention. On the other hand, if after sharing some knowledge, the partner wants to patent their invention, you may argue against it and prove that some parts of the knowledge used in their invention comes from your company's assets: "*we avoid [receiving] such information because afterwards, it is difficult to prove that you did not use it, and you need to compensate it [to partner] financially*" (P3:104). Therefore, companies take additional measures of precaution when they become aware of a high degree of similarity of their inventions and limit or discontinue communication: "w*hen we do similar inventions, then we don't want any of our scientists to be contaminated by knowledge*" (M12:137).

Disclosing on a need-to-know basis. Lastly, it is not always possible to know how similar the technology of a partner is, or, how competitive the co-development environment might be. As in an example cited earlier from a BioCL manager, the partners tried to stay close to the testing process at BioCL's site, "*shadowing*", which not only allowed them to maintain physical boundedness, but also only revealed the information that became necessary in the testing process – the other details, even if not necessarily thought of as secret, remained confidential if not requested: *"we need*

to think of how to ask, but then [partners] always answer like civilised people" (M7-1:143).

To summarise, the "enactment" group includes the practices companies carry out as they understand it as relevant to their cooperative project. Firms balance their needs for positive outcome of their cooperation in a variety of ways but also avoid extending sharing to include unnecessary detail.

4.3 Openness, Secrecy and the "Smoke-Screen" in Inter-Firm cooperation

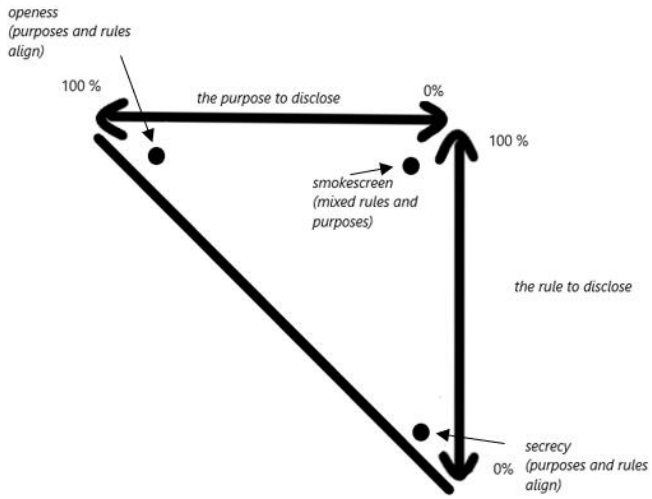
Some practices that firms use in cooperation, such as "creating a misleading area" or "empty talk" hold the elements of both secrecy and knowledge sharing: secrecy may be a part of sharing, and sharing may be part of secrecy as well. Furthermore, some practices may be used with the purpose of both sharing something and keeping it secret at the same time and cannot be separated by the rules and understanding (Schatzki, 2001a) of action but hold double purpose. Therefore, the sharing of knowledge and secrecy do not appear as separate activities but as a negotiated degree of both in combination.

Knowledge sharing and secrecy practices are activities, which are what research participants do and say and which are organised by rules, practical understanding and ends and purposes. If we imagine perfect openness, in practice, it should combine the willingness to share (the purpose) and the availability of the knowledge in question for disclosure (the rule). In the case of perfect secrecy then, there must be the intent to keep the knowledge secret (the purpose) and the disposition of this knowledge not to be disclosed (the rule). The purposes and rules in both perfect openness and perfect secrecy align and guide activities towards disclosure or withholding of knowledge.

However, if there are conflicting interests between withholding information and protecting certain knowledge (the purpose of an action) and the situation requires openness (the rules used in the action), cooperating parties enact those conflicting rules and purposes through a layered presentation: by sharing the full information but leaving out the necessary highlights and contextual elements that would make it understandable to the person to whom it is conveyed; I call such purposeful

performance a “smoke-screen”. In the smoke-screen, different layers of information on the surface and below it allow the conveyer to provide an honest account in the discussion but make sure a part of the account stays inaccessible to the conversation partner (see Figure 15 below).

Figure 15. The triangle of openness, secrecy and “smoke-screen”



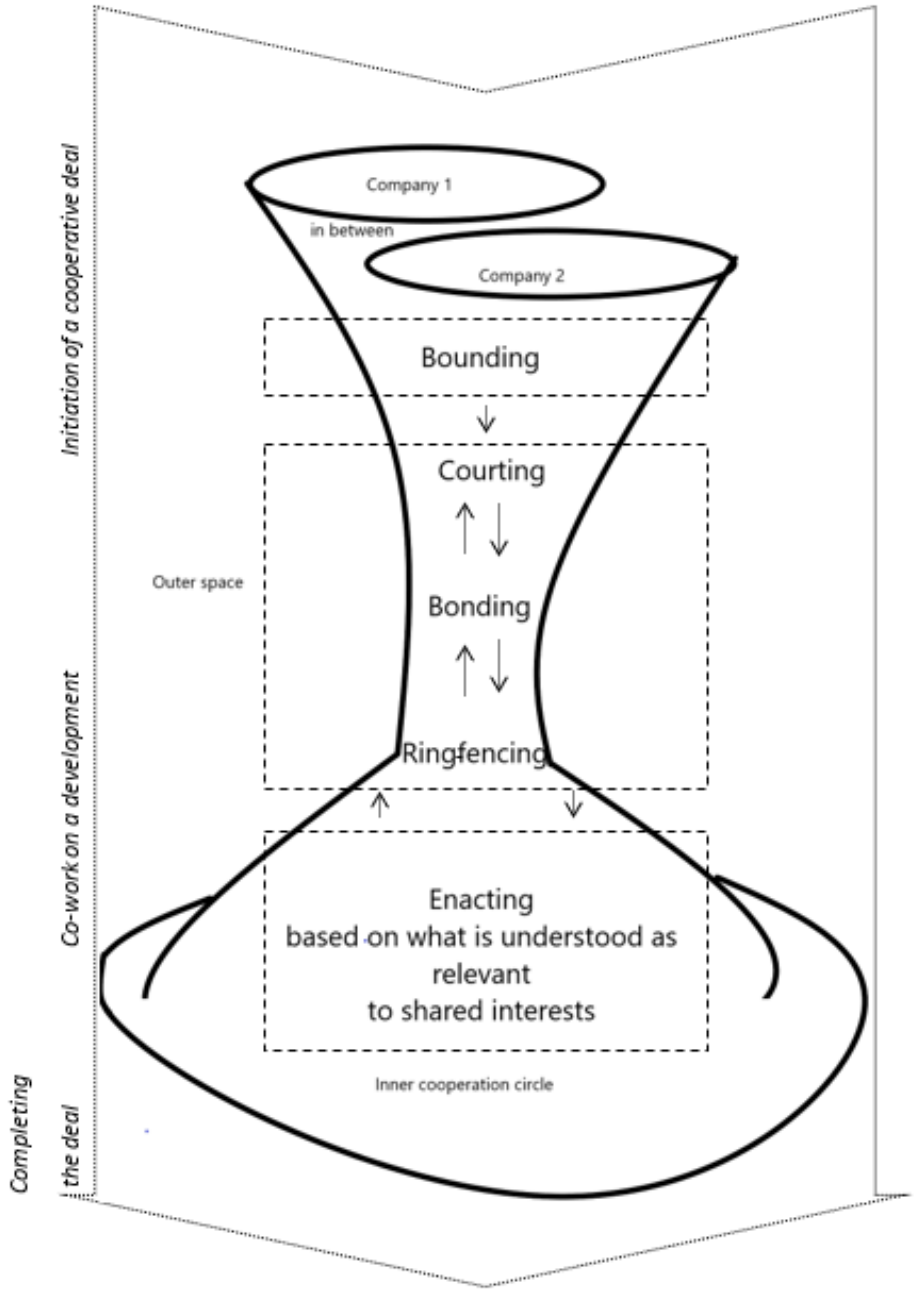
4.4 The Physiology of Knowledge Sharing and Secrecy in Inter-Firm Cooperation

Based on what I discussed in the previous chapter about the cooperation and knowledge sharing experiences of BioCL and its partners, successful sharing and sufficient secrecy is an important part of the activities in the cooperation process of BioCL and their partners, and requires the enactment of interrelated practices and the fulfilling of several functions that uphold the cooperation process (“physiology” or the co-functioning of the previously discussed anatomical parts). Therefore, I further discuss several aspects of the physiology of knowledge sharing and secrecy in inter-firm cooperation: how practices are enacted in the cooperation process, the multiplicity of cooperation spaces, secrecy circles and practice bundles.

4.4.1 The Process of Cooperation

Knowledge sharing practices interact and are performed in spaces within the overall cooperation process. Figure 16 on the next page provides a schematic visual representation of how knowledge sharing and secrecy practices evolve and interact in cooperation. Based on the aims and data of this research, this visualisation of the process is only a partial representation of the overall cooperation process – it represents the groups of practices used in initial involvement and accomplishing co-work, but does not cover how firms exit from cooperation. Also, the assumption is that potential partners are already identified.

Figure 16. Physiology of practices



The figure showcases a cooperation scenario between two companies, in which two firms engage in conversation and a co-development. The two companies,

Company 1 and Company 2, each have their own entrusted circles and through bounding, courting, bonding and ring-fencing practices, the companies negotiate and end up with a common entrusted circle – the inner cooperation circle, which is needed to enact knowledge sharing and perform the agreed cooperation tasks. Due to the limitations of a drawing and the clarity of the figure, the possible simultaneous enactment of these practices is not depictured and is only discussed in text.

The practices are displayed in a descending order down to the enactment and the inner cooperation circle, although the order is conditional – these practices are iterative, recursive, simultaneous and bundled, which means the same practice may be continuously performed throughout the cooperation: one of the partners, or both may regularly come back to a practice, or skip some of the practices, depending on what makes sense in a specific cooperation context. However, there are some general principles that most cooperation processes tend to follow – first, the organising starts with the ***bounding*** of the internal teams and cooperation partner teams and creating a shared understanding of knowledge sharing and protection rules. After the bounding period, come a few groups of practices that serve the following functions – courting, bonding and ring-fencing. ***Courting*** practices – attracting partners to commit to the project – strongly depend on the previous cooperation experience and familiarity of partners and are essential when two companies know little about each other, or when the power structure is asymmetric: e.g. one company is small and unexperienced and tries to sell their idea to a larger and more experienced company. Courting is characteristic of the negotiation stage, however, in some cases it may be transferred to a later stage when the companies are already working together, but some interferences push them back to realign their relationship and maintain the attraction between partners. ***Bonding*** practices – creating and maintaining the social contract in a cooperation project – are essential at the beginning of the cooperation process, however, they too may be silently maintained throughout the whole cooperation process. In case of any interference, both bounding and bonding work intensifies. ***Ring-fencing*** – these practices maintain the boundaries of secrecy and sharing through physical and material confinement and engagement and may not be necessary in all cooperation cases; however, they may be performed at the beginning of the involvement or throughout the whole

process of cooperation if the stakes are high and the confidential circle is perceived as having insufficient commitment. Finally, ***enacting*** practices is the largest group of practices of defining, enacting and maintaining the relevant knowledge in a co-performance of cooperation, and it is continuously bundled together with the other aforementioned practices, depending on the social dynamic of the inner circles, as well as any interruptions or realignments.

4.4.2 Spaces and Circles

What characterises practices is that they are performed in temporal and physical spaces, and the cooperation process itself may be envisioned as the formation of a bounded circle, the process of its gluing and the enactment of sharing and secrecy in an inner circle. While the inner circle forms, cooperation partners experience different degrees of uncertainty as to whether they are in that safer agreed zone or are still trying their partner on for size; however, to enact the process of knowledge sharing and secrecy in this trusted social circle, the boundaries of belonging or being outside of this circle must be discussed and agreed upon.

If the discussion or agreement is not satisfactory, the enactment practices are more likely to interfere with the bonding and ring-fencing practices: these practices are not likely to be skipped, except in cases where the current cooperation project is the next one in the series of similar arrangements with the same cooperation partner – for example, testing several substances in development within the setting of the partner's laboratory. It could also be several circles formed as part of the same cooperative project, and the boundaries of each circle delimit the area in which the defined sharing and secrecy practices are enacted and what, how and why is being shared.

For a cooperation project to perform, a co-circle that includes all or part of the members of every cooperating party is necessary. However, there may be a different circle with different sharing and different secrecy practices that draws its boundaries inside each of the cooperating parties as well – all cooperating firms may have their own inner circles that partially overlap with the co-circle, but which also include other members of the organisation who don't belong to the greater co-circle. When there are more than two partners, a more complex relationship forms, an all-firms co-circle

is still necessary, however, it may be that pairs or trios of firms have another co-circle including only members from those two or three firms, in which the members may be the same as those who belong to the all-firms co-circle, or, they may differ slightly, and these circles typically serve to carry out a smaller part of the co-development, which requires a less rigid secrecy agreement within their co-circle.

4.4.3 Bundles of Practices

These practices are not only recursive, but they also form bundles or even a broader practice serving several functions: even practices of different functions may be performed as a part of the same bundle. As in the example of a BioCL manager provided below:

> "*Or they want to be there, what we call "shadowing", ehr, providing advice, making sure that our scientist is running their systems correctly. Ahr, working or dealing with any sort of small issue that might come in the evaluation, and correcting before it becomes a problem. So, some, a simple word for it, that we use is "babysitting", so they would want you to babysit while we do the work, in case something goes wrong, they help you to fix it, before you conclude that the technology does not work." (M4:59)*

Here the practice bundle consists of two distinct practices: "staying nearby" and "disclosure on a need-to-know basis", which also serve two functions – one, ring-fencing and not allowing partners to study technology too thoroughly (e.g. reverse-engineering it, tracing back the process of how it was created); second, enacting the exchange of knowledge based on when a need arises in order to ensure that the partner can understand the value of the technology and can efficiently perform their functions in cooperative development, and in this way avoiding sharing excessive details. This also alleviates the tension between which information is relevant and which is not relevant to cooperative project.

5. THE DISCUSSION OF RESEARCH FINDINGS

In this research, I have explored the cooperation between a biotechnology firm

and its partners, as well as their knowledge sharing and protection practices when working on inter-firm cooperative agreements. I analysed how companies with high motivation to share their knowledge with a partner for the success of their cooperative affair therefore share, but also simultaneously protect their proprietary knowledge. To explore this phenomenon, I used a single case study of a biotechnology company and its cooperation partners and analysed a wide range of these companies' practices in different contexts. In this penultimate section, I discuss how the findings of this research complement the extant scientific knowledge about the nature of cooperation, as well as knowledge and secrecy. I then conclude this section with the discussion of inter-firm cooperation practices and the process model of the cooperation, and how these contribute to the development of a theory of inter-firm cooperation.

5.1 The Nature of Cooperation

Definition and Structure of Cooperation. Research participants defined cooperation as a relationship with an external firm that meets several criteria: cooperation requires parties to reconcile their expected outcomes of a deal and their interest in innovation with their desire for monetary compensation. Based on a definition from economic theories of inter-firm cooperation (Oxley, 1997), the form and structure of the cooperation deal are important considerations; however, in this case study, these were rather seamlessly adopted based on circumstances such as, the status of legal ownership rights, the level of uncertainty in the technological development and other factors. The choice of form and structure was communicated as rather unproblematic and seen as a secondary issue among the numerous other choices that managers have to make while arranging cooperative relationships with external firms. However, while transaction theorists dedicate attention to the balance of cost and value in a cooperative development, this is not easily achieved and/or calculable: the costs involved with a present deal may only have some projected value in the rather distant future after the completion of a cooperative project. Therefore, firms assess the value in relative terms: as they do not expect to achieve profit as a direct output of their work with an external firm, they instead consider motivational factors, which are related to shorter-term goals, and which drive their

willingness to engage in inter-firm cooperation. Such present interest is more focused on new technologies and innovation than on monetary reward, and, therefore, the findings of this study endorse the open innovation claims, which define cooperation as a way to become more innovative (Laursen & Salter, 2006), and in this context, the firm explicitly considers this an important motivation for engaging in inter-firm relationships.

Transaction value scholars have identified that shared outcome is an important consideration for inter-firm transactions (Zajac & Olsen, 1993); nevertheless, in this research, the meaning of the shared outcome is extended. In this case study, internal company motives may be variously interlinked with what the company assumes to be their counterpart's motives, or may only account for internal motivation itself; thus shared outcomes are manifold and have no uniform explanation of what is or what qualifies as a shared outcome. It appears that it is not the outcome itself that is important, but the practice of the discourse and negotiation around this outcome that defines a cooperation. The findings of this study demonstrate that the economic analyses, which attend to the entity and structure of a cooperation, are appropriate for the analysis of inter-firm relationships but only address the issues that biotechnology firms treat as secondary in their practice. However, by analysing social processes and the practice of arriving at the cooperation outcome, we address the issues of contemporary organisations that are not only more urgent and demanding in practice, but that also enrich our theoretical understanding of the complexity and plurality of the concept.

Motivation to Engage in Inter-Firm Cooperation. The general reasons why companies engage in cooperation seen in this research are in line with previous studies; however, this study provides a more granular view on how companies organise themselves in the context of technological uncertainty. Based on the findings of this study, the major trigger to go and look for a cooperation partner is a lack of (or uncertainty about having sufficient and proper) internal capabilities and resources, which is in line with the findings of previous cooperation studies (Mayer & Salomon, 2006). The understanding of the need for external sourcing is nevertheless not a stable or linear process – it may be reconsidered at any time depending on what offers the company receives from other companies, and the weighted

cost/benefit of cooperation with another firm against building corresponding capabilities in-house. Companies cooperate when they see it as an optimal cost and value ratio (Zajac & Olsen, 1993), or as a beneficial development of their dynamic capabilities (Teece, 2007; Teece et al., 1997); however, the process is much more dynamic, iterative, and less "decisionist" than has been asserted in economic analyses. The actions and choices of firms are highly affected by situational factors, and companies make choices that make sense in a given situation (Newell et al., 2009; Schatzki, 1988). As soon as companies learn new information, their actions may be reconsidered and changed and they then carry on until some other new information requires another revision of the action plan; also, more often than not, managers lack proper information for their decisions and have to make their choices based on partial assumptions. In addition, new cooperation opportunities arise not only from internal initiatives but may be offered by external companies, therefore, the ongoing planning is reconsidered in light of such offers. An opportunity does not necessarily need to fit in the way it has been previously envisioned to but its fit is considered based on a broader vision of the company's development. Such flexibility was perceived by managers as a positive and helpful factor in adapting to uncertain markets and taking advantage of changing circumstances. Therefore, it is less of a restructuring and more a continuous reshaping of current practices and future anticipations; the general aim and purpose remain the same, but the practical implementation is flexible and an initial plan to develop something in-house or cooperate with an external company may take shape and be reshaped multiple times.

External learning is both a common motive and an incentive for cooperation (Das & Kumar, 2007; Goeltz, 2010; Mody, 1993), but the type of learning that the company expects is different based on how mature the company is at the time of cooperation, what its overall activities are and how experienced the company is in organising relationship with other companies. At first, when the focus company had little cooperation experience, their primary motive was to learn to work with other companies, to see what other companies do, and to "socialise" with the hope of gaining new ideas for company development and growth. At this stage, cooperation is part of an overall strategy for company development – it is purposefully encouraged and promoted. Later, when the company became more mature, what they now

needed was to access resources and capabilities rather than learn from them (R. M. Grant & Baden-Fuller, 2004), and use these for the development of their own business structure. Whereas, learning new competences and gaining direct access to other company knowledge, which in the literature is identified as a source of inter-firm conflicts (Das & Kumar, 2007), is more a secondary effect depending on the circumstances – the firms take this as their partner's right to protect and only share the minimum amount necessary for the co-development and only at such time when the need arises; this way, it seems, the companies build relationships that skirt around the source of potential conflict.

Competition. I found that contrary to the prevailing view, competition is not a stable property and definition of organisational relationships – when firms engage in cooperation, they act in a way that ensures that their competitive concerns are dealt with outside the cooperation circle, and continuously revisited. Therefore, my findings reflect the essential claim of Alter and Hage (1993) that companies need to have the least competitive struggle possible to accomplish a cooperative deal successfully; however, the attitude is not directly tied to the stable and preconceived characteristics of those organisations at all stages of the cooperation process, which seems to be the background assumption in linking competitive tension in inter-firm cooperation with the competition between companies belonging to the same industrial sector. Companies that belong to the same industry may perform as competitors when they are not interested in working together, however, if they have interest in exploiting their complementary resources, the companies engage in practices that allow them to draw boundaries between their outer and inner spaces and push the competitive concerns out of the inner cooperation circle.

Additionally, even if companies do not come from the same industry, it does not mean they are not competing for the same resources, innovations and customers. It happens often in the biotechnology industry as well, the industry this case study takes place in – there are a lot of specialisations and variations on how and from what type of resources the same outcome may be reached. Biotechnology itself contains many subdomains, and even physicists, chemists and other scientists may not share common knowledge, but work in inter-disciplinary groups; or, they may work independently and compete to achieve the same purpose (e.g. producing a different

product that serves the same function and has the same value to customer) through different means. The industry is pluralistic and cooperating companies will always have concerns about their partner company – they may be invisibly competing, they may be not careful enough in communication with third parties, or they may even "give wind" of an upcoming innovation to a third party, and this would negatively impact the expected profits from the innovation. Therefore, firms do not select a non-competitor per se, but they select companies to cooperate with based on their resource or competence needs, and they evaluate whether the relationship will be trustful enough, and then they work on making a safer and non-competitive environment, in which they can accomplish their tasks. Therefore, as economic literature has extensively explored, choosing partners based on their company profile does not seem to be sufficient guidance in the current market circumstances in biotechnology and the practice-based lens, which I used in this study and which considers social practices as the base of human action (Schatzki, 2016), uncovered a more in-depth understanding of how firms overcome the tension between openness and secrecy.

5.2 The Definition of Knowledge

The research participants defined knowledge in different terms – as kinds of information, data, material artefacts, or social interaction. In practice, it is difficult to explicate what the knowledge being shared in cooperation consists of, and a common way of referring to knowledge is through connecting it to material objects or social interactions, as well as by reproducing the process of interaction and explaining praxis, which connects to the way knowing is defined by practice scholars (Nicolini, 2012). Some managers also referred to the categorisation of knowledge or distinct knowledge types based on when and where the knowledge was created (Bogers, 2011), and it is this practice that is part of the enactment of knowledge sharing. However, the categorisation that is used by BioCL and their partners, what research participants called knowledge types, is instead a typology of the circumstances of when and by whom the knowledge was created, not a typology of the knowledge itself. The meaning of knowledge is changing, and it depends on the social and material contexts in which it is embedded (Cook & Brown, 1999). Only the account

of context provides the needed information for the understanding of what knowledge is shared and how it is part of the practical enactments (McDermott, 1999) in cooperation.

5.3 Secrecy in Inter-Firm Cooperation

As traditionally conceived, secrecy may take the form of withholding information (latent or manifest); however, it also uses partial revelation as a tool to limit disclosure; or even sharing of excessive details and a wide range of information which creates a “smokescreen” and prevents the partner from understanding the very essence of the knowledge, which the company wants to safeguard from outside players even if they are their partners. Differentiation between latent and manifest secrecy, as in Simmel (1906), Goffman (1978) and (Grey & Costas, 2016), is practically significant and allows organisations to differentiate between the secrets that the other party does not know are being held secret and the secrets that are known to exist. In the context of inter-firm cooperation, companies understand that there are secrets that they know exist and there are also secrets that they do not know the other company is holding. Manifest secrecy is justified as ethical as companies appreciate that they all have something to keep confidential; however, there is a limit to how much the company may claim they cannot speak of something which is being asked about. Latent secrecy is justified as less reasonable than manifest secrecy and is accepted as a temporary measure, which demands eventual revelation. The practices of secrecy extend beyond their direct functionality and they build power relationships as described by Grey and Costas (2016): a larger company with easier access to the required information establishes a more powerful position by practicing latent secrecy; a smaller firm has less possibility to attain a higher power status due to limited resources.

5.4 The Intertwinement of Openness and Secrecy

A common definition of secrecy highlights non-sharing or “non-information” (Bok, 1982); in complicated, tense circumstances (Coles et al., 2003). However, I find that secrecy in inter-firm cooperation involves both the sharing and withholding of

information. I have found that companies not only withhold information with the intent to protect it from their competitors, but also pursue secrecy through excessive communication. For this phenomenon, I use a “smokescreen” metaphor, which pictorially describes how a larger amount of information than it is necessary may help to hide essential details and maintain secrecy. In cooperation, openness and sharing are perceived as desired qualities, and obvious withholding of information is accepted within reasonable extent. Whereas, hiding through sharing may help to normalise a secretive intention and perform it in a more cooperative way. I explore a partnership in which the need and motivation to share is a primary motive of such an engagement, therefore, sharing is perceived as a desired process, and obvious withholding of information is accepted within a limited extent and context. Whereas, hiding through sharing disguises this intention and presents the partner as more cooperative. Earlier studies mainly looked at secrets as consisting of some kind of information (Costas & Grey, 2014), which can explain why these studies did not attend to sharing as part of secrecy. When looking at what secrets entail, they of course contain the tension of revelation (Bok, 1982) but the essence of a secret is something that is hidden; therefore, as the findings of this case study show, it is both withholding and sharing that help to maintain the secrecy of organisational knowledge in inter-firm cooperation.

The misconception of secrecy as withholding information may also partly derive from positioning openness through knowledge sharing in contrast to protection by not sharing knowledge (Bogers, 2011), and asserting that the tension between sharing and not sharing, or openness and secrecy, needs to arrive at an equilibrium in order to have a successful cooperation. In this research, sharing and not sharing knowledge is a different dimension and a separate consideration from that of openness and secrecy, guided by rules and purposes and enacted through a practical understanding of the same performance on superficial and/or contextual levels. By going beyond the opposition of thought and action (Gherardi, 2000) we are no longer stuck in solving the contradiction and puzzle of simultaneous secrecy and sharing and can now observe how organisational actors deal with the complexity and elicit practices, which I discuss in the subsequent section, 6.5.

5.5 Knowledge Sharing and Secrecy Practices in Inter-Firm Cooperation

In this research, I analyse interdependent knowledge sharing and secrecy practices to find how they are intertwined and constitute recursive social organising (M. S. Feldman & Orlikowski, 2011; Giddens, 1984) in the inter-firm cooperation process, and this opens new possibilities for the interpretation of cooperation process. Extant cooperation research, which uses an economic premises of knowledge sharing and protection and approaches the process from an individualist and structural perspective (e.g. Bogers, 2011; McEvily et al., 2004) brings a certain degree of value; however, such research cannot resolve the question of how companies deal with the tension of these supposedly incompatible organisational activities. Additionally, by isolating the purposes and practices of cooperation (knowledge sharing) and competition (knowledge protection) and attempting to create some universal principles, research studies overlook the contextuality (Garvin, 1993; Polkinghorne, 1992) and diversity of these practices – the iterative, recursive, simultaneous and bundled ways in which secrecy is enacted in inter-firm cooperation.

Based on the findings of this study, which takes a practice-based approach, we can observe that managers may have a common aim when they engage in sharing and protecting organisational knowledge, or they may perform the same practice with the dual aim of both demonstrating open sharing and protecting their proprietary knowledge at the same time. Interruptions of regular practices trigger the return and revision of previously performed actions (Yanow, 2015) as well, and different contexts and circumstances trigger the revisiting, rethinking or realigning of secrecy practices in inter-firm cooperation. The organisation of knowledge sharing and secrecy may fully or partly coincide with the general stages of the cooperation process (Ring & Van de Ven, 1994) but as knowledge sharing and secrecy practices develop to suit the changing needs of cooperation partners, they may become asynchronous with the progress of the cooperation deal and create a unique and peculiar chain of events.

5.5.1 Anatomy: Secrecy and Knowledge Sharing Practices

In some cooperation practices, such as avoiding contamination (not sharing a development which may be too similar to a partner's development), firms do not signal that they are being secretive to their partners, and this resembles the phenomenon of silence in the military context as described in the research study by Chris Grey (2014). Other practices, such as a voluntary choice to keep your distance from your partner's knowledge resources, which are perceived as confidential, are similar to ignorance in the military context (Grey, 2014); however, it is different in that ignorance in military contexts is coordinated by an external person, whereas in cooperation in biotechnology, the process participants intentionally withdraw due to reasons related to organisation inside their firm or based on a bilateral understanding. Lastly, surveillance has a specific meaning in the military context, whereas in biotechnologies, knowledge protection measures takes a rather different form. Also, similarly to previously conducted studies (Gusterson, 1998), I find that the compartmentalisation of social spaces into trusted membership circles, in which more information is shared compared to a wider company context. To summarise, some qualities in biotech inter-firm cooperation resemble findings in the military context, however, the military setting is significantly different from that of most other industries and implies different internationalities, which limit the comparison. It is impossible to cover the diversity of human practices in one case study, and it is impossible to grasp the depth of practices through the use of large-scale surveys, which signifies the need for more in-depth research studies performed in a variety of contexts (industries, cooperation types, product types, etc.) which would allow us to understand secrecy as a routine and common practice of our socio-organisational lives.

Patenting is a common formal measure of intellectual property protection (Delerue & Lejeune, 2011; Veugelers & Cassiman, 2003); however, in contrast to what is analysed in the extant literature, patents are not only seen as a public revelation in return for claiming and protecting invention rights, but are also used to protect specific knowledge: companies use descriptions of their technologies that would make it more difficult for a competitor to reproduce them or find work-arounds for them, i.e. by including very broad descriptions of the technology or omitting some details so as to make the description less specific. Therefore, patenting is

transformed into strategic secrecy wrapped in the guise of revelation, which partly overcomes the known issues of patenting in highly regulated industries, such as the biotechnology case investigated in this research study.

In management research, selective revealing (Alexy et al., 2013) is known as a company's decision to make some of their know-how public (usually the knowledge from which an organisation does not expect to gain a profit); also, limited revelation and inclusion in secrecy circles (Grey & Costas, 2016; Johnson, 2002) serves as a way to protect certain knowledge from those who are not included in the circles. In this research, I find that companies use similar strategies in order to enact a partial disclosure of their knowledge between cooperating parties. Partial disclosure is based on various criteria governing who is entitled to know (Costas & Grey, 2014), the type of information to share (Bogers, 2011) or the amount of detail shared; however, the motivation behind this selectivity is different because the partners (or outsiders) don't receive the important information – knowledge reaches partners only if it is necessary and only that which is the least critical to safeguarding the company's competitiveness. Therefore, by maintaining secrecy, the companies enact the transparency of knowledge sharing boundaries, which, in turn, facilitates the process of gaining a shared understanding and shared expectations.

5.5.2 Physiology: The Intertwinement of Practices in Cooperation Process

In this research, I find that although the cooperation process is iterative and recursive, and multiple practices are enacted simultaneously and in alternating bundles, there is some general logic with which most cooperation processes comply.

First, cooperation starts with the practices related to the *bounding* function (bounding internal teams and cooperation partners within a shared understanding of knowledge sharing and protection rules), then follow the practices that serve several other functions – *courting* (attracting partners to commit to a joint project), *bonding* (creating and maintaining the social contract of a joint project), *ring-fencing* (maintaining the boundaries of secrecy and sharing through physical and material confinement and engagement) and, finally, they culminate in the *enacting* practices that facilitate a co-performance (defining, enacting and maintaining relevant knowledge in the co-performance of a project). Noticeably, the preparatory phases

of cooperation don't seem to hold less or more importance, as well, it is difficult to separate them from the phase in which the companies perform the actual co-development, because the preparatory stages share some practices that continue to be enacted until the end of the cooperation deal. This offers an important implication to cooperation research, which tends to study these stages separately and identify distinct steps and issues of each. By identifying the continuous and iterative practices that firms may be using from the beginning of negotiation to the closure of inter-firm cooperation (Ring & Van de Ven, 1994), this research highlights the importance of the holistic approach to the process (Albers et al., 2016). Additionally, by analysing the cooperation process as embedded in social practices (Newell et al., 2009), the understanding of the cooperation process and its practical implementations are significantly advanced.

6. CONCLUSIONS AND IMPLICATIONS

Knowledge sharing and secrecy in inter-firm cooperation is a complex issue and lacks empirical and theoretical understanding of the practices that help organisations carry out the endeavour. Therefore, this research addresses this gap and explores how knowledge sharing and secrecy intertwine in inter-firm cooperation practice and bring joint contribution to cooperation outcomes.

First, in this research I explored the theories of the firm that explain the phenomenon of inter-firm cooperation, as well as how knowledge sharing and secrecy are treated in these theories. I find that current research studies in management more often draw on economic theoretical assumptions and suffer from several issues – *the lack of a social, holistic, activity based and contextualised approach* – and that these issues prohibit management science from advancing the understanding of knowledge sharing and secrecy in inter-firm cooperation.

I identify that recent theoretical developments in knowledge and secrecy research suggest that social ontologies are better suited to the understanding of social phenomena: social theories attend to the holistic nature of these phenomena that reside in human practices and enable a contextualised analysis of the practices. Therefore, I choose the practice theory lens, which addresses the limitations of research in the tradition of economic theories and offers a favourable framework for

the analysis of the understanding of knowledge sharing and secrecy in inter-firm cooperation, and I use it in my empirical data access and interpretation. I use an emergent case study research design and explore cooperation practices from the perspectives of multiple cooperation partners and employ an interpretative approach to data analysis.

I find partial relevance of the explanations of economic theories of the cooperation process, but also complement their findings with new insights that were possible by attending to organisational activities and taking into consideration the social and material dimensions. I find that knowledge sharing and secrecy in inter-firm cooperation is a process embedded in its social and material environment. The definitions of knowledge and secrecy as provided by research participants are highly contextual and provide substantial background for revisiting the understanding of cooperation. As well, I find that the competition in cooperation is not a stable property but a relative attitude of cooperation partners.

I identify knowledge sharing and secrecy practices that serve several organisational functions:

1. Bounding – the bounding of internal teams and cooperation partners to a shared understanding of knowledge sharing and protection rules,
2. Courting – attracting partners to commit to the joint project,
3. Bonding – creating and maintaining the social contract of this project,
4. Ring-fencing, which maintains the boundaries of secrecy and sharing through physical and material confinement and engagement,
5. Enacting – defining, enacting and maintaining relevant knowledge in co-performance of cooperation.

I find that sharing and hiding are not opposed or distinct processes but may be parts of a same practice (and also praxis). Additionally, secrecy is not only practiced by the means of withholding information, but also by revelation. Openness and knowledge sharing are commensurable and may be enacted together with secrecy and used to reconcile the conflicting motivations and rules of performances, and that such “smoke-screen” practices are used alongside other practices of secrecy and knowledge sharing; and all these practices intertwine in interdependent, iterative and recursive cooperation process.

Implications to theory. This research study aimed to answer how knowledge sharing and secrecy are intertwined in inter-firm cooperation practices and bring joint contribution to cooperation outcomes. The key contributions to the existing cooperation theories and the novelty of this research are as follows:

1. As opposed to the widespread popular and scientific stance, secrecy is not the "dark side" of cooperation, but an enabling practice of inter-firm cooperation intertwined with knowledge sharing, which helps to build boundaries and more efficient knowledge sharing
2. Practice theory – the novel socio-ontological lens used in this research, enables us to see the above-mentioned intertwinement of knowledge and secrecy, which is not apparent when analysing cooperation from an economic standpoint.
3. Knowledge sharing is not the opposite to secrecy but it belongs to a different dimension, which may coincide when an organisation holds purposes which contradict social rules. Therefore, knowledge sharing and disclosure may serve as a tool for the enactment of secretive intentions, and a holistic analysis helped me to identify this phenomenon.
4. Knowledge sharing and secrecy practices contribute to several organisational functions in cooperation process, and this study presents the practices and their fulfilled functions relevant to cooperation between biotechnology firms.

This research contributes to the literature of knowledge sharing and protection in inter-firm cooperation by departing from the dominant perspective in this field and taking a novel angle – looking at the process through the practice theory lens. The research lays grounds for a new theoretical understanding of knowledge work in cooperation. Rich and unique bilateral (that of the company and their partners) data is collected for this research and is a strong reason to consider that the presented findings are transferrable from an inter-firm cooperation in biotechnology to cooperation in other industries and a wider range of inter-firm relationships (organisational functions in particular, while there is some reservation on to what degree specific praxis and practices transfer or are differently shaped in other contexts). The practices and their bundles may differently manifest in other industries

or types of contexts, but the functions are more generic processes, which are expected at least partially hold when doing research in other industries and contexts. The future research could explore whether the results of this research may be extended to different contexts such as internal company cooperation dynamics or interactions between social or political groups, or if that may be a manifestation of a more general social phenomena.

Limitations of this research. The limitation is, however, that in a single case study within a complex research environment, I was not able to conduct prolonged observations; as well, I captured large number of details within a narrow context. Therefore, I could not compare the interplay between the research participants' historical recollections of their experiences and real-time behaviour. Further studies in this field would benefit from real time practice and praxis analyses, which would contribute to revealing the micro dynamics of inter-firm knowledge work. Additionally, further studies would benefit from expanding the kinds of industries, types of cooperation and other contextual considerations, as well as from comparison of the practices identified in this and future studies.

Implications to practice. The biotechnology industry, as well as other high-tech industries, are facing significant challenges running their research and development activities in-house, and, therefore, are increasingly engaging in cooperation with external counterparts, which could raise their efficiency, complement resources and move products faster to market. The cooperation nevertheless also stimulates competitive dynamics, which, paradoxically, both facilitate and complicate the partnership. The findings of this research show that industry players deal with the potentially negative dynamics through social practices, which help them overcome the tension between sharing and protecting knowledge. The cooperation practice elicited in this research may be useful for the companies that plan to cooperate or that are already engaged in some cooperative activities to analyse their success and failures and identify areas for improvement. Organisations should pay attention not only to formal protection of their knowledge but also to the informal and social side of cooperation with external partners.

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APPENDICES

Appendix 1. Research participants and accessed data profile

Reference No.	Fieldwork phase	Company	Region	Job Function	Company Type (Partners Companies)	Job Function	Interview conducted	Recording	No. of Inter-views	Length of Interview	No. of Analytic Notes After the Interview
P1-1, P1-2	Phase 1, Phase 2	Partner 1	Local	The Founder	Biotechnology start-up	Managerial	Face-to-face	Sound recorded	2	40 & 45 mins	4
M1	Phase 1	BioCL	Local	Director, IP	N/A	Managerial	Face-to-face	Sound recorded	1	40 mins	5
M2	Phase 1	BioCL	Local	Senior Manager, Product	N/A	Managerial	Face-to-face	Sound recorded	1	50 mins	4
M3	Phase 1	BioCL	Local	Director, Product	N/A	Managerial	Face-to-face	Sound recorded	1	60 mins	3
M4	Phase 1	BioCorp	North America	Director, Business Development (Global)	N/A	Managerial	Online (GotoMeeting)	Sound recorded	1	50 mins	1
M5	Phase 1	BioCL	Local	Director, R&D	N/A	Managerial	Face-to-face	Sound recorded	1	65 mins	3
M6	Phase 1	BioCL	Local	Group Manager, R&D	N/A	Managerial	Face-to-face	Sound recorded	1	70 mins	4
M7-1, M7-2	Phase 1, Phase 2	BioCL	Local	Vice Director, R&D	N/A	Managerial	Face-to-face	Sound recorded	2	45 & 30 mins	1
M8	Phase 1	BioCL	Local	Manager, R&D	N/A	Managerial	Face-to-face	Sound recorded	1	40 mins	0
M9	Phase 1	BioCL	Local	Senior Group Manager, R&D	N/A	Managerial	Face-to-face	Sound recorded	1	55 mins	2
M10-1, M10-2	Phase 1, Phase 2	BioCL	Local	Senior Group Manager, R&D	N/A	Managerial	Face-to-face	Sound recorded	2	95 & 45 mins	2

Research participants and accessed data profile (continued)

Reference No.	Fieldwork phase	Company	Region	Job Function	Company Type (Partners Companies)	Job Function	Interview conducted	Recording	No. of Inter-views	Length of Interview	No. of Analytic Notes After the Interview
M11	Phase 1	BioCL	Local	Group Manager, Quality Assurance	N/A	Managerial	Face-to-face	Notes during and after the interview	1	45 mins	1
P3	Phase 2	Partner 3 (previously: manager at BioCL)	Local	Managing Director	Biotechnology start-up	Managerial	Face-to-face	Sound recorded	1	50 mins	0
M12	Phase 2	BioCorp	North America	Vice President, R&D (Global)	N/A	Managerial	Online (Zoom.us)	Sound recorded	1	50 mins	0
M13	Phase 2	BioCorp	North America	Director, R&D (Global)	N/A	Managerial	Online (Zoom.us)	Sound recorded	1	45 mins	0
P4	Phase 2	Partner 4	Europe	Head of Research Group	University	Managerial	Online (Zoom.us)	Sound recorded	1	45 mins	1
P2-1	Phase 2	Partner 2	Local	Head of Research Group	Research Institute	Managerial	Face-to-face	Sound recorded	1	50 mins	3
P5	Phase 2	Partner 5	Europe	Director, Head of Department	Research Institute	Managerial	Online (Zoom.us)	Sound recorded	1	40 mins	1
P6	Phase 2	Partner 6	Europe	Director	Research Center at the University	Managerial	Online (Zoom.us)	Sound recorded	1	45 mins	0
P2-2	Phase 2	Partner 2	Local	Junior Researcher	Research Institute	Non-Managerial	Face-to-face	Sound recorded	1	45 mins	
P7	Phase 2	Partner 7	Europe	Head of Research	Research Institute	Managerial	Online (Skype)	Sound recorded	1	40 mins	1

Research participants and accessed data profile (continued)

Reference No.	Fieldwork phase	Company	Region	Job Function	Company Type (Partners Companies)	Job Function	Interview conducted	Recording	No. of Inter-views	Length of Interview	No. of Analytic Notes After the Interview
				Group							
P8	Phase 2	Partner 8	Local	Department Manager	Research Institute	Managerial	Face-to-face	Sound recorded	1	60 mins	1
P9	Phase 2	Partner 9	North America	The Founder and Director of Research Center	Private Research Laboratory	Managerial	Online (Zoom.us)	Sound recorded	1	25 mins	1

Appendix 2. Semi-Structured Interview Guide

Dear …,

Thank you for agreeing to take part in this research. I am sure your personal experiences will be a valuable addition to my research.

I will again introduce myself in brief, I am Irina Liubertė, PhD student from Lithuania, ISM University of Management and Economics. My research focuses on knowledge sharing and hiding practices in inter-firm cooperation. I am interested in different kinds of cooperative agreements and I aim to understand the practices of knowledge sharing and hiding at different stages of such cooperative agreements between different companies.

Interview normally takes around 45 minutes to complete.

As well, I would like to ask you if I can sound-record this interview? The recording will be kept confidential and not shared with any third parties and will only be used for the analysis purposes. Do you agree for this interview to be recorded?

Thank you very much; we will proceed to the interview questions then.

[Q0.1-Q0.3 ONLY ASK IF 1ST INTERVIEW]

Q0.1. First, could you please tell about yourself, and your work experience?

Q0.2. Also, could you please tell more about your current company at which you work, [COMPANY NAME]?

Q0.3. What is your experience in cooperation with other companies? As mentioned previously, under cooperation I mean alliances, co-development projects, cooperative licensing, technology transfers and similar.

[Q0.3a ASK IF SALES RELATED POSITION]

Q0.3a As a part of your work, which stages of cooperation are you involved in and do you take part in?

[Q0.4a or Q0.4b ASK REPEAT INTERVIEWS ONLY]

Q0.4a [if ongoing case reported in the first interview] Last time we discussed one cooperation case that was still in process. Here is the description of this case [hand

printed document that was sent a day before the interview]. Could you please tell me how the process developed since then?

Q0.4b [if historical case reported in the first interview] Last time we discussed one cooperation case in the past [name it]. Here is the description of this case [hand printed document that was sent a day before the interview]. Could you please let me know if you would like to add something that you think is missing in this document?

INTRO_1. Now I would like to speak with you about how you and your company share knowledge with your partners.

[FOR 1ST INTERVIEW ONLY]

Do you remember some recent cases at [COMPANY NAME], where you were working on a cooperative agreement with external partners and where there was a need to share knowledge?

[……]

[……]

[ALL]

Q1. How did you organise the knowledge sharing process in this cooperation case [NAME OF THE CASE]?

Q2. How would you define what knowledge you need to share when you cooperate with external partners?

Q3. What do you do to share it?

Please provide specific examples.

Do you have any further examples from the particular cooperation cases that you previously mentioned?

Q4. How would you define what knowledge you need to hide?

Q5. What do you do in order to protect that knowledge?

Please provide specific examples.

Now, I would like to show a list and examples of potential secrecy practices that were identified in previous research.

Q6. Could you please review the list and let me know how your company is using these knowledge protection practices?

Could you please provide examples from your experience?

Q7. Are there are any other ways your company uses to protect its knowledge?

Could you please provide examples from your experience?

Secrecy Practice[3]	**Examples of Descriptions**
Restricting	Hiding, protecting, keeping locked, blinding
Limiting based on who can know	Limiting who can know, keeping under control, keeping confidential
Selective revealing (providing less than the actual technology is about)	Avoiding details, providing vague descriptions, being less specific, speaking in general terms
"Creating a smokescreen" (providing more than the actual technology is about)	"misleading area around the invention", "describing more broadly", adding more than the actual product entails

Now I would like to ask a few questions about the information that may be unintentionally omitted in inter-firm communication.

Q9. Do you remember any such cases?

Can you please provide examples of what you may not intentionally hide but accidentally omit when cooperating with external partners?

[Q9a, Q10, Q10a ask based on the interview flow]

Q9a. How do you learn of such omissions?

How did you know that you omitted something in this situation?

[3] [3] The table with the examples of secrecy practices was printed on a separate sheet and was handed to research participants

Q10. Several research participants mentioned to me that “knowledge in between the lines” is an important factor in communication with their partners. How do you understand this term?

Q10a. What issues do you experience due to such knowledge “between the lines”?

Can you provide some examples from your experience?

Q11. How would you define the feeling of uncertainty, which you may sometimes experience when sharing knowledge with your company partners?

Do you have any specific recent examples?

INTRO_3. For the last part of this interview, I would like to ask you how you perceive that your partners are sharing or hiding knowledge from you.

Q12. When partners share something with you, how do you know if something is missing?

Please provide specific examples from your experience.

Q13 Could you please elaborate more on how you know that the partner company is hiding something intentionally?

Q13a. How do you deal with that and learn what you need to know for the co-project?

Q14. How do you understand whether it is an unintentional omission and partners did not have the intention to hide something?

Q14a. How do you deal with such omissions and get what you need to know for the co-project?

[Q15, Q16 ASK IF NOT DISCUSSED DURING THE FIRST PRESENTATION OF THE HAND-OUT]

Again, I am going to show you the same list of knowledge secrecy or protection practices.

Q15. Thinking of your partners, how are they using knowledge protection practices when you cooperate with them? Please provide examples from your

experience.

Q16. Are there are any other ways? Please provide examples from your experience.

[Q21, Q21a, Q20 AS IF RELEVANT TO PARTICIPANT'S EXPERIENCE]

Q21. In your experience with patenting, are you familiar with the strategy of "creating a smokescreen", when more information is presented than needed for the invention?

Q21a. Do you recall any other contexts in cooperation, where a similar strategy is used?

Q20. Cooperation with an external firm often requires both things at the same time – sharing and hiding certain company knowledge. How do you deal with this at the same time?

Q17. And I only have one last question for you now about knowledge sharing in inter-firm cooperation – is there anything else that you think is important that I didn't ask about yet?

Thank you a lot for your participation and valuable input.

Q18. Before we complete the interview, can you think of someone who was involved in the same cooperation deals we discussed in this interview who could also potentially participate in this research and share his/her experience about the cooperation process?

Thank you again for your time. I'd like to remind you that that the data collected during this interview is confidential and will only be used in aggregate analysis for my PhD thesis and publications. No participants' or companies' names will be mentioned in these research reports.

Q19. [note of research participant's inquiry about research results]

Representative Quote	1st level code (organisational praxis)	2nd level code (organisational practices)	3rd level code (organisational function)
"Sometimes you have to. Because you know, if you have something new, you have to get intellectual property rights protected. and then you have to talk about it. But before that, you know, you can lose everything. This happened to me a few times also. So, you are bit, you know, you better make sure that everything protected, otherwise, you lose your rights." (P6: 39)	Protect something new then talk about it	Protecting legally	Bounding
"The same with scientists [R&D department employees] – most often, we have trainings. Trainings about what is know-how, what is company's confidential information, […]". (M1: 160)	We have [internal] training	Internal policing	Bounding
"When you are bringing out some presentation [to a person outside the company], you have to go through so called legal review, intellectual property review, so you don't take away more knowledge than it is necessary for the given project." (M1: 160)	You have to go through legal review	Revising	Bounding
"We had, we had, of course, confidentiality agreement, it was a part of overall business agreement. So that was protected. intellectual property was protected that way" (M13:27)	Protected intellectual property with confidentiality agreement	Building commitment	Bounding
"I signed that, you know, agreement for five years, and I am waiting very painfully just five years in order we will get free and go ahead." (P6:53)	Painfully waiting five years to have the freedom to speak	Temporary prohibiting	Bounding
"first, initial [sharing], then you go deeper, and then deeper again. If you share everything on your first meeting, if it bad. You need to partition" (P3:112)	You need to partition, don't share all in the first meeting	Showing a little	Courting

Representative Quotations in Identified Themes (continued)

Representative Quote	1st level code (organisational praxis)	2nd level code (organisational practices)	3rd level code (organisational function)
"It can be used in another way, where you are not revealing your true intention, but you are discussing wide range of thing, but really interested in one thing." (M13:55)	Discussing wide range of things without revealing true intention	Creating misleading area	Courting
"we had a collaboration with a person, who was very innovative, had many patents, offered his technologies to [BioCL]. And that information… there were many patents, a lot. Here, here and there is working well, and this is working well […] it is difficult to understand what is this, and what is that" (P3:128)	The person talking a lot about many of his inventions	"Empty talk"	Courting
"it is pretty common especially smaller companies who are trying to gain interest with from bigger companies, would be looking to amplify the number of other companies that they have been working with, or speaking with, or collaborating with. so that they can appear to be perhaps more important or more successful" (M13:63)	Amplify the number of other companies they worked with	Overselling	Courting
"[…] in a mutually trustful environment, but actually, hey, you know, it is like marriage, you say, I know, here is a very nice environment, where everybody is happy, but after while the things can go differently (P6: 53)	Mutually trustful environment is not stable like a marriage	Trust building	Bonding
"did you tell them already, and [did you] tell them, and them? […] and they are the partners. Why didn't you tell them?" (P1-2:95)	Confused as to who is supposed to be told the information	Defining membership	Bonding
"Or they want to be there, what we call "shadowing", ehr, providing advice, making sure that our scientist is running their systems correctly." (M4:59)	Want to be there shadowing	Staying nearby	Ring-fencing
"We don't share the technology, we only use it on our site" (P3:56)	We only use it on our site	Limiting access	Ring-fencing

Representative Quote	1st level code (organisational praxis)	2nd level code (organisational practices)	3rd level code (organisational function)
"There were few instances where there was something that we needed to hide. If we stayed on topic of, you know, if we were staying on the topic of what was relevant to our business collaboration, there was not much needed to be hidden" (M13:27)	If staying on topic, there is not much left to be hidden	Staying strictly on topic	Enacting
"project started, nothing is going well. We call [our partner], but they don't answer. [...] Don't reply emails." (M6:95-100)	Did not answer phone or emails	Leaving unanswered	Enacting
"They just say, you take it from eppendorph A, put it into B, put into buffer C, and so on. We use such guidance." (P7:25)	Take from A put into B and C	"Black-boxing"	Enacting
"We send them a partial process, so they could check how it works. […] They need to make an experiment and we know, that it works in our conditions. But [we don't know] if that will work in their conditions. But it is [normal], they also don't say everything to us" (M10:93)	We send them partial process They don't say everything to us	Stripping out the detail	Enacting
"You provide all points—[define] where is their [partners] ownership, where our ownership. The distribution of intellectual property." (P2-1:31)	Define where the ownership is of both you and your partner	Categorising	Enacting
"If you tell about your invention earlier than you write it down, then the claims of this invention […] may be added into [partner's] patent, and automatically, you will have to argue with your own words, because [partners] wrote it [in patent]" (M10-2:47)	What you tell before you write it down may be used by your partner adversely	Avoiding contamination	Enacting
"You are only told as much as you ask" (M7-2:44)	Told as much as you ask	Need-based disclosure	Enacting

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