Balancing the Tension between Knowledge Sharing and Knowledge Protection in Coopetition:

Empirical study of high-tech companies

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Abstract
Coopetition, where companies cooperate with their competitors, is emerging as a prevalent phenomenon among high-tech companies since the end of 20th century. In contrast to traditional view of only competing, companies implement the strategy on the belief that “sometimes the best way to succeed is to let others do well, including your competitors”. However, despite some benefits offered by coopetition, about half of coopetition failures. This challenges researchers and practitioners in finding reasons and solutions to improve the probability of success.

Several studies have pointed out that the tensions in the nature of this strategy are what lead to high failure rates. Tensions in this context are referred as simultaneously handling of contradictory-yet-interrelated forces such as cooperation versus competition, trust versus opportunism, and knowledge sharing versus knowledge protection. Due to both positive and negative influence of such tensions on coopetition, researchers suggest that coping with tensions is an effort of finding a balance between opposing forces, instead of reducing or eliminating them completely. However, it is widely admitted that how to strike the balance so far has not been answered with limitation of few empirical studies.

Coopetition is likely to involve the exchange of knowledge which is a fluid mix of framed experience, values, contextual information and expert insights. Knowledge is considered as critical resource creating value and promoting innovation, especially in high-tech industry. The need of knowledge is due to the fact that companies in this sector are technology-oriented and knowledge-based. Hence, it is suggested that the tension between knowledge sharing and protection is considered as one of the most significant tensions in coopetition for them. Accordingly, our focus in this study is proposing a mechanism that high-tech companies can use to balance the tension between knowledge sharing and knowledge protection when engaging in coopetition.

In order to achieve this purpose, we chose qualitative research method. The study further develops an inductive framework and explorative study design. We used primary data which we collected through a well-devised interview guide and conducted semi-structured interviews in six high-tech companies involved in coopetition.

Our key finding implies the importance of trust and Non-Disclosure Agreements in balancing the tension between knowledge sharing and knowledge protection in coopetition for high-tech companies. Trust serves as the means for enhancing knowledge sharing while Non-Disclosure Agreements is the formal system to support the trust and govern knowledge sharing and protection. Our finding also indicates that balancing the tension related to knowledge in coopetition for high-tech companies involves decision making processes where questions of whom to share with, what to share and under which condition to share are considered. These mechanisms are towards harmony orientation with three dimensions of enrichment of offered products/services, bridging the needs of single party through collaboration and commitment, and synchronizing individual effort towards common goals.

This thesis contributes to knowledge management literature in coopetition. We propose a theoretical framework and provide some empirical evidence on how to attain harmony in mechanisms of balancing the tension between knowledge sharing and protection in coopetition. This accordingly assists managers in high-tech companies in appropriately planning for further success in coopetition. However, due to the small sample size of study, the mechanisms should be subject to further research.

Keywords: balance, tension, knowledge sharing, knowledge protection, high-tech companies, coopetition, cooperating with competitors, harmony, Yin-Yang principles
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Abbreviations

CAD/CAM: Computer-Aided Design/Computer-Aided Manufacturing
CEO: Chief Executive Officer
HSPA: High Speed Packet Access
ICT: Information and Communication Technologies
IPRs: Intellectual Property Rights
NDA: Non-Disclosure Agreement
NACE: National Association of Corrosion Engineers
OECD: Organisation for Economic Cooperation and Development
OSS: Operations Support System
R&D: Research and Development
SON: Self-Optimizing Network
UMTS: Universal Mobile Telecommunications System
## Contents

1. **Introduction** .......................................................................................................................... 1
   1.1. Problem background ............................................................................................................... 1
   1.2. Research gaps ...................................................................................................................... 4
   1.3. Research question .................................................................................................................. 4
   1.4. Research purposes ............................................................................................................... 4
   1.5. Delimitations ....................................................................................................................... 5
      1.5.1. High-tech companies ..................................................................................................... 5
      1.5.2. Forms of high-tech coopetition ..................................................................................... 6

2. **Scientific Methodology** ........................................................................................................... 8
   2.1. Choice of Subject .................................................................................................................. 8
   2.2. Preunderstanding ................................................................................................................... 8
   2.3. Literature selection and source criticism ............................................................................... 9
   2.4. Research Philosophy ........................................................................................................... 10
      2.4.1. Ontology ....................................................................................................................... 10
      2.4.2. Epistemology ............................................................................................................... 10
   2.5. Research Approach ............................................................................................................. 11
   2.6. Research design .................................................................................................................. 12

3. **Theoretical framework** ......................................................................................................... 14
   3.1. Coopetition as a paradoxical relationship .......................................................................... 14
      3.1.1. Conceptualisation of coopetition ................................................................................ 14
      3.1.2. Motives for coopetition of high-tech companies ......................................................... 16
      3.1.3. Tensions as challenges of coopetition strategy ............................................................. 17
   3.2. Knowledge .......................................................................................................................... 19
      3.2.1. Definition of Knowledge .............................................................................................. 19
      3.2.2. Taxonomies of knowledge ............................................................................................ 19
   3.3. Perspectives on knowledge sharing and knowledge protection ........................................... 21
      3.3.1. Knowledge sharing vs. knowledge protection .............................................................. 21
      3.3.2. Benefits of knowledge sharing in high-tech companies ................................................. 22
      3.3.3. Risk of knowledge sharing in high-tech companies ....................................................... 23
   3.4. The tension between knowledge sharing and knowledge protection in high-tech companies ................................................................................................................. 24
   3.5. Balancing the tension between knowledge sharing and protection .................................... 25
      3.5.1. Yin-Yang principles ....................................................................................................... 25
      3.5.2. The harmony concept ................................................................................................. 27
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3.1. Knowledge sharing</td>
<td>53</td>
</tr>
<tr>
<td>5.3.2. Knowledge protection</td>
<td>56</td>
</tr>
<tr>
<td>5.3.3. The balance</td>
<td>59</td>
</tr>
<tr>
<td>5.3.3.1. Relationship and Trust</td>
<td>59</td>
</tr>
<tr>
<td>5.3.3.2. Strategies to share and protect knowledge and influencing factors</td>
<td>61</td>
</tr>
<tr>
<td>6. Analysis and discussion</td>
<td>67</td>
</tr>
<tr>
<td>6.1. What to share: Value of knowledge towards coopetition and competitor</td>
<td>67</td>
</tr>
<tr>
<td>6.2. Whom to share with: Relationship with competitor and trust</td>
<td>68</td>
</tr>
<tr>
<td>6.2.1. Relationship with competitor</td>
<td>68</td>
</tr>
<tr>
<td>6.2.2. Trust</td>
<td>70</td>
</tr>
<tr>
<td>6.3. Under which condition to share knowledge</td>
<td>70</td>
</tr>
<tr>
<td>6.3.1. Managing explicit knowledge</td>
<td>70</td>
</tr>
<tr>
<td>6.3.1.1. Contractual knowledge exchange contents and procedure</td>
<td>70</td>
</tr>
<tr>
<td>6.3.1.2. Inter-organizational coordination by mutual adjustment</td>
<td>71</td>
</tr>
<tr>
<td>6.3.1.3. Intra-organizational planning and control procedures</td>
<td>71</td>
</tr>
<tr>
<td>6.3.1.4. IPRs and Information Systems</td>
<td>72</td>
</tr>
<tr>
<td>6.3.2. Managing tacit knowledge</td>
<td>73</td>
</tr>
<tr>
<td>6.3.3. Managing knowledge in general: Clear statement of works</td>
<td>74</td>
</tr>
<tr>
<td>6.4. Balancing knowledge sharing and protecting with harmony orientation</td>
<td>74</td>
</tr>
<tr>
<td>6.5. Proposed framework</td>
<td>75</td>
</tr>
<tr>
<td>7. Conclusion</td>
<td>79</td>
</tr>
<tr>
<td>7.1. Research findings</td>
<td>79</td>
</tr>
<tr>
<td>7.2. Theoretical contributions</td>
<td>79</td>
</tr>
<tr>
<td>7.3. Managerial implications</td>
<td>80</td>
</tr>
<tr>
<td>7.4 Societal implications</td>
<td>81</td>
</tr>
<tr>
<td>7.5. Limitation and Future Research</td>
<td>81</td>
</tr>
<tr>
<td>8. Quality Criteria</td>
<td>83</td>
</tr>
<tr>
<td>8.1. Credibility</td>
<td>83</td>
</tr>
<tr>
<td>8.2. Dependability</td>
<td>84</td>
</tr>
<tr>
<td>8.3. Conformability</td>
<td>84</td>
</tr>
<tr>
<td>8.4. Generalization (Transferability)</td>
<td>84</td>
</tr>
<tr>
<td>8.5. Authenticity</td>
<td>85</td>
</tr>
<tr>
<td>Reference list</td>
<td>86</td>
</tr>
<tr>
<td>Appendices</td>
<td>99</td>
</tr>
</tbody>
</table>
Appendix 1: Interview questions

Appendix 2: Sample of initial codings and categories

List of Tables
Table 1: Explanation of alliance formation (Yasuda, 2005, p. 766) ................................................................. 6
Table 2: A framework for understanding coopetition (Gnyawali et al., 2008, p. 9) .............................................. 15
Table 3: Knowledge taxonomies and example (Alavi & Leidner, 2011, p. 113) ...................................................... 20
Table 4: Management of different types of information (Fernandez & Chiambaretto, 2016, p. 10) .................... 31
Table 5: Phase of thematic analysis (Braun & Clarke, 2006, p. 87) ................................................................. 43
Table 6: Overview of companies studied ........................................................................................................... 48

List of Figures
Figure 1: The five dimensions of harmony orientation (Chow & Yau, 2005, p. 189) ............................................. 28
Figure 2: Conceptual framework for balancing knowledge sharing and protection in coopetition ................. 35
Figure 3: Sample of coding using OpenCode software ....................................................................................... 45
Figure 4: List of themes and subthemes ............................................................................................................. 46
Figure 5: Mechanism to balance the tension between knowledge sharing and knowledge protection in coopetition for high-tech companies ................................................................................. 76
Figure 6: Detailed mechanisms to balance the tension between knowledge sharing and knowledge protection in coopetition for high-tech companies (part of our final framework) ......................................................... 77
1. Introduction

In this Chapter, we will introduce our thesis concerning the tension between knowledge sharing and protection. Firstly, we outline our choice of this topic and why we deemed it to be valuable to study. This is followed by background of our research to illustrate more on problematization and discuss the research gaps. We will end this chapter with our research question and purposes.

1.1. Problem background

“Sometimes the best way to succeed is to let others do well, including your competitors.”

Brandenburger & Nalebuff (1996, p. 38)

Coopetition, a relationship involving the simultaneous pursuit of cooperation and competition (Bengtsson & Kock, 2000, p. 411), is considered as a “winning strategy in 21st century” (Yami et al., 2010) thanks to its various benefits. According to Zakrzewska-Bielawska (2013, p. 51), coopetition is highly observable in high-tech sector due to specific characteristics prevalent in this sector. However, many failure cases of coopetition raise several questions such as “Is coopetition just another fashionable concept or a true revolution in strategic thinking?” (Yami et al., 2010, p. 1). The question considers the fact that there are tensions in the nature of this strategy leading to failure, in which knowledge sharing and knowledge protection is one of the most significant conflicts (Raza-Ullah et al., 2014, p. 190). As implied by Simoons (2011), coopetition is not a pathway to achievement by itself, appropriate management considering many factors when implementing it is required to increase the higher probability of success. We will address this problem concentrating on striking a balance between knowledge sharing and knowledge protection based on the understanding that the tension relating to knowledge sharing and protection is likely to affect alliance’s structure and the result (Norman, 2002, p. 178). An empirical research of high-tech companies is in assistance of providing valuable data for our research.

The problem background as indicated above will be further elaborated in the next paragraphs.

Coopetition

Since the mid-1990s of 20th century, alliances have become the dominant strategy for the companies to compete and grow in a business context of market globalization (Kale & Singh, 2009, p. 45). It is interesting to notice that more than 50% of such strategic alliances represents the relationship between competing companies (Alkhafaji, 2001, p. 237). In another study, Tether (2002, p. 950) found that 15% of companies researched cooperated with their competitors for innovation. Ritala et al. (2008, p. 185) however discovered that when it comes to highly intensive decisions on strategic alliances, a few relationships with main competitors are present (i.e. 6.5% of 56 information and communication technology companies studied). In fact, the rate of cooperation among competitors is different depending on purpose of specific cooperation, yet it is still visible as an emerging trend with several examples of big companies (e.g. joint venture of Sony and Samsung spanning from 2003 to 2009, cooperation of Toyota and General Motors from the mid-1980s to 2009, or recent cooperating relationship between Microsoft and Cisco since 2014). This phenomenon indicates the coexistence of cooperation and competition in strategic collaborations, which can also be termed as “coopetition”.

Originally, Nalebuff and Brandenburger (1996, p. 16) in their book about “Coopetition” viewed the phenomenon broadly from a network perspective where competitive and cooperative parts of the relationship are available among different actors in the network including customers, suppliers and competitors. From a network view, they defined competitors by stating that “a player is your competitor if customers value your product less when they have the other player’s product than when they have your product alone” (Nalebuff & Brandenburger, 1996, p. 18). Accordingly,
Burger King and a nearby toy store can be competitors on the basis that the probability of impulsive consuming behaviors in toy store is low if kids are in Burger King for hamburgers (Bengtsson & Kock, 2000, p. 415). Bengtsson and Kock (2000, p. 415) however suggest that coopetition should be viewed at inter-organizational level. It means that coopetition research focuses on mutual relationships between two companies who are direct competitors. Competitors here are the actors that “produce and market the same products” (Bengtsson & Kock, 2000, p. 415). For example, McDonald is competitor of Burger King, not a toy store as mentioned above. This thesis refers to the latter view by Bengtsson and Kock (2000, p. 415) so that we can better investigate the tension and complexity. Hence, coopetition is considered as the dyadic relationship between competitors where both elements of cooperation and competition are involved.

The reasons for coopetition may vary, however, creating greater value is one of the most common motives to improve companies’ performance (Rusko, 2011, p. 2). Positive outcomes can be seen in several areas of finance, technology, management and strategy (Zineldin & Dodourova, 2005, p. 462). For details, Radu (2010, p. 165) indicated that collaborations help companies penetrate new market, access to new technologies or the best quality or the lowest cost, reduce financial risks and R&D expenses, and gain competitive advantage. Through literature review and observation from practice, it can be recognized that the need for coopetition is even more serious in high-tech industry since companies in this sector are innovative, technology-oriented and knowledge-based (Zakrzewska-Bielawska, 2013, p. 51). They are encouraged to cooperate with competitors under the intensive pressure for innovation with the complexity of products and the uniqueness of resources (Zakrzewska-Bielawska, 2013, p. 51). Also according to Gnyawali and Park’s review (2011, p. 650), coopetition in high-tech industry happens due to several challenges including short product life cycles, substantial requirement for research and development investments, combination of various technologies, and need for high technological criteria. Hence, it is necessary for them to cooperate with competitors in the purpose of gaining and generating new technological knowledge and by being equipped with such knowledge, they have capability to pursue innovations.

**Tension between knowledge sharing and knowledge protections in coopetition and balancing requirements**

Although coopetition may be perceived by participating companies as a great strategy to bring common benefits as above, figures show their struggling situation. Research of Park and Ungson (2001, p. 37) recorded that the failure rate was 50%. These figures urge researchers and practitioners to find the explanations for the failure of majority of cases while others performed effectively (Lunnan & Haugland, 2008, p. 545). Several researchers agreed that tensions are responsible for such tremendous pressure for innovation by significantly reducing chances of success in cooperative relationships or causing aggravation in the partnerships and inherent instabilities of alliances (Bengtsson & Kock, 2014b, p. 39; Das & Teng, 2000, p. 77 & Raza-Ullah et al., 2014, p. 192). Besides rational perspective, several of them also pay attention to the influence of emotional complexity on the level of tension in coopetition (Kumar, 2014, p. 6 & Raza-Ullah et al., 2014, p. 1). Indeed, due to the coexistence of two opposing forces of cooperation and competition, tension exists in the nature of coopetition (Mattsson & Tidstrom, 2015, p. 357). Tensions therefore are related to the difficulties of handling concurrently pairs of contradictory-yet-interrelated forces (Fang et al., 2011, p. 774), such as cooperation versus competition, rigidity versus flexibility, short-term versus long-term orientation, joint value creation versus private value appropriation, trust versus opportunism, and knowledge sharing versus knowledge protection (Das & Teng, 2000, p. 77; Ilvonen & Vuori, 2013, p. 2010; Raza-Ullah et al., 2014, p. 192; Zineldin, 2004, p. 784). Tension between knowledge sharing and knowledge protection is our primary focus.
In accordance with Raza-Ullah et al. (2014, p. 190), matter of sharing knowledge and preventing knowledge leakage simultaneously is raised as the most substantial tension in coopetition. This is due to the fact that there is a contradiction between joint value creation versus private value appropriation where partners cooperate to obtain the mutual goals. Hence, companies share knowledge while trying to exploit each other’s know-how to gain their competitive advantage (Raza-Ullah et al., 2014, p. 192). Coopetition is likely to involve the exchange of knowledge, which is considered as critical resource creating value, in turn, increasing the level of innovation and productivity (Drucker, 1994, p. 53). Knowledge can be defined as a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experience and information (Davenport & Prusak, 2000, p. 5) and such knowledge may be tacit or explicit (Nonaka, 1994, p. 16). It is widely-accepted that sharing knowledge is essential to succeed when involving in partnerships so that mutual goals can be fulfilled. Knowledge sharing in the network is also motivated by promising benefits to increase company’s’ competitive advantage (Ilvonen & Vuori, 2013, p. 211). However, such benefits are associated with risks since the company may expose critical knowledge to the partner during knowledge sharing (Ilvonen & Vuori, 2013, p. 212). Protection mechanisms are necessary, at the same time, the company needs to ensure that knowledge flow is provided enough to accomplish the goals of coopetition (Norman, 2002, p. 178). In similar vein, Das and Teng (2000, p. 86) also indicated that the tension in transferring knowledge where sharing firm’s know-how and competence carelessly to partners may lead to termination of the collaboration.

To increase the rate of survival and success of alliances, Das and Teng (2000, p. 77) called for a delicate balance of these competing forces. This is in accordance with Teece’s proposal on the challenge for policy analysts and managers in finding the right balance of competition and cooperation (Teece, 1992, p. 1). Park et al. (2014, p. 213) also emphasize that balance is necessary to maintain and manage the relationship and at the same time escalate the probability of identifying improvements from both competition and collaboration. Specifically related to knowledge issue in coopetition, Li et al. (2012, p. 1191) find it important for partner companies in identifying “means to obtain the appropriate balance between knowledge sharing and knowledge protection”. Balance can be referred to a condition where the competing forces have the same level of strengths (Das & Teng, 2000, p. 85). In contrast, based on Yin-Yang principles, Mattsson and Tidstrom (2015, p. 349) argue that balancing should be an attempt in achieving harmony, instead of achieving such equivalence. Finding a balance in accordance with Yin-Yang principles would be valuable to study since Yin-Yang provides a holistic approach for solving problems (Cheng, 2008, p. 290). Yin-Yang has been applied mostly to understand business behaviours in China or Asia, yet its contributions in understanding business dynamics, especially in Western markets, have not been fully explored (Mattsson & Tidstrom, 2015, p. 348). Generally, we state that appropriate mechanisms to reach balance in coopetition is important, however, requires further studies (Li et al., 2012, p. 1191).

We choose to conduct the research in high-tech companies on the understanding that knowledge management, especially for technological innovation purpose, is considered as the most imperative activity to reach the long-term success for them (Bong et al., 2004, p. 16). Keeble and Wilkinson (1999, p. 300) also implied that high-tech companies create values through the ability of sharing and utilizing various knowledge from both external and internal resources. In addition, digital age now allows us to access information promptly and technology is changing the way we create and distribute knowledge (Gregson et al., 2015, p. 5). Hence, it would be interesting to study about knowledge sharing and knowledge protection in coopetition in a high-tech context.
1.2. Research gaps
Coopetition, i.e. simultaneous cooperation and competition between firms (Gnyawali & Madhavan, 2000, p. 432), is currently used competitive strategy since the end of 20th century. Despite the phenomenon being relatively new, it is interesting to note the rapid growth on the amount of research on coopetition (Bengtsson and Kock, 2014, p. 183). From the various theoretical studies, balancing the conflicting dualities that cause tensions in coopetition is quite evident as a recommendation for further studies (Bengtsson et al., 2010, p. 209; Bengtsson & Kock, 2014, p. 183; Das & Teng, 2000, p. 56).

Several authors assert that tension is inherent when combining both cooperation and competition (Bengtsson & Kock, 2000, p. 412; Das & Teng, 2000, p. 56; Gnyawali et al., 2011, p. 651). According to Gnyawali et al. (2012, p. 7), tension is as a result of contradicting dualities prevalent in coopetition, which in turn could inhibit the effectiveness of the company’s performance. Among the observable multiple sources of tensions was that between knowledge sharing and knowledge protection (Bengtsson & Kock, 2000, p. 415; Das & Teng, 2000, p. 43). Accordingly, Bogers (2011, p. 94) argues that several trends have given rise to the need of studying the tension between knowledge sharing and protection, most importantly because firms have started to open their boundaries to tap external knowledge. In similar vein, Fernandez et al. (2014, p. 71) posit that for competitive advantage to be gained from coopetition, careful management of knowledge sharing is required, because if the company’s knowledge and skills are duplicated in any way, their ability to create unique value is compromised. Therefore, it is clear that there is an inherent paradox caused by the tension between knowledge sharing and protection (McEvily et al., 2004, p. 721).

Despite the surge of scholarly interest in coopetition and its management practices, no attention has been paid to the balancing of the dualities between knowledge sharing and protection that causes tension in coopetition (Fernandez et al., 2014, p. 71). Empirical gap appears in explaining how this tension is managed in coopetition context. The underlying managerial dilemma is how to uphold knowledge sharing and knowledge protection simultaneously without suppressing one of the two logics (Bengtsson et al., 2010, p. 209). Ilvonen and Vuori (2013, p. 201) suggest that further study should address the issues of balancing knowledge sharing and protection from a theoretical and empirical standpoint to reveal the practical means on how a balance can be achieved. Based on these arguments, we aim to contribute to the coopetition management literature by addressing this gap.

1.3. Research question
Basing on the problem background and research gaps, our study aims to address the following question:
*How do high-tech companies balance the tension between knowledge sharing and knowledge protection in coopetition?*

1.4. Research purposes
The main purpose of our study is to identify the mechanisms that high-tech companies use to find a balance between knowledge sharing and knowledge protection in coopetition. This is based on our understanding that balancing the tension related to knowledge is significant for companies to reach successful coopetition by sharing knowledge, and at the same time, sustaining their competitive advantage by protecting knowledge (Fernandez & Chiambaretto, 2013, p. 1).

To achieve our objectives, firstly, we need to find out clearly the tension between knowledge sharing and knowledge protection faced by high-tech companies in coopetition, then conduct critical literature review to have a comprehensive understanding about the balance concept. As
discussed above in the problem background part, balance is a solution to manage tension suggested by several researchers. However, Park et al. (2014, p. 214) emphasize that further investigation on different aspects of balance is required. Hence, we believe that an appropriate perspective on balance will serve as the basis which enables us to propose proper management mechanisms for the companies. Furthermore, we use qualitative method to sustain the answer for our research question. Accordingly, we plan to have semi-structured interviews with management levels in high-tech companies where coopetition is involved. A framework providing mechanisms for high-tech companies to balance the tension related to knowledge will be built at the end by combining literature review and empirical data. We trust that such proposed framework is required to increase the success rate of coopetition in practice.

We expect that our research will have theoretical contribution on balancing the tension related to knowledge in coopetition. With the stories and insights from high-tech companies, the thesis will also provide practical implications for management levels to develop appropriate plans for success when cooperating with competitors.

1.5. Delimitations

Our study has some delimitations to consider. Firstly, our main purpose is to find mechanisms for high-tech companies to balance the tension between knowledge sharing and knowledge protection in coopetition. However, there is no single preferred method for identifying or defining the high technology industries. Therefore, this study is delimited to the feature of high-tech companies discussed in Section 1.5.1 as below. Our selected companies had some features discussed in this section. Secondly, an understanding about various forms and areas in which high-tech companies cooperate with rivals is the basis leading us to appropriate study later. Since forms of high-tech coopetition are not explicitly shown in literature, we use suggestions from a study of Yasuda (2005) on high-tech alliances as a guideline. Accordingly, we delimit the forms of high-tech coopetition as indicated in Section 1.5.2.

Furthermore, given the sensitivity in the nature of our study, we do not focus on a specific segmentation. We acknowledge that there is a difference between large corporation and SMEs in specific context, but at the same time, we assume the different sectors might offer useful insight. this study aims at exploring this new perspective of Yin-Yang and harmony orientation in business context. Thus, we apply a broader perspective in terms of our company selection find out if the same (Yin-Yang) could be applied in business context. We also recognized the issues of cultural difference and that is why this study if further delimited to multinational corporations.

1.5.1. High-tech companies

According to Zakrzewska-Bielawska (2010, p. 93), defining high-tech is complex and varied because new and more precise classifications are certainly emerging. Further, defining the limits and sizes of high-tech industry is also challenging because companies operating in this sector have a wider approach in terms of feature and characteristics. NACE report (2016, Rev.2) gives recommendations on how high-tech companies can be categorized to the nature of what is being manufacture. They suggest three below categories of companies:

- Manufacture of basic pharmaceutical products and pharmaceutical preparation,
- Manufacture of computer, electronics and optic products, and
- Manufacture of air and space related product.

Besides, as per Zakrzewska-Bielawska (2015, p. 161), high-tech companies may include companies which provide services on telecommunications, computer programming, consultancy and related activities, information service activities and scientific R&D.
Based on 2009 OECD report, Zakrzewska-Bielawska (2010, p. 93) also suggests that high-tech companies possess one of the following features to differentiate with low-tech companies:

- High demand for scientific research and intensity of R&D expenditure,
- High level of innovativeness,
- Fast diffusion of technological innovations,
- Fast process of obsolescence of the prepared products and technologies,
- High level of employment of scientific and technical personnel,
- High capital expenditure and high rotation level of technical equipment replaced by more modern and innovative devices,
- High investment risk and fast process of the investment devaluation,
- Intense, strategic domestic and international cooperation with other high-tech enterprises and scientific and research centres,
- Implication of technical knowledge in the form of numerous patents and licences,
- Increasing competition in international trade.

1.5.2. Forms of high-tech coopetition

According to Yasuda (2005, p. 765), there are four forms of alliances in high-tech industry including technology license, joint R&D, sourcing agreement and joint venture. The following table explains clearly the basis for the formation of such alliances based on resource-based theory and transaction-cost theory.

Table 1: Explanation of alliance formation (Yasuda, 2005, p. 766)

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<th>Resource-based theory</th>
<th>Transactional-cost theory</th>
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<tr>
<td>Technology license</td>
<td>Firms exchange technological resources and financial resources</td>
<td>Monetary compensation for license is lower than cost incurred for its own development</td>
</tr>
<tr>
<td>Joint R&amp;D</td>
<td>Firms combine technological and financial resources</td>
<td>Cost required for joint R&amp;D is lower than cost required for its own in-house R&amp;D</td>
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<tr>
<td>Sourcing agreement</td>
<td>Firms exchange manufacturing resources and financial resources</td>
<td>Cost for consignment is lower than cost for its own in-house manufacturing</td>
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<tr>
<td>Joint venture</td>
<td>Firms combine technological, manufacturing, distribution and financial resources</td>
<td>Cost for joint venture is lower than cost for stand-alone operation</td>
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As mentioned above, we will discuss forms of high-tech coopetition using these suggestions. Accordingly, definitions of each form together with particular examples in practice are presented.

License or licensing is commonly used in high-tech industry including several types such as technology license, patent license or cross-licensing which should be clearly distinguished to avoid confusion. Regarding meaning of the words, license is a legal agreement (Yasuda, 2005, p. 765) while licensing is a transaction between licensee and licensor (Peters, 2005, p. 421). A technology license is the legal arrangement where companies are allowed to use other partners’ technologies.
for their own purpose (Yasuda, 2005, p. 765). A patent license provides licensee with the legal right to use partners’ technologies within the description of a particular patent (Peters, 2005, p. 421). Companies license patents on the consideration of financial matter while “most of the know-how related to patented technology, however, stays with the licensor” (Peters, 2005, p. 421). In contrast, technology license offers a wider scope with the involvement of “know-how” (Peters, 2005, p. 421). The last term, cross-licensing, happens when “companies holding overlapping patents license their patents to each other to receive the benefit of gaining access to another patented technology” (Baltes, 2003, p. 10). Technology license signed by Ericsson and Cisco in 2015 can serve as an example for licensing between high-tech companies. According to agreements, Cisco pays license fee to Ericsson so that Cisco can develop self-optimizing network (SON) products based on Ericsson’s operations support system (OSS) interfaces (Ericsson, 2015). Ericsson and Cisco are two market leaders in networking, mobility, and cloud technology (Cisco, 2015). They are strong competitors, at the same time, complementary partners of each other (Cisco, 2015).

In a coopetition context, a joint R&D can be understood as alliances where two or more competitors agree to join together on purpose of developing any technologies or products with a specific goal and schedule. This understanding is based on definition of joint R&D suggested by Yasuda (2005, p. 765). One outstanding example comes from the collaboration between Motorola Inc (Motorola) and Huawei Technologies Co Ltd (Huawei), two competitors in telecommunications and networking hardware. In July 2006, they announced to jointly develop 3G Universal Mobile Telecommunications System (UMTS) and High Speed Packet Access (HSPA) solutions. Accordingly, a joint R&D center was built in Shanghai, China so that employees from both sides could work together. Motorola’s contribution is its services experiences in network design, integration and security while Huawei’s contribution is its technology expertise (Huawei, 2006).

A sourcing agreement is the arrangement in which companies use manufacturing service from partners and are provided with finished (or semi-finished) products according to the company’s requirements (Yasuda, 2005, p. 766). Following this definition, we find out that sourcing services are popular in high-tech companies such as Dell, Cisco and Toshiba. However, when coming to coopetition, it is difficult to have examples of sourcing between competitors who “produce and market the same products” as adopted in our thesis (Bengtsson & Kock, 2000, p. 415). Sourcing is more relevant activity in terms of procurement and supply chain (e.g. involves supplier and buyer) rather than cooperation between direct competitors. We hence exclude sourcing agreement from forms of high-tech coopetition.

As per Yasuda (2005, p. 766), a joint venture is a legal entity of which equity ownership is shared between companies. Joint venture is a common solution adopted by companies so that development and production costs can be shared and new markets can be expanded (Daft et al., 2015, p. 228). To give one example, in 2011, a joint venture was established between 2 pharmaceutical companies from US and India which are Merck & Co., Inc., (known as MSD) and Sun Pharmaceutical Industries Ltd., (Sun Pharma), respectively. This joint venture aimed to develop and produce innovative branded generic medicines for emerging markets (Machado & Ahmed, 2011).

Based on the above arguments, we propose that there are three popular forms of high-tech coopetition namely license related to technology, joint R&D and joint venture. Furthermore, we also note that the most common fields where companies cooperate with competitors in high-tech industries are production or services (68.94% of the studied firms), sales and distribution (58.72%), supply (55.74%) and R&D (45.11%) (Zakrzewska-Bielańska, 2015, p. 162).
2. Scientific Methodology

2.1. Choice of Subject

We are two students currently enrolled in the Master program in Business Development and Internationalization. The program has equipped us with knowledge about innovation, entrepreneurship and networking from an international perspective. During the program, we both took a course in managing networks and internationalization, which contributed to our desire to investigate the phenomenon of cooperating with competitors. Being entrepreneurship students, we embrace the idea of starting our own enterprise as young innovators, at the same time, we acknowledge that the business environment is becoming more dynamic, innovative and highly competitive, consequently, forcing firms to be more engaged in alliances. Through cooperating, companies can create a base for long term relationship which strengthen them to survive in the market. Among the suggested different kind of alliances, we find coopetition to be more interesting with the idea of cooperating with competitors. It means that the relationship involves simultaneous collaboration and competition.

This phenomenon is full of benefits for both involved parties since competitors may have several common things such as technology and market vision. So it will increase the efficiency of the cooperation. However, the interactions are quite difficult to sustain and balance due to what several authors refer to as tensions or conflicts. We were intrigued with the tension between knowledge sharing and knowledge protection mainly because knowledge is now considered as a critical resource for firms to achieve competitive advantage. However, given the nature of these interactions where both cooperation and competition are involved, it is challenging to make decisions on whether to use the shared knowledge for mutual gains among the involved parties or to use the shared knowledge to outperform your competitor. Therefore, we believe that investigating the tension between knowledge sharing and protection is beneficial for companies in practice. This phenomenon is here to stay and finding mechanisms that will provide a smooth interaction when simultaneously cooperating and competing is of high importance.

2.2. Preunderstanding

According to Bryman and Bell (2011, p. 414), preunderstanding is the perspective, experience or prior encounter that the author has gained regarding the research being conducted. A general presumption is that research without basic previous knowledge will alter the understanding of the topic (Nyström and Dahlberg, 2001, p. 339). Therefore, preunderstanding allows the authors to gain a better understanding of the subject, hence avoiding misleading the research being conducted negatively (Dahlberg et al., 2001, p. 345). Having a preunderstanding fundamentally helped us determines the choice of methods and philosophical position to use throughout the study. Therefore, to conduct a credible research and bearing in mind that this is an explorative study, we thought it quite relevant for the authors to be endowed with the necessary educational, professional and practical experiences.

We have both had extensive courses business administration and marketing. During our entire period of study, we have taken courses that relates to strategic management, networking and internationalisation. Having this knowledge played a major role towards our topic selection. The preconceptions of theories and concepts have been taught to us throughout our entire academic period. In terms of work related practical experience, both of us have previously worked in a telecommunication and consultancy company. We had a chance of interacting with how companies build strategies and incorporate them in their business model. And also various alliances that occurred in these companies towards production of new products and services for the customers.
It is noted that our current awareness of the topic together with our practical experience could influence the results of this study in a negative way. Meaning, bringing out what we perceive towards the topic. However, we ensured we had an open-mind and continuous discussions with our supervisor to avoid any impacts from our previous preunderstandings on the topic. We remained impartial as possible when conducting the interviews to avoid directing our participants towards a specific response which might affect the credibility of our study. Our interview guide questions were also constructed in a way that it will not lead the participants towards a certain direction thereby getting their own perceptions and opinions on this research topic. This was further verified and approved by our supervisor. Therefore, we believe that our knowledge regarding the topic is relevant and was used in a manner that could not influence the credibility of this study.

2.3. Literature selection and source criticism

Literature review is one significant part in the process of our thesis, by which we can select our topic and then conduct a proper research as per Sharp’s suggestion (2002, p. 82). In this case, a proper research is normally considered as “critical literature review” (Saunders et al., 2009, p. 58). Hence, during our review, we have tried to compare and evaluate which literature is the most relevant to our study (Cottrell, 2003, p. 232).

We approached to the phenomenon of “Coopetition” through lectures provided during our master program. At the earlier stage of choosing specific topic, together with our prior knowledge, Google.com was in assistance of gaining our general knowledge about this issue. The knowledge here can be the awareness of current state of this subject, or understandings about different perspectives related to the topic. To narrow down our topic to the tension related to knowledge in coopetition, and later to have critical literature review, we searched in Umea University Library for academic articles. Some databases are referred by the library namely Diva portal, Emerald Insight, Industrial Marketing Management, Journal of Operations Management, Routledge (Taylor & Francis Group), and The Academy of Management Review etc. Fully aware of the influence of source criticism on the credibility of the study, we aim to use such databases as trustworthy sources. The primary literature sources of our thesis include conference proceedings on coopetition and some master and PhD thesis. However, we mainly use secondary sources which are published to wider audience. This is due to the fact that secondary sources, usually covered by “search tools”, are easier to find than primary sources (Saunders et al., 2009, p. 69). They can be listed as reports from government publications on R&D investments and high-tech industry, textbooks, books and academic journal articles. Although coopetition is a rather young research field started from mid-1990s, a large number of literature are provided. Hence, we have chance to use a lot of peer-reviewed studies to enhance the quality of thesis.

Keywords or search terms play an important role in searching for relevant literature since they represent research question and research goal (Saunders et al., 2009, p. 76). For scanning literature, we use certain keywords such as coopetition, high-tech companies, balance, harmony, tension, knowledge sharing, knowledge protection, Yin-Yang principles. These keywords have been searched separately or jointly. As implied by Yami et al. (2010, p. 5), the first challenge of studying coopetition is linguistic issue since the term of “coopetition” is not available in the main vocabularies of any languages, even in economic or management dictionaries. Hence, there is a number of papers discussed about this issue without exactly mentioning about “coopetition”. In order to cover almost related articles, we also investigated the similar concepts such as “cooperate with competitors” in parallel. We screened the abstracts of articles before searching for full text version. In case the abstracts seem suitable for our study, we would read through other important parts including discussion, conclusion and reference list that potentially leads to appropriate
articles in the same topic. For some databases and publishers (e.g. Emerald Insight, Industrial Marketing Management), when downloading a specific article, they will suggest some other relevant articles, for example, “Other users also viewed these articles” or “Users who downloaded this article also downloaded.”. Such function is helpful in searching for an enormous amount of articles. Some authors appear as pioneers or outstanding researchers in some specific subjects of coopetition such as Bengtsson & Kock (coopetition generally); Fernandez and Tidstrom (tension in coopetition); Gnyawali & Park and Zakrzewska-Bielawska (coopetition in high-tech companies); and Loebbecke (knowledge management in coopetition). Hence, we explored more their works. Moreover, we further used additional articles in our analysis. Given the fact that this was a new perspective which has not been fully developed. It was therefore necessary that we find more articles to support our analysis.

We understand that using secondary references (i.e. citations) may result in different meaning compared to original version. Therefore, citations are minimized by searching for replaceable literature. However, in some cases where the necessary information is in numerical data (e.g. percentage of failure coopetition case) while the articles are too old to own full text, or books are not available (to borrow) in Umea University Library; secondary referencing is applicable.

2.4. Research Philosophy

It is significant for researchers to have a position on how the world works and how knowledge of human evolves so that they can adopt coherent research strategy and methods to answer research questions (Ritchie et al., 2014, p. 4; Saunders et al., 2009, p. 108). In accordance with the ideas of Johnson and Clark (2006), Saunders et al. (2009, p. 108) implied that there is no rule in which a research philosophy is better than the others but the most important issue is how well researchers can argue for such philosophical positions against the possible alternatives. Therefore, we state below our belief together with the reasons leading to our positions on two main branches of research philosophy; ontology and epistemology.

2.4.1. Ontology

Ontology describes the assumptions we take about the way the world works and relates to the nature of reality (Gray, 2004, p. 14; Saunders et al., 2009, p. 110). The purpose of this philosophical stance is to recognize if social entities are objective entities or social constructions (Bryman & Bell, 2011, p. 20). Accordingly, there are two main positions of ontology which are objectivism and subjectivism (this position can also be named as “constructionism”) (Bryman & Bell, 2011, p. 20; Saunders et al., 2009, p. 110). Objectivism researchers believe that “social entities exist in reality external to social actors” while researchers with subjectivism position suppose that “social phenomena are created from the perceptions and consequent actions of social actors” (Saunders et al., 2009, pp. 110-111). We embrace subjectivism as our ontological position since we assume that social entities (e.g. organisations) should be related and influenced by social actors (e.g. managers). Our research purposes are finding out how high-tech companies balance the tension between knowledge sharing and knowledge protection in coopetition. To achieve this objective, we need to interview managers to see their views on the issue. Hence, our point of view about the reality is that knowledge sharing and knowledge protection within the organisations (social entities) to another companies are decided by managers as social actors.

2.4.2. Epistemology

“Epistemology, or the theory of knowledge, is concerned with how we know what we do, what justifies us in believing what we do, and what standards of evidence we should use in seeking truths about the world and human experience” (Audi, 1998, p. 1). Epistemological point of view taken by researchers concerns what they consider as acceptable knowledge in a particular research area.
There are three dominant positions of epistemology including positivism, realism, and interpretivism (Saunders et al., 2009, pp. 113-116). Generally, these positions answer the question if the same principles to understand natural sciences can be applicable for social world (Bryman & Bell, 2011, p. 15). Positivism advocates the application of natural science method to social reality (Bryman & Bell, 2011, p. 15). Normally, researchers with positivism position will tend to use a highly organized methodology so that the replication can be managed (Gill & Johnson, 2002, p. 10). Hence, positivistic research focuses on description and explanation with hypotheses provided (Carson et al., 2001, p. 5). Basically, realism has the same idea with positivism on researching social reality using principles of studying natural sciences (Bryman & Bell, 2011, p. 15). However, the reality embraced by realist researchers is considered with “independent of human mind” (Saunders et al., 2009, p. 114). In contrast to positivism and realism, interpretivist researchers challenge the possibility of applying the principles and procedures to understand natural sciences to social reality. They are based on the argument that human as social actors play an important role in influencing social phenomenon (Saunders et al., 2009, p. 116). Researchers with interpretivist position believe that “human make sense of the world around us” (Saunders et al., 2009, p. 116). According to Saunders et al. (2009, p. 116), interpretivism is appropriate to research issues related to business and management so that individuals and other objectives can be studied together in a specific context. This is also one of the reasons that we embrace interpretivism as our epistemological position.

Interpretivism is also consistent with our ontological position of subjectivism with the belief that “social phenomena are created from the perceptions and consequent actions of social actors” (Saunders et al., 2009, pp. 110-111). By interviewing managers to have their insights about the tension related to knowledge in coopetition, we emphasize the individual perception of social actors (i.e. managers interviewed). Adopting interpretivism, examples from managers about intentions or motivations regarding the issue should be noticed to achieve meaningful conclusions (Saunders et al., 2009, p. 116).

2.5. Research Approach
In logic, reasoning is often categorized as either inductive “bottom up” approach or deductive “top down” approach (Tracy, 2013, p. 21; Saunders et al., 2012, p. 143). A researcher using an inductive reasoning begins with observing specific interactions. This is generally followed by building a conceptualized framework basing on the observations. Thereafter, the researcher makes tentative claims by examining the data collected and finally drawing conclusions that builds theory (Tracy, 2013, p. 22). In other words, the researcher develops theory and relates them to the existing literature after investigating the data collected (Saunders et al., 2009, p. 41). Hence, the inductive approach indicates the method that mainly uses comprehensive readings for raw data to develop concepts, topics and models through analysis of the raw information by the researcher (Thomas, 2006, p. 238).

This reasoning is in contrast with a deductive approach in which, the researcher begins with a broader or general theory, followed by devising hypotheses about the social world basing on theory that will be further subjected to testing. The researcher will then use the evidence gathered from the research to confirm or disconfirm the original theory (Tracy, 2013, p. 22). More or less, normally the researcher assumes a hypothesis based on his knowledge about the field and the theories which includes concepts that can be further converted to researchable objects (Bryman & Bell, 2011, P. 11). Hence, the deductive approach is a data examination process that is fixed to investigate whether data are reliable compared to previous prepositions, assumptions and theories developed by researchers (Thomas, 2006, p. 238). Accordingly, Saunders et al. (2009, p. 61) posit that the main aim of the literature review in inductive approach is not to offer a summary of all
that has been studied in your research area, but rather, to review the most substantial and appropriate area in relation to your study. This allows the research results to be in alignment with prior observation and further to develop from the common or substantial premises in the raw data.

Notably is the fact that both approaches have advantages and disadvantages that cannot be ignored. According to Saunders et al. (2009, p. 125), a positive factor for using a deductive approach is that the researcher is implored to maintain an independent view of what is being studied, thereby creating a good chance of being objective. While, a potential drawback is that what has been deducted can only be applied to the sample that was chosen. On the other hand, when applying an inductive approach, the strength is observed in terms of looking at how individuals interprets the social world through perceptions and beliefs, and thereby developing an understanding of meanings and rules for behaviour (Saunders et al., 2009, p. 126; Tracy, 2013, p. 22). However, the drawback for inductive reasoning is that the findings of the study may be interesting, although they may not be entirely the truth or may have unclear theoretical significance (Bryman & Bell, 2011, p. 13; Saunders et al., 2009, p. 126).

In our study, we embrace the inductive principle of building theory based on the outcome of the research (Bryman & Bell, 2011, p. 13). However, we also acknowledge Ritchie et al. (2014, p. 6) claim that a researcher cannot follow purely inductive or deductive approach. Their argument is that although the approach may be inductive, the questions, the generation, and interpretation of data cannot be based on a blank mind. Therefore, assumptions will be deductive in process. Our objective is to gain a practical understanding on how to balance tension between knowledge sharing and protection. Therefore, we base our foundation mainly from the understanding of our participants’ perceptions but with support of already existing phenomenon in the extant theories. However, it is important to note that our conclusions will be based on the existing literature, empirical findings and our own logical thinking.

2.6. Research Design

Research can be conducted with three different designs named as exploratory, descriptive and explanatory research (Yin, 1994, p. 3). This thesis aims to suggest a mechanism for high-tech companies to balance the tension between knowledge sharing and knowledge protection in coopetition. As discussed in the research gaps, there are few empirical research investigating in the sources and dimensions of tensions arising from various conflicting dualities in coopetition at different levels, such as inter-organisational level (Fernandez et al., 2014, p. 223). In addition, how to balance such tensions, specifically the tension between knowledge sharing and knowledge protection, so far has not had the answer yet. Hence, our thesis is an exploratory study in accordance with statement of Robson (2002, p. 59) that exploratory studies allow researchers “to seek new insights; to ask questions and to assess phenomena in a new light”. In our study, balancing mechanism in the concept of harmony according to Yin-Yang principles can be considered has not well-developed in coopetition. Hence, this study may bring the novelty idea into business research. In addition, exploratory studies do not aim to provide certain solutions to current issues but serve as “the initial research, which forms the basis of more conclusive research” (Singh, 2007, p. 64). They are flexible studies where “you must be willing to change your direction as a result of new data that appear and new insights that occur to you” (Saunders et al., 2003, p. 140). Pursuing exploratory study, we are ready to change our conclusion on how to find a balance in knowledge sharing and knowledge protection in coopetition based on the opinions from cases interviewed.

According to Saunders et al. (2003, p. 146), the choice of research strategy is depended on several factors such as (1) types of research questions and objectives of research, (2) the extent of existing
knowledge and (3) the amount of time and other available resources. Regarding the research questions, with the purposes above, our thesis is driven by the following research question:

**How do high-tech companies balance the tension between knowledge sharing and knowledge protection in coopetition?**

Defining the research questions is a significant step in a research study in which one of the key points is understanding the form of research questions (Yin, 1994, p. 7). Our thesis focuses on “how” question which in most cases, is likely to use case study, experiment or history as preferable research strategies (Yin, 1994, p. 7). This is due to the fact that “how” question usually manages with “operational links needing to be traced over time” (Yin, 1994, p. 6). Case study should be the most suitable research strategy for us since experiment is mainly related to psychology (Saunders et al., 2003, p. 142) while history is applied when “there is virtually no access or control” (Yin, 1994, p. 8). However, since the harmony concept has not been well-developed in business studies, we therefore mainly explore this mechanism to balance the tension between knowledge sharing and protection in accordance with the Mattsson & Tidstrom (2015) Yin-Yang perspectives.

In this vein, our thesis is mainly exploratory study. Therefore, we bring forth a new perspective and assumptions that we will use to further develop theory and develop new ideas for future research.

**Qualitative research design**

Qualitative and quantitative are acknowledged as two main research designs (Neuman, 2014, p. 16). The difference between these two researches is normally based on using words (qualitative) or numbers (quantitative); and using closed-ended questions (quantitative hypotheses) or open-ended questions (qualitative interview questions) (Creswell, 2013, p. 32). Qualitative research aims at understanding individuals or groups attributed to the problem while quantitative research tends to test theories by investigating the relationship among variables (Creswell, 2013, p. 32). Each research design is not limited to only one research approach (Bryman & Bell, 2011, p. 27). However, the process of qualitative research is typically conducted inductively from specific to general themes (Creswell, 2013, p. 32). In contrast, researchers using quantitative research normally adopt deductive approach so that theories can be tested (Creswell, 2013, p. 32). Based on the fact that we choose inductive approach for our study, we apply qualitative as our research design. Furthermore, according to Neuman (2014, p. 39), exploratory research like our study mainly uses qualitative since this research design is more open and allows researchers to discover new issues. Indeed, purpose of this study is to gain a deeper understanding about the tension between knowledge sharing and knowledge protection faced by high-tech companies in coopetition, in turn, identify the mechanisms to strike a balance. Hence, we believe that a qualitative research design where data is collected in the participant’s setting will be in assistance of efficiently answering the research question.
3. Theoretical framework

This chapter aims at critically reviewing existing literature on how to balance the tension between knowledge sharing and knowledge protection in coopetition for high-tech companies. Firstly, we provide theories on coopetition in general and coopetition in high-tech companies specifically. This is followed by theories on knowledge including the definition of knowledge, the taxonomies of knowledge and the perspectives of knowledge sharing and protection. Here we aim to outline how the tension between knowledge sharing and knowledge protection evolves. The last part is the theory on the Yin-Yang principles and harmony orientation that will further assist us in building our conceptual framework. The chapter ends with a proposed conceptual framework devised from the theories.

3.1. Coopetition as a paradoxical relationship

3.1.1. Conceptualisation of coopetition

Competition and cooperation are two widely-accepted divergent concepts to describe the relationship between companies. According to traditional definition, competition is the conflicting and rival relationship among competitors (Bengtsson & Kock, 2000, p. 414). It is developed consistently in strategic management literature where several researchers believe that a sustained competitive advantage is necessary for companies to defeat their competitors in creating value added for customers (Barney, 1991, p. 102 & Porter, 1991, p. 101). Competitors here are referred to the companies offering the same products and services to customers (Johnson et al., 2014, p. 55). Theories about cooperation were built later implying that a company’s critical resources may be expanded and embedded in inter-organisational relationship (Dyer & Singh, 1998, p. 660). It means that the company’s competitive advantages are improved based on the ability to cooperate with other organisations. Companies implementing cooperation expect to gain mutual benefits in accordance with win-win game structure (Padula & Dagnino, 2007, p. 33). Recently, the term of coopetition was born to introduce an emerging business strategy where cooperation and competition are combined simultaneously between two or more organisations (Brandenburger & Nalebuff, 1996, p. 16; Bengtsson & Kock, 2000, p. 414; Gnyawali et al., 2006, p. 507). Brandenburger and Nalebuff (1996, pp. 15 - 16) argued that approach of researching cooperation and competition separately has limitation of not providing the whole picture of inter-dependences between companies. Only viewing competition underestimates the positive effects of cooperation on performance (Bouncken, 2015, p. 579). In contrast, individually studying cooperation underestimates the negative impacts of competition, such as opportunistic behaviours (Bouncken, 2015, p. 580). Hence, a combination of these two elements is necessary to maximize the value creation (Boucher et al., 2013, p. 73).

Ray Noorda, the founder of Novell, coined the word of “coopetition” in the 1990s (Chiambaretto & Dumez, 2016, p. 111). Then, the concept was broadly spread after the publication of the book “Coopetition” of Brandenburger and Nalebuff in 1996 giving the initial theory and explanation about this strategy (Bouncken et al., 2015, p. 580). Since the mid-1990s, growing number of articles relating to coopetition has been written with different views such as dyadic coopetition, multifaceted coopetition and intra-firm coopetition (Rusko, 2011, p. 311). Among of those, two articles of Bengtsson and Kock in 1999 and 2000 are considered as significant pieces according to Gast et al. (2015, p. 502). Up to date, two main definitions of coopetition on vertical and horizontal axis have been built by Brandenburger and Nalebuff (1996) and Bengtsson and Kock (2000), respectively. Brandenburger and Nalebuff (1996, p. 17) adopted a network perspective including relations between companies and many complementary organisations in the network (e.g. suppliers, buyers, potential entrants, substitutes and incumbents). They defined coopetition vertically in which cooperation and competition may be taken place simultaneously among any
couples of participants in the industry value chain that decrease the value of products from the main company (Brandenburger & Nalebuff, 1996, p. 17). In contrast, Bengtsson and Kock (2000, p. 415) viewed coopetition from an inter-organizational perspective. They provided horizontal definition where coopetition is considered as the simultaneous pursuit of cooperation and competition between direct competitors (Bengtsson & Kock, 2000, p. 415). Direct competitors are companies manufacture the same products or services targeting to the same markets (Bengtsson & Kock, 2000, p. 415). A framework from Gnyawali et al. (2008, p. 9) as below can be used to give an understanding about coopetition.

Table 2: A framework for understanding coopetition (Gnyawali et al., 2008, p. 9)

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<tr>
<th>Locus of Co-opetition</th>
<th>Axis of Co-opetition</th>
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<tr>
<td>Dyad (Same firms)</td>
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<tr>
<td>Temporally and spatially collocated</td>
<td>Co-opetition between players who are vertically adjacent to each other in the industry value chain and who compete and collaborate in the same domains. Manufacturer works with dominant retailer as well as smaller retailer to survive so that the dominant retailer does not have a monopoly.</td>
</tr>
<tr>
<td>Temporally and spatially separate</td>
<td>Co-opetition between players who are vertically adjacent to each other in the industry value chain and who compete in one domain and collaborate in another domains.</td>
</tr>
<tr>
<td>Multiple Firms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Co-opetition between players who are vertically adjacent to each other in the industry value chain and who collaborate with each other in order to compete with rivals pairs or groups.</td>
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In business articles, coopetition is mostly referred to the cooperation with competitors. The thesis also refers to the definition of Bengtsson & Kock (2000, p. 415) as mentioned above to better investigate existing tension and complexity in this strategy. In frame of this study, coopetition is
viewed at inter-organisational level with the focus on dyadic relationships between two companies which are direct competitors in the market (horizontal axis) (Gnyawali et al., 2008, p. 9).

We adopt game theory to explain coopetition phenomenon on the understanding that this theory can explore situations of inter-organisational relationship where single action of one company will directly affect the payoffs of others (Shy, 1995, p.11). It is noted that game theory is adopted to understand the phenomenon rather than finding a solution since we do not expect to use mathematical models and equations at the end. In general, game theory states that an organization should consider the likely moves of competitors and these moves’ implications to implement its own strategy (Johnson et al., 2011, p. 217). This theory is mainly applicable where competitors are interdependent which means that the results from choices made by one competitor is influenced by options decided by other competitors. Accordingly, companies need to consider two significant principles of making decision including “getting in the mind of the competitors” and “think forwards and reason backwards”. Above all of those, game theory encourages managers of companies to think about the way of converting lose-lose competition into win-win cooperation.

Basically, Brandenburger and Nalebuff (1996, p. 6) described the way company uses game theory to reach the positive-sum achievements. It can be done by increasing the existing value or establishing new ones in coopetition. As an additional point, Cairo (2006, p. 52) stated that coopetition is based on the principle that creating and capturing value, means “dividing up of the pie”, is central of companies’ activities. Instead of viewing the creation and division of the pie separately as above, Zineldin (2004, p. 783) implied that coopetition is a win-win strategy where companies can create new values together then enjoy the synergy effects (i.e. creating a bigger pie together then achieving the bigger slice). Similarly, we perceive coopetition as a win-win relationship with the interactive process of cooperation and competition where the balance between value creation and value appropriation is needed (Bengtsson & Kock, 2014a, p. 180; Gnyawali et al., 2009, p. 312).

3.1.2. Motives for coopetition of high-tech companies

In general, companies implement coopetition strategy under the influence of various motives on the basis that they can enjoy the synergy effects from this strategy (Bouncken, 2015, p. 589). A company in competitive situation will make efforts in constantly escalating its activities to sustain competitive advantages (Boucher et al., 2013, p. 73) while by cooperating, the company can utilise the complementary resources from partners (Dyer & Singh, 1998, p. 676). According to Ritala and Hurmelinna-Laukkonen (2009, p. 819), three main motives for coopetition are suggested. Firstly, coopetition allows companies to create value. Secondly, by cooperating with competitors, companies can expand their existing market size or form a new one. Final motive considers the benefits of coopetition in sharing the costs (e.g. production, distribution and R&D).

In high-tech industry, coopetition tends to be prevalent due to particular characteristics of this sector including short product life cycles, technological convergence and high R&D costs as suggested by Gnyawali et al. (2008, p. 13). Cooperating with competitors enables high-tech companies to cope with these characteristics which will be discussed further as following.

Short product life cycles

The likelihood of cooperation with competitors is observable in high-tech industry since this strategy assists in overcoming the challenges of short product life cycles. Most technology companies have to cope with unstable markets with increasingly short product life cycles as a result of quick technological innovation and market competition (Aytac & Wu, 2013, p. 255). To survive, the companies need to reduce the R&D period and time to launch products to market (Gnyawali et al., 2008, p. 11), especially in current economic downturn. As mentioned above, one
of the motives for companies to adopt coopetition strategy is allowing them to improve existing products or form new ones by joint research and development (Ritala & Hurmelinna-Laukkanen, 2009, p. 826-827). Hence, it can be said that coopetition increases the capability of companies in creating product faster (Gnyawali et al., 2008, p. 11).

**Technological convergence**

Technological convergence represents in high-tech industry nowadays where a product can handle multi-tasks, for example, mobile phone can be a camera at the same time. According to Gnyawali et al. (2008, p. 12), technological convergence has different influences on high-tech companies and industry. The technological convergence may lead to requirement of more complicated and sophisticated technology. In this case, complementary resources for R&D activities should be available from partners to increase the diversity of the resources. Furthermore, technological convergence creates chances for companies in setting industry standards. Those standards can be set by competition among groups with the presence of market leader companies. In this regard, Gomes-Casseres (1994, p. 63) indicated that companies can cooperate with each other to grow in the battle for industry standards and achieve mutual positive outcomes. Several researchers propose that coopetition is significant for innovation of high-tech companies (Gnyawali & Park, 2011, p. 651; Park et al., 2014, p. 219; Quintana-Garcia & Benavides-Velasco, 2004, p. 927). Indeed, innovation is critical for high-tech companies to deal with emerging technological convergence.

**High R&D costs**

Sharing costs and risks is one of the main motives for companies to involve in coopetition as mentioned above, especially in high-tech industry due to the high uncertainty of technology (Gnyawali et al., 2008, p. 12). Zineldin (2014, p. 785) also implied that coopetition allows companies to enjoy various benefits including high levels of R&D and other advantages on costs, market and customer value. Hence, coopetition is a solution for high-tech companies so that they can reduce R&D costs by making use of the pool of resources shared by competitors, who are likely to own similar knowledge and a common market vision rather than non-competitors (Gnyawali et al., 2008, p. 12; Ritala and Hurmelinna-Laukkanen, 2009, p. 586). Statics show that R&D costs in high-tech industry are high compared to other areas and keep increasing overtime. For example, according to European Commission (2013, p. 19), the top 2000 worldwide companies spent 6.2% of R&D budget more in 2012 compared to 2011. The first and second places belong to Germans carmaker Volkswagen and Samsung Electronics from South Korea, respectively. 50 companies standing in the top of R&D investments are mainly from high-tech areas, such as ICT industries, and Pharmaceuticals and Biotechnology (European Commission, 2013, p. 9).

### 3.1.3. Tensions as challenges of coopetition strategy

In spite of various benefits as discussed above which make coopetition the “*winning strategy for 21st century*” (Yami et al., 2010), companies involving in coopetition face several challenges to succeed. Boucher et al. (2013, p. 74) critically consider coopetition as “*a dangerous situation*”. This concern is real considering a large failure percentage of coopetition up to 50% according to Park & Ungson (2001, p. 37). Coopetition is paradoxical with the involvement of two opposing elements of cooperation and competition (Bengtsson et al., 2016, p. 20). Such complex nature of coopetition may lead to difficulties for companies in managing effectively this strategy. Saying in other way, it may result in lose-lose situation instead of the possible win-win situation as the initial idea of Brandenburger and Nalebuff (Bengtsson et al., 2016, p. 20).

Companies have to cope with tensions which are resulted from coopetition paradox (Bengtsson et al., 2016, p. 20). Handling tensions is imperative when engaging in coopetitive relationships as
suggested by several authors (Bengtsson & Kock, 2014a, p. 39; Das & Teng, 2000, p. 77; Raza-Ullah et al., 2014, p. 192). It is due to the fact that tensions account for many failure cases of coopetition by decreasing chances of success significantly and causing aggravation in the partnerships and inherent instabilities of alliances (Bengtsson & Kock, 2014a, p. 39; Das & Teng, 2000, p. 77; Raza-Ullah et al., 2014, p. 192). Fernandez et al. (2014, p. 69) also called for the importance of managing tensions since tensions could hinder the positive influence of coopetition on innovation outcomes. Tensions are considered as the difficulties of handling pairs of contradictory-yet-interrelated forces at the same time (Fang et al., 2011, p. 774). Some examples are cooperation versus competition, rigidity versus flexibility, short-term versus long-term orientation, joint value creation versus private value appropriation, trust versus opportunism, and knowledge sharing versus knowledge protection (Das & Teng, 2000, p. 77, Ilvonen & Vuori, 2013, p. 2010, Li et al., 2012, p. 1191, Raza-Ullah et al., 2014, p. 192, Zineldin, 2004, p. 784).

Tensions can be distinguished into three levels as suggested by Fernandez et al. (2014, p. 223) including inter-organizational level, intra-organizational level and inter-individual level. The inter-organizational level depends on the variation in explicit and implicit strategic priorities of each parties (Fernandez, 2014, p. 223). The intra-organizational level is the result of the competition in various business units of the company and different activities developed with competitors (Fernandez, 2014, p. 223). Finally, inter-individual level refers to the paradoxical psychological considerations in decision making (Fernandez, 2014, p. 224). Based on above study of Fernandez et al. (2014, p. 223), Bengtsson et al. (2016, p. 21) divide tensions as external and internal tensions. External tensions relate to the difficulties that top management level in companies have to overcome when involving in both cooperation and competition with partners while internal tensions relate to lower levels within organization (Bengtsson et al., 2016, p. 21). Studying coopetition at inter-organisational level, we mostly focus on external tensions to see the dilemma which management level have to cope with when dealing with coopetitive partners. Besides rational perspective as above, several authors also pay attention to the influence of emotional complexity on the level of tension in coopetition (Kumar, 2014, p. 6 & Raza-Ullah et al., 2014, p. 1). Tensions in coopetition hence involve emotions with both negative and positive feelings such as simultaneous trust and distrust between partners (Raza-Ullah et al., 2014, p. 10).

Generally, tensions are negative in business relationships as they cause conflicts, burdens and problems (Tidstrom, 2013, p. 261). However, as observed by Bengtsson et al. (2016, p. 21), more researchers recently point out that different levels of external tensions can result in both positive and negative performances which expose the synergy characteristic of coopetition. Hence, the challenging task is not avoiding or eliminating tensions but balancing tensions (Bengtsson et al., 2016, p. 21; Das & Teng, 2000, p. 77; Fernandez et al., 2014, p. 69; Gnyawali & Park, 2011, p. 652; Li et al., 2012, p. 1191 & Tidstrom, 2013, p. 263). Balance is helpful in sustaining the relationship while maximizing the chances of positive gains from both competition and collaboration (Park et al., 2014, p. 213). Managing tensions in balanced manners also ensures the inter-dependences and continued relationship (Gnyawali & Park, 2011, p. 659). According to Das and Teng (2000, p. 85), balance is referred to a condition where the competing forces have the same level of strengths. However, based on the principles of Yin-Yang, Mattsson and Tidstrom (2015, p. 349) suggested that balancing is not putting efforts in achieving equilibrium but to obtain the harmony. This is a complicated issue and in fact, it remains unclear on how to balance the tensions to get optimal performances in coopetition. Balancing the tensions in coopetition is a significant challenge for coopetitive partners as well as researchers.

Coopetition, a paradoxical relationship full with tensions, is a “double edged sword” (Boucken & Kraus, 2013, p. 2060). It can be perceived as a great strategy in sustaining market power or pursuing innovation with several advantages (Boucken et al., 2015, p. 590). At the same time, it
can be barriers of companies’ success with several tensions resulting in opportunistic behaviours, misunderstandings and spillovers (Boucken et al., 2015, p. 590). Hence, how to balance the tensions available in the nature of coopetition is a challenging task for companies to benefit from this strategy.

3.2. Knowledge

3.2.1. Definition of Knowledge

Nonaka (1994, p.15) defines knowledge as a justified true belief that increases an entity’s capacity for effective action. This traditional definition perceives truthfulness as an essential attribute of knowledge. However, Timonen and Ylitalo (2007, p. 506) assert that the real world knowledge is based partly on sensory data that can be inaccurate, thus not truthful. Therefore, researchers nowadays use many different expressions in defining knowledge. According to Davenport and Prusak (2000, p. 5), knowledge is a fluid mix of framed experience, values, contextual information and expert insights that provides a framework for evaluating and incorporating new experience and information. In similar line, Wang and Noe (2010, p. 117) emphasize that knowledge is “information processed by individuals including ideas, facts, expertise, and judgement relevant for individual team and organisation performance.”

In coherence with the assertions that high-tech products and services tend to be highly complex requiring integration of different but complementary knowledge (Grant, 1996, p. 56; Norman, 2002, p. 177), our approach towards understanding knowledge in high-tech companies follows the argumentations of Davenport and Prusak (2000, p. 5) definition as mentioned above. It is mainly because the definition encompasses the relevant characteristics of knowledge, thereby, demonstrates how knowledge is formed through practical know-how running through individuals’ mental vision. Further, we subscribe to the view that knowledge is socially constructed (Nonaka, 1994, p.57) and assert that within high-tech companies, organisation knowledge is generated from the combination of knowledge that exists within individuals, processes and their interactions (Trkman & Desouza, 2013, p. 3). Therefore, knowledge that is new to an organisation has to be either invented internally or acquired from external sources. Application of this knowledge depends particularly on how the focal firm perceives the value of a particular knowledge towards gaining competitive advantage (Zhang et al., 2010, p. 77).

3.2.2. Taxonomies of knowledge

Drawing on the work of Polanyi (1967), Nonaka (1994, p. 16) explicated two dimensions of knowledge in organisations i.e. tacit knowledge and explicit knowledge. Explicit knowledge refers to the knowledge that is transmittable in formal systematic language, i.e. knowledge is codified (Nonaka, 1994, p. 17). This kind of knowledge can be verbalized and communicated, processed, transmitted and stored relatively easy (Alwis & Hartman, 2008, p. 134). For example, the ownership manual accompanying the purchase of an electronic product can be classified as explicit knowledge. This manual contains knowledge on appropriate operation of the product for easily using (Alavi & Leidner, 2001, p. 112). In contrast, tacit knowledge is deeply rooted in action commitment and involvement in a specific context and comprises of both cognitive and technical elements (Nonaka, 1994, p. 17). Alavi and Leidner (2001, p. 110) posit that the cognitive element refers to individual models consisting of mental maps, beliefs, paradigms, and viewpoint. Whereas the technical element consists of concrete know-how, crafts and skills that applies to a specific context. Therefore, tacit knowledge is assumed to integrate the mechanisms in learning from insights and heuristic procedures (Duffy, 2000, p. 66).

Accordingly, Alavi and Leidner (2001, p. 112-113) further show how tacit knowledge has received greater interest and attention than explicit knowledge yet the former is not alone in providing both
the benefits and risks to organisations. They discuss how the tacit-explicit knowledge classification is widely cited. However, it is interesting to note that along the dimension of tacit-explicit knowledge, other knowledge classification exists. For instance, knowledge can be declarative (know-about), procedural (know-how), casual (know-why) and conditional (know-about). King (2006a, p. 16) further explains that “Know what,” knowledge specifies what action to take when one is presented with a set of stimuli. For instance, a salesperson who has been trained to know which product is best suited for various situations has a “know-what” level of knowledge. On the other hand, “know-how” this is knowing how to decide on an appropriate response to a stimulus. Such knowledge is required when the simple programmable relationships between stimuli and responses. For instance, “Know how” type knowledge permits a professional to determine which treatment or action is best at a given condition. Another type of knowledge is “know-why” knowledge. Individuals with this knowledge have a deeper understanding of causal relationships, interactive effects and the uncertainty levels associated with observed stimuli or symptoms. This will usually involve an understanding of underlying theory and a range of experience that includes many instances of anomalies, interaction effects, and exceptions to the norms and conventional wisdom of an area. In addition, there is a pragmatic approach to classifying knowledge. This approach simply attempts to identify the types of knowledge that are useful for the organisation, such as knowledge about customers, products, process, and competitors. While declarative knowledge is the factual information stored in memory, this kind of knowledge is known to be static in nature, for example, knowledge that describes processes, there attributes and the relations (Zack, 1998a, p. 646). These categories are further highlighted in the table below.

**Table 3: Knowledge taxonomies and example (Alavi & Leidner, 2011, p. 113)**

<table>
<thead>
<tr>
<th>Knowledge Types</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tacit</td>
<td>Knowledge is rooted in actions, experience, and involvement in specific context</td>
<td>Best means of dealing with specific customers</td>
</tr>
<tr>
<td>Cognitive tacit</td>
<td>Mental models</td>
<td>Individual beliefs on cause effect relationships</td>
</tr>
<tr>
<td>Technical tacit</td>
<td>Know-how applicable to specific work</td>
<td>Surgery skills</td>
</tr>
<tr>
<td>Explicit</td>
<td>Articulated, generalized knowledge</td>
<td>Knowledge of major customers in a region</td>
</tr>
<tr>
<td>Individual</td>
<td>Created by an inherent in the individual</td>
<td>Insights gained from completed projects</td>
</tr>
<tr>
<td>Social</td>
<td>Created by and inherent in collective actions of a group</td>
<td>Norms for inter-group communication</td>
</tr>
<tr>
<td>Declarative</td>
<td>Know-about</td>
<td>What drug is appropriate for an illness</td>
</tr>
<tr>
<td>Procedural</td>
<td>Know-how</td>
<td>How to administer a particular drug.</td>
</tr>
<tr>
<td>Casual</td>
<td>Know-why</td>
<td>Understanding why the drug works</td>
</tr>
<tr>
<td>---------------------</td>
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<td>----------------------------------</td>
</tr>
<tr>
<td>Conditional</td>
<td>Know-when</td>
<td>Understanding when to prescribe a drug</td>
</tr>
<tr>
<td>Pragmatic</td>
<td>Useful knowledge for an organization</td>
<td>Best practices, business frameworks, project experiences, Engineering drawings, market report</td>
</tr>
</tbody>
</table>

It is evident in the literature where different authors argue that the efficiency of knowledge sharing is significantly influenced by the nature of knowledge embedded in the capabilities possessed by a firm together with the complementary skills, which is mostly tacit knowledge (Fernandez 2014, p. 72; Kogut & Zander, 2014, p. 631; Zhang et al., 2010, p. 76). However, this should not be the case because explicit knowledge may pose particular risks related to assumptions of legitimacy and by virtue of being recorded, and as such, leading decision makers to favor explicit knowledge over tacit. Therefore, explicating knowledge in terms of tacit-explicit may results in rigidity and inflexibility, which would impede, rather than improve performance (Alavi and Leidner, 2001, p. 112). This is in coherence with Ipe’s arguments (2003, p. 345) that knowledge must be seen as more than just tacit or explicit in nature. Regardless of whether knowledge is tacit or explicit, the value attributed to it has the significant impact on whether and how companies share knowledge.

Understanding the taxonomies of knowledge is important because high-tech companies consider knowledge as a critical resource. The motivation to share or protect the knowledge in coopetition relies on how companies perceive these dimensions of knowledge towards competitive advantage. In addition, basing on Trkman and Desouza’s arguments (2012, p. 3) that not all the knowledge shared in coopetition networks is relevant for the company, it is important to identify what kind of knowledge is interesting and indispensable for the company and if it should be shared or protected accordingly.

### 3.3. Perspectives on knowledge sharing and knowledge protection

#### 3.3.1. Knowledge sharing vs. knowledge protection

Ipe (2003, p. 345) describes knowledge sharing as “the act of making knowledge available to others.” Individuals can contribute to knowledge application in the organisation and as a result, gain competitive advantage through the fundamental means (Wang & Noe, 2010, p. 115). According to Sveiby (2001, p. 345), sharing implies a conscious act where the person sharing does not lose the shared knowledge, rather the act results in joint benefits and ownership of the knowledge in the alliance relationship. Therefore, knowledge sharing supports the goal of knowledge creation through technological development and further fuel learning among the partners (Fernandez et al., 2014, p. 74; Soekijad & Andriessen, 2003, p. 578).

On the other hand, knowledge protection is “the process by which companies sustain uniqueness and value of their technological competences” (McEvily et al., 2014, p. 714). The risks of unwanted knowledge appropriation by coopetition alliance partners are what motivate firms towards knowledge protection, because a company’s resources and capabilities are valuable only if they are distinctive and not possessed by competitors (Norman, 2002, p. 180). Therefore, for high-tech companies, if the company’s knowledge and skills are duplicated, their ability to create unique value is diminished. In addition, by virtue of focal firms in the alliance being main competitors, partners may reduce their implications in collaboration by limiting the access to the
pooled knowledge by partners (Fernandez et al., 2014, p. 74) through knowledge protection mechanisms.

Both the process of knowledge sharing and knowledge protection is essential in coopetition networks. This is because knowledge sharing has the benefits to enhance the exploration process while knowledge protection is necessary to bounder exploitation process (Fernandez et al., 2014, p. 74). More so, in high-tech industry where rapid proliferation of technology creates new challenges, companies need to be open to the flow of internal and external knowledge while at the same time protect their core knowledge from unwanted appropriation (Bruton & Samie, 1998, p. 51). Therefore, we will further explore the knowledge sharing benefits and risks to bring out a better understanding of the inherent tension caused by the combination of these two conflicting opposites (i.e. knowledge sharing and knowledge protection).

3.3.2. Benefits of knowledge sharing in high-tech companies

Tsai (2002, p. 180) posits that both cooperative and competitive benefits emerging from networking are what motivate companies to share knowledge. Accordingly, the cooperative benefits of knowledge sharing are the collective use of the shared knowledge in pursuit of common interest whereas competitive benefits are those that arise when the knowledge shared is used for private gains (Khanna & Gulati, 1998, p. 195).

Several scholars have identified knowledge sharing as a dominant objective of innovation. Their argument is that collaboration with competitors enables companies to acquire and create new technological knowledge and use this knowledge in pursuit of innovation (Gnyawali et al., 2008, p. 11; Gnyawali & Park, 2011, p. 651; Ritala & Hurmelinna-Laukkanen, 2009, p. 826). In high-tech companies, the capacity to innovate has become increasingly essential for generating competitive advantage and reducing strategic uncertainty, as such, they seek interaction between individuals and organisations that possess diverse different knowledge to enhance the organization’s ability to innovate. Thus, the ability to exploit external knowledge is critical component for organisations innovative capabilities (Cohen & Levinthal, 1990, p. 128). This is further consistent with the knowledge based view of a firm presuming that firms develop capabilities that improve their performance through knowledge work, acquired both externally or internally to pursue innovation projects that involves high risks and require heavy investments (Gnyawali & Park, 2011, p. 651).

Another important benefit of knowledge sharing prevalent in the literature is competitive value. In high-tech companies, their ability to share and use diverse knowledge, whether internally or externally generated creates competitive value (Keeble & Wilkinson, 1999, p. 398; Ipe, 2003, p. 342). Khanna and Gulati (1998, p. 195) assert that the common benefits of a particular firm are the proportion of this value it appropriates. In similar vein, Cairo (2006, p. 51) states that coopetition is based on the principle of creating and capturing value, and subsequently dividing that value. The author asserts that creating value can either be through enlarging the existing market share for the alliance partners or creating new markets for the partners benefits. However, Zineldin (2004, p. 783) asserts that instead of viewing the creation and division of the metaphorical pie (value) separately as above, they should collectively create a bigger pie which in turn will offer bigger slices. This is because when companies create new values together using the pooled knowledge, they enjoy the synergy effects.

Zhang et al. (2010, p. 74) posit that value creation and the ability to innovate can only be achieved when there is collective learning. Alliance partner must therefore be able to learn how to adapt and integrate knowledge acquired from the alliance to serve specific innovative need. According to Kogut (1988, cited in Norman, 2002, p. 178), learning within alliance occurs when partners
combine their competences to accomplish outcomes that none of the partners can attain individually. It is assumed that this kind of learning is relevant to derive important benefits collectively. However, there can also be individual learning that benefits only one partner occurring simultaneously (Norman, 2002, p. 178). This is kind of learning hinders the firms from sharing their knowledge and instead opt for knowledge protection.

In addition, access to competitive knowledge is also regarded as a benefit of knowledge sharing in the literature (Gnyawali et al., 2006, p. 509; Ilvonen & Vuori, 2013, p. 214; Kock et al., 2010, p. 112). According to Ilvonen and Vuori (2013, p. 214), competitive knowledge refers to knowledge that is related to the company’s competitive issues, for example, knowledge about customers, technological knowledge on products and processes, knowledge about competitors moves etc. Through knowledge sharing, a company has the opportunity to access the useful relevant and interesting knowledge that can be used to complete the puzzle of the company’s competitive position and choices (Vuori, 2011, p. 30; Ilvonen & Vuori, 2013, p. 214).

3.3.3. Risk of knowledge sharing in high-tech companies

According to Kale et al. (2002, p. 752), learning and internalizing critical knowledge from partners is an important objective in knowledge sharing process. Therefore, Norman (2002, p. 178) posits that learning race is a risk in knowledge sharing process. The author defines learning race as the extent to which focal firms believe that the partner is focused on learning during the alliance. In similar vein, based on game theory, Larsson et al. (1998, p. 285) argue that when firm’s purpose in alliance is to learn from each other, they are likely to face the learning dilemma. The rationale behind this is that each individual organisation will pursue the maximum organizational share of the joint learning by taking more than it gives. For example, one partner may acquire new skills from another partner and then integrate the acquired skills into its own firm’s knowledge base, thereby, increasing the competitive advantage of the firm in non-alliance activities (Norman, 2002, p. 178). In this regard, mutual learning is therefore the main driver for knowledge sharing in high tech companies within collaborations. Therefore, if the partner’s firm ability to learn is not in coherence with mutual objectives, the firms will be obliged to protect their knowledge (Bogers, 2011, p. 96) from the partners as they consider this risky for the company.

Absorptive capacity is another relevant risk highlighted in the literature that hinders knowledge sharing (Bogers, 2011, p. 96; Cohen & Levinthal, 1990, p. 128; Ilvonen & Vuori, 2013, p. 216). According to Cohen and Levinthal (1990, p. 128), absorptive capacity refers to the ability of a firm to recognize the value of new external knowledge and assimilate it towards its innovation capabilities. The authors argue that a firm must possess existing knowledge that overlaps to some degree with knowledge that the firm is trying to absorb. This overlap between the focal firm and the partners’ resources is the proxy of the partners’ ability to use any knowledge gained from the focal firm (Norman, 2002, p. 181). Therefore, if the absorptive capacity of the partnering company is considered low, knowledge sharing is less likely to occur. In essence, we can assume that absorptive capacity goes hand in hand with learning, therefore when firm is able to learn from the collaboration and accordingly create new knowledge, then it can be assumed that the firm has a higher absorptive capacity.

Companies involving in coopetition may also experience the risk of knowledge spillover. According to Ilvonen and Vuori (2013, p. 216), this is the knowledge that is not meant to be shared within the partners. Thus when unintended sharing occurs, a focal firm may lose its competitive advantage to the other partner. Accordingly, Doz et al. (1989, p. 136) argue that when both partners are equally determined on absorbing and internalizing the others skills, distrust and conflict could possibly spoil the relationship. It consequently leads to high knowledge protection mechanism applied by the firm. However, Solitander (2011, p. 9-10) noted that no legal protection can
completely protect knowledge, especially when issues of unintended knowledge sharing occurs and the firms are unaware of the transfer occurring (Jiang et al., 2013, p. 984).

In line with the knowledge spillover is the risk of opportunistic behaviour. Cheng and Tang (2013, p. 241) define opportunistic behaviour as seeking of self-interest with guile, leading to deceit-oriented violation of implicit or explicit promises. The possibility of opportunism is usually present in coopetition because it involves dealing with partners outside own firms. Loebbecke et al. (1999, p. 15) argue that under the assumption of opportunistic behaviour, knowledge sharing might fail when one partner's intention is to benefit more that initial agreement. In addition, different authors have emphasized on the tacitness of knowledge being valued more in high-tech companies (Kogut & Zander, 1995, p. 631; Nonaka, 1994, p. 19; Norman, 2002, p. 182). As discussed above, tacit knowledge cannot be easily articulated and codified, taught to others and not easily visible when observed (Norman, 2002, p. 182). Therefore, the underlying assumption is that when knowledge is tacit in nature, no protection mechanisms can be used to protect this knowledge, thus firm are reluctant to share when the relationship dynamics is hampered by fear or display of opportunistic behaviour (Bengtsson et al., 2010, p. 202).

Therefore, it is evident that due to the combination of this two conflicting opposites (i.e. knowledge sharing benefits and the risks that lead to knowledge protection), there is an underlying dilemma on whether to share more knowledge with aim of gaining from the coopetition, or whether to protect knowledge with fear of the prevalent risks associated. As such, tension is an inherent challenge towards successful coopetition (Das & Teng, 2000, p. 56; Gnyawali & Park, 2011, p. 651).

3.4. The tension between knowledge sharing and knowledge protection in high-tech companies

According to Bogers (2011, p. 94), the tension of knowledge sharing and knowledge protection is the forces and their interdependencies that affect the extend to and the mode in which knowledge is shared and protected in coopetition networks. This tension greatly challenges the alliance structure of high-tech companies because the key characteristic in these companies is the continuous development of new technology, thus making the old technology and products obsolete (Bruton & Samie, 1998, p. 52).

As discussed above, coopetition is prevalent in high-tech companies because they face challenges that prompt them to seek alternative strategies in aim of increasing their competitive advantages. One of such challenges is the short product life cycle that makes the ability to rapidly develop and market new products essential in high-tech companies. As such, it is necessary for high-tech companies to open their boundaries to tap external knowledge through allying with other firms who have partially overlapping knowledge (Norman, 2002, p. 177), including their competitors. By doing so, high-tech companies aim at achieving competitive advantage by having knowledge that is valuable, rare, and not easily imitable (Gnyawali and Park, 2011, p. 651; Tidd & Bessant, 2014, p. 42), that will make them overcome the aforementioned challenge.

High-tech companies also have to share their core knowledge with these competitors because knowledge sharing supports the goal of knowledge creation through technological development (Fernandez et al., 2014, p. 72; Li et al., 2012, p. 1195). However, at the same time, unintended sharing may occur thus damage the focal firm’s competitive advantage. The underlying argument is that because of the increasing complexity of knowledge, partners always aim at achieving different kind of goals, which may not be evident beforehand during the manifold negotiations. Thus, while working together to create value, the temptation to be opportunistic in order to
appropriate greater share of the created value is also very high (Gnyawali and Park, 2011, p. 651), especially when unintended sharing occurs.

Arrow (1962, cited in Bogers, 2011, p. 96) refers to this as “information paradox” or “disclosure dilemma”. It basically means not knowing the partner's motives and intentions. Normally, the value of knowledge that the coopetition firms are bringing in the alliances, the partners intentions, and goals have to be revealed during negotiations. Although, according to Williamson (1996, p. 26), when bounded by rationality and opportunism, all the complex contracts undertaken by firms are unavoidably incomplete. Therefore, the firms may not be willing to disclose all their knowledge during the early stages of negotiations. They believe that the knowledge they possess whether tacit or explicit can reveal so much that the other partner may learn enough to terminate the negotiations and try to proceed on their own (Maskell and Malmberg, 1999, p. 170).

It is therefore difficult to know truly the partner's motives and goals for collaborations. In this vein (when there is a disclosure dilemma), firms will tend to protect their core knowledge from their partners because of the risks involved. Hurmelinna-Laukanen (2005, p. 24) asserts that protection mechanism such as intellectual property rights (IPRs) and legal contracts are normally used for knowledge protection. However, applying such mechanisms will have the biggest influence on knowledge sharing propensity of firms, thereby affecting the coopetition goal. Accordingly, Solitander (2011, p. 9) argues that inasmuch as firms tend to protect their core knowledge from their partners by using protective mechanisms, the imitability of part of the knowledge is still prevalent especially when the coopetition is among firms in the same technological field. As such, no legal protection measure can completely protect knowledge and thus inhibiting performance in the alliance.

In this regard, the benefits associated with sharing company’s core knowledge have to be weighed up against the inherent risks. Chen (2008, p. 3) suggests that even if coopetition tension inhibits performance in high-tech companies, the firm’s objective should not focus on reducing this tension but rather maintain and balance them effectively. We explore the notion of balancing the tension between knowledge sharing and protection by analyzing the benefits and risks of knowledge sharing. We believe that the contradicting benefits and risks which are prevalent during the knowledge sharing process are the cause of this inherent tension in coopetition.

It is also important to note that mechanisms for knowledge protection increases the bargaining power of companies when they want to form coopetition. According to Hurmelinna-Laukanen (2009, p. 286), when companies tend to protect their knowledge more by using the protection mechanisms like IPRs, then it is perceived that they have something of higher value which will make competitors want to gain access. Thereby, encouraging networking and collaboration for innovation purposes.

3.5. Balancing the tension between knowledge sharing and protection
3.5.1. Yin-Yang principles
Mattsson and Tidstrom (2015, p. 348) define Yin-Yang as a holistic, dynamic and dialectical worldview based on the duality of opposing elements. It is derived from Chinese view on a paradox as independent complementary opposites and each force cooperates with its counterforce. It means that when a certain force is active, its counter force is also active. This is on the contrary to the Western thinking where a paradox is viewed as being independent exclusive opposites (Cheng, 2008, p. 288). The author further posits that the relationship in Yin-Yang is illustrated by showing positive and negative poles within a phenomenon, each separate and distinct in expression, but both are integral part of that phenomenon (Cheng, 2008, p. 288). Based on Fang’s arguments
(2012, p. 30), Yin represents the “female” energy such as weakness and softness; while Yang represents the “male” energy such as strength, hardness and masculinity. The Yin-Yang principle embodies the dualities, paradoxes, united view in diversity, constant change and harmony (Cheng, 2008, p. 290). Hence, it potentially allows us to have a holistic approach for solving problem (Cheng, 2008, p. 290).

Yin-Yang principles have been used in different literatures as a reference for investigating paradoxical relationship relating to certain phenomenon. For example, Fang (2012, p. 30) demonstrated how Lawrence and Lorsch (1967) applied the Yin-Yang perspective to reach a fine balance between differentiation and integration. Similarly, several researchers applied the same principle towards reconceptualizing competition - cooperation relationship, cross cultural convergence and coopeetition (Chen, 2008; Luo, 2005 & Ralston et al., 1993). Therefore, it is evident that Yin-Yang perspective is applied on the interaction between opposites to present harmonious action between the forces (Mattsson & Tidstrom, 2015, p. 349). Basing on the Yin-Yang perspective, we conceptualise knowledge sharing and knowledge protection as two phenomena which occur in pairs and have complementary and opposing characteristics.

The following Yin-Yang principles are used as the guideline to understand the interrelation between opposing forces such as cooperation versus competition (Mattsson & Tidstrom, 2015, p. 349). We believe that such principles can also be applied to explore the tension between knowledge sharing and knowledge protection in coopetition where knowledge sharing represents cooperation and knowledge protection represents competition:

“1. All change can be related to pairs of opposing forces.
2. Opposing forces are mutually dependent and contribute to each other. One force therefore contains the seeds of the other.
3. The balance between opposing forces is in a state of constant change and should therefore be observed and analyzed over time.
4. The change process implies a continuous balancing in order to reach harmony.
5. Interaction between opposing forces has society-wide effects.”

Based on the first principle, it can be said that the processes of competition (e.g. knowledge protection) affect the processes of cooperation (e.g. knowledge sharing) and vice versa (Mattsson & Tidstrom, 2015, p. 356). This statement is consistent with Bengtsson et al.’s study (2010, p. 199) on coopetition dynamics and the argument that changes in degrees of cooperation and competition (i.e. weak versus strong) have interactions to each other. Secondly, cooperative processes (e.g. knowledge sharing) include factors that trigger competitive process (e.g. knowledge protection) and vice versa (Mattsson & Tidstrom, 2015, p. 357). The third principle leads to argument that the dominance of cooperation and competition (knowledge sharing and knowledge protection) changes constantly depending on the changes in relationship between companies and market structure (i.e. external factor) (Mattsson & Tidstrom, 2015, p. 357). Based on fourth principle, balancing processes between competition and cooperation happened aim to achieve a harmony. The answer of what is considered as harmony will be elaborated in the next part. Finally, the interaction between cooperation and competition goes beyond a single business relationship. It takes place in broader market contexts than the dyadic relationships between two companies (Chen, 2008, p. 299; Mattsson & Tidstrom, 2015, p. 358).

Based on above argument, we assert that balancing the tension between two opposing factors (e.g. knowledge sharing and knowledge protection) can be achieved through finding harmony rather than some kind of equilibrium.
3.5.2. The harmony concept
Harmony is “the combination or adaptation of parts, elements, or related things so as to form a consistent or orderly whole” (Oxford dictionary, 2012). In simple terms, harmony means complementing, supporting or depending each others of any coexisting individual elements to create a whole unity (Chow, 2004, p. 1). Harmony therefore is basically related to interpersonal behaviours.

Conflicts and tensions are regular area of focus in business studies while concept of harmony is not yet developed in business context. However, it is argued by Mattsson and Tidstrom (2015, p. 357) that dealing with tensions and conflicts can be considered as the efforts to reach the harmony. In addition, a literature review of alliance management (e.g. management of joint venture) suggests that harmony is a critical factor towards success of alliances (Chow & Yau, 2005, p. 188). O’Keefe and O’Keefe (1997, p. 191) also implied that concentrating on harmony rather than conflicts may assist both parties in effectively reaching the common goals. This is due to the fact that an inter-organisational relationship with harmony orientation can promote interpersonal relationships, mutual understanding and support, in turn, lead to better performance (Chow, 2004, p. 5). Saying in a different way, the lack of harmony in relationship results in conflicts (Alter, 1990, p. 491).

3.5.3. Scale of harmony orientation
There are five components of harmony and considered as a scale to evaluate if a relationship is treated with a harmony orientation, namely Enrichment, Leading, Bridging, Synchronizing and Imitation (Chow & Yau, 2005, p. 189). The article written by Chow and Yau (2005) is the only research found which offers a scale to evaluate harmony in business. The dimensions of harmony were discussed in international joint venture specifically. Indeed, among business studies, the harmony concept is mostly researched in relation to international joint ventures. We further elaborate these dimensions in context of coopetition on the basis that joint venture between competitors is one form of coopetition as discussed in our delimitations of “Forms of high-tech coopetition”.

*Enrichment:* The advantage of coopetition is the ability of combining complementary knowledge from partners so that they can utilise the economies of scale, quickly innovate and therefore be able to penetrate into a larger market (Ritala & Hurmelinna-Laukkanen, 2009, pp. 826-827). However, it is imperative that such complementary knowledge is integrated effectively to enrich the products or services offerings so that they can meet different needs of customers (Chow & Yau, 2005, p. 189). This target may be reached by the mutual assistance from each party in coopetition. Accordingly, where one company cannot solve a problem by itself since it is their weakness, the other party with the complementary strengths may propose assistance. This case is especially observed when multinational companies do not have the local resources advantage and therefore, the support from local companies are necessary (Chow & Yau, 2005, p. 190).

*Leading:* Also based on above argument, in some specific situations, the requirement of taking the leading role actively from one partner is emphasized. It will ensure that the objective will be achieved more effectively (Chow, 2004, p. 126). The cooperation between Sony and Samsung can be an outstanding example from high-tech industry where the problem of technological convergence is recognized. Sony with strong capability in LCD technology led Samsung in this core technology while Samsung with the expertise in overall TV making drove Sony in developing LCD panels (Gnyawali & Park, 2011, p. 654).

*Bridging:* In coopetition where different companies come with possibly different agenda, bridging the needs of engaging partners are essential. Strongly-linked bridge ties are depended on the effort of collaboration together with the commitment from individual party (Chow & Yau, 2005, p. 191).
Synchronizing: Same as the above, different party may have different interests. It creates the dilemma of optimizing the individual benefits or considering the coopetition’s performances. Efforts from one party do not make sense if the other side does not synchronize their efforts (Chow & Yau, 2005, p. 191). Supports with goodwill are critical to achieve the synchrony. Furthermore, decision making towards common interests and overall benefits of alliance cannot be underestimated (Chow & Yau, 2005, p. 191).

Imitation: This last dimension supports the Leading element above. In coopetition context where companies work closely together, it is natural that there are leaders and followers in several business practices (Chow & Yau, 2005, p. 191). The Imitation factor implies the importance of “adjusting their own structures, expectations, and ways of conducting business” to reach the synchrony and harmony with the leading partner (Chow & Yau, 2005, p. 191). The requirement seems to be more applicable in joint ventures where the synchrony in common direction of strategic management is required.

Figure 1: The five dimensions of harmony orientation (Chow & Yau, 2005, p. 189)

Applying the scale of harmony in coopetition, we mainly concentrate on three dimensions namely enrichment (e.g. using complementary knowledge effectively to enrich products/services provided to customers), bridging (e.g. collaborative orientation and commitment from both parties) and synchronizing (e.g. goodwill supports and decision making towards common goal). We assume that to achieve enrichment factor, leading and imitation dimensions have been partly accomplished so that products or services can be offered completely to customers. Enrichment factor implies the complementary knowledge provided by both parties. It means that companies have enough capability to compensate the weaknesses of each other. If this is the case, leading and imitation would exist naturally in enrichment factor so that companies can save the costs.

3.5.4. Harmony in coopetition
Harmony in coopetition is achieved when all parties notice that both competitive and cooperative processes are consistent and well-matched with each other. It can often be unstable depending on the changes “in the market context and/or in the opinions, objectives, and experiences of one or
two counterparts”. Hence, the balancing process is never ending (Mattsson & Tidstrom, 2015, p. 360). It might even lead to interrupt the coopetitive relationship and result in single relationship of cooperation or competition (Mattsson & Tidstrom, 2015, p. 360). The same principle can also be applied for knowledge sharing (cooperation part) and knowledge protection (competition part) in coopetition.

3.6. The balance between knowledge sharing and knowledge protection in coopetition

As discussed in the part for understanding tensions as challenge of coopetition strategy, the challenging task to manage the tension is not avoiding or eliminating them but balancing tensions (Bengtsson et al., 2016, p. 21; Das & Teng, 2000, p. 77; Fernandez et al., 2014, p. 69; Gnyawali & Park, 2011, p. 652; Li et al., 2012, p. 1191 & Tidstrom, 2013, p. 263). Managing tensions in balanced manners also assists in maintaining relationship between two parties (Gnyawali & Park, 2011, p. 659). Hence, to manage the tension related to knowledge when cooperating with competitors, we find it significant for companies to balance the knowledge flows. This means that the knowledge is provided enough to achieve the mutual goals while core knowledge is protected from unintended leakage to keep companies’ competitive advantages.

In order to achieve this objective, we aim to apply the suggestions by Mattsson and Tidstrom (2015, p. 349) that balance is linked to harmonious acts based on Yin-Yang principles. Saying in a different way, harmony can be a mechanism to manage alliance effectively. However, since the harmony concept has not well-developed in business studies so far, we mainly explore this mechanism to balance the tension knowledge sharing and protection in accordance with the suggestions from several authors that companies need to determine what knowledge to share, with whom, and under which conditions (Levy et al., 2003, p. 642; Loebbecke et al., 1999, p. 15). As such, we take into consideration the interactions between knowledge sharing and protection based on Yin-Yang principles with harmony orientation.

3.6.1. What knowledge to share: Value of knowledge towards coopetition and competitors

As mentioned above in Section 2.2 of “Taxonomies of knowledge”, there are two characteristics of the nature of knowledge including “tacitness and explicitness of knowledge” and “the value contributed to knowledge” (Ipe, 2003, p. 343). From knowledge-based perspective, we consider characteristics of knowledge as significant in balancing knowledge sharing and knowledge protection. This is in accordance with Bogers’ study (2011, p. 101) that types of knowledge (e.g. explicit or tacit knowledge) decide the way of establishing knowledge sharing and knowledge protection. In general, explicit knowledge is embodied in specific products and processes while tacit knowledge is collected through individual experience and organizational cultures (Inkpen & Dinur, 1998, p. 456). Explicit knowledge can be codified and stored in objective locations, hence, it has the potential to be acquired and accumulated by competitors (Lam, 2000, p. 490). However, if companies wish to protect it from unintended loss to competitors, they can adopt several formal methods supported by laws and regulations, such as IPRs, cross-licensing (Gnyawali & Park, 2011, p. 655; Jordan & Lowe, 2004, p. 246). In contrast, tacit knowledge is personal and contextual (Lam, 2000, p. 490). Saying in different way, tacit knowledge is sticky and extremely attached to organisation’s routines or individual members’ heads (Ipe, 2003, p. 344; Jordan & Lowe, 2004, p. 246). Hence, it requires close involvement and extended social contacts for competitors to capture (Jordan & Lowe, 2004, p. 246; Lam, 2000, p. 490). However, it is noted that tacit knowledge can be easily observed and imitated in some cases, especially when companies go for joint development alliances with the similar technology area (Bogers, 2001, p. 102; Norman, 2002, p. 181). In this case, losing tacit knowledge may lead to more negative consequences than explicit
knowledge (Norman, 2002, p. 182). This is due to the fact that tacit knowledge (e.g. technical know-how) is more likely to create competitive advantages for companies compared to explicit knowledge (Amit & Schoemaker, 1993, p. 33). Accordingly, several authors suggest that the more tacit the knowledge is, the more protective mechanisms the companies use (Jordan & Lowe, 2004, p. 247; Norman, 2002, p. 182).

However, it should be noted that knowledge, which is a part of organization's’ capability, generally can lead to superior performance irrespective of explicit or tacit knowledge (McEvily & Chakravarthy, 2002, p. 285). Explicit knowledge acquired from competitors may also result in new and exclusive knowledge for the company when combining with its existing unique knowledge (Zack, 2002, pp. 69-70). It is critical in high-tech coopetition where technology sharing is popular. Inkpen and Dinur (1998, p. 462) found out that the knowledge connected to “technology sharing” tends to be explicit and objectified knowledge since it is primarily embedded with product designs or particular manufacturing processes. Furthermore, although formal regulations can offer several mechanisms to protect knowledge as mentioned above, whether all critical knowledge is likely to be protected is still questionable (Ilvonen & Vuori, 2013, p. 220). Based on these points, we argue that although it is important to distinguish explicit and tacit knowledge to decide mechanisms used for controlling knowledge sharing (which will be discussed later in the Section 2.3.3.3 of “Under which conditions to share”) (Bogers, 2001, p. 101), what to share with competitors in coopetition should focus on the value of knowledge (Ipe, 2003, p. 345).

In this regard, Norman (2002, p. 181) emphasizes that the loss of valuable and core knowledge to competitors may cause the loss of company’s competitive advantage because core knowledge is considered as center for success of the company. He also states that the loss of non-core knowledge does not have much influence on the company’s capability to compete (Norman, 2002, p. 181). Therefore, companies are encouraged to protect their core knowledge (Norman, 2002, p. 181). These arguments are not completely convincing putting in the context of coopetition on the understanding that if each company tends to pursue its interest, the coopetition gets negative affects (Gross et al., 2004, p. 249). Hence, we conquer with finding of Fernandez & Chiambaretto (2016, p. 10-11) and suggest that decisions on sharing or protecting knowledge should consider the value of knowledge towards objectives of coopetition and appropriability from competitors (i.e. criticality and appropriability). Fernandez & Chiambaretto’s paper (2016) mainly focuses on “information”. However, we apply this article in “knowledge” issue based on Kogut & Zander’s definition (1992, p. 20) that information is “[…] knowledge which can be transmitted without loss of integrity”. Stenmark (2001, p. 3) also suggests that “information is one form of knowledge”.

We therefore propose that based on value of knowledge towards objectives of coopetition and competitors, knowledge can be critical (to alliance) and appropriable (to competitor). Knowledge is critical to coopetition if the knowledge is significant to coopetition’s success (Fernandez & Chiambaretto, 2016, p. 10). Knowledge is appropriable for competitors when the competitor is likely to be able to use such knowledge for other purposes (Fernandez & Chiambaretto, 2016, p. 10). To decide whether share or not share the knowledge, we apply Fernandez & Chiambaretto’s principle (2016, p. 10) as shown in Table 4 below. In essence, non-critical knowledge (to coopetition) should be protected. Critical and non-appropriable knowledge (to coopetition) should be shared to prevent coopetition’s failure. Critical and appropriable knowledge should be protected or shared with caution to avoid the risk of opportunistic behaviours from competitors (Fernandez & Chiambaretto, 2016, p. 24). It is suggested that companies may share critical knowledge to competitors but transfer it from “appropriable” to “non-appropriable” (Fernandez & Chiambaretto, 2016, p. 25). For example, companies may share “technical solutions” without any explanation on the steps led to such solutions (Fernandez & Chiambaretto, 2016, p. 25). Differentiating between
appropriable and non-appropriable knowledge normally depends on managers of the company (Fernandez & Chiambaretto, 2016, p. 26).

Table 4: Management of different types of information (Fernandez & Chiambaretto, 2016, p. 10)

<table>
<thead>
<tr>
<th>Appropriability</th>
<th>Criticality</th>
<th>Critical</th>
<th>Non-critical</th>
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<tbody>
<tr>
<td>Appropriable</td>
<td>Protection and Sharing</td>
<td>Protection</td>
<td></td>
</tr>
<tr>
<td>Non-appropriable</td>
<td>Sharing</td>
<td>Protection</td>
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3.6.2. Whom to share with: Relationship with partner and Trust
Researchers with relational view focus on the role of relationship with partner and the development of mutual trust in facing the tension between knowledge sharing and knowledge protection (Jordan & Lowe, 2004, p. 244).

Relationship with partners plays an important role in the control and coordination of alliance (Jordan & Lowe, 2004, p. 245). It includes two dimensions which are choosing right partner and becoming a good partner from focal company. We will focus on the first dimension rather than “becoming a good partner” since we assume that all companies studied will consider themselves as “a good partner” and act in an honest way. It is also due to the fact that there are not many articles discussed about this issue. However, “becoming a good partner” will be used as a link to the next part of Trust later.

The criteria to recognize right partner may vary but the most widely-accepted standard is the possible fit together (Jordan & Lowe, 2004, p. 245; Twardy, 2009, p. 7). It means that companies should choose partner who possesses complementary knowledge. Companies can also choose partners based on the experience of prior relationship between them that help promote cooperation (Norman, 2002, p. 185). Indeed, at the beginning of inter-organizational relationships, companies may have uncertainties when cooperating with each other if they have no prior relationship (Inkpen, 2000, p. 1032). Hence, previous ties can serve as the base for inter-organizational trust (Gulati, 1995, p. 92). Norman (2002, p. 185) suggests that a number of transactions in the past is linked to more trustworthy actions later. It can be said that companies with longer cooperative histories normally see each other less opportunistic (Parkhe, 1993, p. 803). In addition, prior relationship can provide basic understandings about each other’s values for further learning (Heide & Miner, 1992, p. 271). Beside choosing the right partner, the relationship with partner also emphasizes on the need of becoming a good partner from the focal company. Kanter (1989, cited in Jordan & Lowe, 2004, p. 245) stressed that “open communication and behaving in honourable ways” from focal company are critical to enhance inter-organizational trust. However, it creates “prisoners’ dilemmas” when actually being good partner invites opportunistic behavior from more selfish partners with little transparency and more competitive intent (Hamel et al., 1991, p. 93; Larsson et al., 1998, p. 285).

Due to the dilemma above, the relationship between partner is often explored with trust as the coordinating element. Trust is associated to the belief that words or promises from a partner are reliable and that partner will accomplish its obligations in the relationship (Inkpen, 2000, p. 1027). Trust can also be defined as “positive expectations about another’s motives with respect to oneself"
in situations entailing risks” (Boon & Holmes, 1991, p. 194). It contributes to the confidence in partner cooperation when facing risky situations (Das & Teng, 1998, p. 494). Competency-based trust and goodwill trust are two most popular types of trust discussed in inter-organizational literature. Competency-based trust refers to the belief in the ability to perform of partners, while goodwill trust represents the belief in partner’s behaviours that benefit both alliance and focal company (Norman, 2002, p. 183-184). In this study, we concentrate on goodwill trust to examine the risk of opportunistic behaviours from competitors in coopetition. When acquiring knowledge, trust serves as a means to enhance an open knowledge-sharing atmosphere (Bogers, 2011, p. 103). This is due to the fact that the decision makers do not feel the need of protecting themselves from opportunistic behaviours of partners (Blau, 1964; Jarillo, 1988; cited in Inkpen, 2000, p. 1028). Together with the growth of trust, the willingness to put oneself at risk and to commit to the alliance also increases (Inkpen & Currall, 1998, p. 11). As per Norman (2002, p. 184), the link between trust and structures to govern alliances has been popularly documented. When partners in the alliances trust each other, they will engage in trusting actions (Inkpen & Currall, 1998, p. 10). Trust actions lead to the reduction of safeguarding procedures and monitoring costs (Inkpen & Currall, 1998, p. 11), less usage of formal contracts, less detailed agreements and superior exchange of communication and information (Norman, 2002, p. 184). Hence, it can be stated that controlling structure and trust are alternatives (Nooteboom, 1993, p. 1001).

Connecting the above with the knowledge sharing and protection in coopetition, it is noted that a focal company with a high level of trust will have a low tendency to manage or limit the knowledge flows to its partner (Norman, 2002, p. 184). It is due to the belief that even when valuable knowledge is leaked to the partner, such partner is less likely to expose opportunistic behaviours that harms the focal company (Norman, 2002, p. 184). In the contrast, the lower trust the focal company has in the partner, the higher level of knowledge protection the focal company takes (Norman, 2002, p. 184). However, it is important to note that trust does not absolutely eliminate but partly reduce the need for knowledge protection (Argandona, 1999, p. 217; Norman, 2002, p. 184).

To conclude, relationship between partners and trust are factors that mediate the tension between knowledge sharing and knowledge protection in alliances by promoting an open sharing environment (Bogers, 2011, p. 103, Jordan & Lowe, 2004, p. 243). However, it should be noted that relationship and trust ask for the familiarity and mutual understanding, they are therefore subject to change depending on specific time and context (Nooteboom, 1996, p. 993).

3.6.3. Under which conditions to share: Under appropriate management

As mentioned above in Section 3.6.1 of “What to share”, nature of knowledge is in assistance of finding appropriate measure of controlling knowledge sharing (Bogers, 2001, p. 101). By different measures of governing knowledge, companies can decrease the risks and gather the benefits (Loebbecke et al., 1999, p. 20). In general, it is suggested that explicit knowledge is controlled by information systems while tacit knowledge is held by people-based management (Levy et al., 2003, p. 643). On the assumption that knowledge sharing is equally valuable (e.g. after considering what to share and whom to share with) and therefore adopted by both companies, several principles to manage knowledge sharing effectively are proposed based on types of knowledge. Using Yin-Yang principles to find a harmony between knowledge sharing and knowledge protection, we believe that knowledge sharing and knowledge protection are correlated and support each other (Mattsson & Tidstrom, 2015, p. 349). One force contains the seeds of the other (Mattsson & Tidstrom, 2015, p. 349). Hence, appropriate management of knowledge sharing may enhance knowledge exchange, at the same time, support knowledge protection and in turn, harmonize the knowledge flows.
The management of sharing explicit knowledge has three requirements of “contractual knowledge exchange contents and procedure, inter-organizational coordination by mutual adjustment, and intra-organizational planning and control procedures” (Loebbecke et al., 1999, p. 20). Indeed, the explicitness of knowledge allows companies to build comprehensive contracts so that contents and procedure of knowledge sharing are specified (Loebbecke et al., 1999, p. 20). Such clear contracts can boost an open and innovative atmosphere for cooperation (Bogers, 2011, p. 102). Contracts provide “mutual depending planning of intermediate deliveries” which requires regular meetings between partners to give feedback and to review corporate performance (Van de Ven et al., 1976, cited in Loebbecke et al., 1999, p. 21). Furthermore, contracts emphasize the importance of expected equivalence in performance of both companies. Hence, in case one company tends to decrease the amount and value of knowledge they share, the partner will require explanations and further contextual information covered by formal agreements (Loebbecke et al., 1999, p. 21).

Lastly, it is suggested that internal guidelines should be used to clarify and ensure that the internal company itself is compliant to the agreement and consistent with company’s interests. Companies should also keep track of competitor’s performance and modify where appropriate.

Besides, some formal mechanisms to manage explicit knowledge are proposed by several researchers such as cross-licensing (Gnyawali & Park, 2011, p. 655) and information systems (Fernandez & Chiambaretto, 2016, pp. 17-18). Cross-licensing happens when “companies holding overlapping patents license their patents to each other to receive the benefit of gaining access to another patented technology” (Baltes, 2003, p. 10). For example, cross-licensing was obtained by Samsung and Sony to enable knowledge sharing while protecting core knowledge (Gnyawali & Park, 2011, p. 655). They enhance product development by cross-licensing their patents (11,000 patents from Samsung and 13,000 patents from Sony), at the same time, sustain competitive advantage by excluding several core patents from cross-licensing (PlayStation architecture of Sony and home networking technology of Samsung) (Gnyawali & Park, 2011, p. 655). Information systems are also useful in balancing knowledge sharing and protection. Information systems can be designed as a common platform where it coordinates the knowledge flows by sharing critical information required by co-operation while preventing competitors from accessing confidential information of company (Fernandez & Chiambaretto, 2016, p. 17). Information systems also minimize the unintended loss of knowledge by limiting the involvement of people (i.e. team members) (Fernandez & Chiambaretto, 2016, p. 18). Finally, using information technology also accelerates communications with lower costs compared to face-to-face communications (Enberg, 2012, p. 773).

The management of sharing tacit knowledge is considered to be more complex due to the tacitness and reciprocity of knowledge. The tacitness of knowledge makes it difficult to identify the content and procedure for knowledge sharing while the reciprocity requires intensive collaboration between two parties to enhance the knowledge process (Loebbecke et al., 1999, p. 21). Accordingly, Loebbecke et al. (1999, p. 21) suggested that the control mechanism of sharing tacit knowledge is subject to three requirements of “close interaction in inter-organizational collaborative teams, managing dual commitment by rotating members of inter-organizational teams, and structuring intra-organizational knowledge flows”. In order to encourage two companies to work closely together, in turn, exchange knowledge effectively, project teams can be assigned. The project team spirit will increase the feeling of commitment among team members of both sides, however, there is concern that too much commitment may initiate the conflicts between team’s goal and company’s concentration (Loebbecke et al., 1999, p. 22). This complexity cannot be absolutely coordinated by formal contracts, but requires for “human-based strategies” (Loebbecke et al., 1999, p. 22). To balance the commitment from project members to the team and company, regular interactions between companies and project members should be made or project...
members should be changed regularly (Edstrom & Galbraith, 1977 & Hamel et al., 1989, cited in Loebbecke et al., 1999, p. 22). Lastly, companies need to control internally by utilizing the knowledge from coming-back project members while ensuring enough time for new project members to get used to with the project (Loebbecke et al., 1999, p. 22). Our study aims to find mechanisms for high-tech companies to balance the tension related to knowledge (i.e. knowledge sharing and knowledge protection) in coopetition. Hence, a project team seems come out as an obvious answer for our questions. However, how to further operate this team effectively (e.g. rotating members of inter-organizational teams, and structuring intra-organizational knowledge flows to utilise the knowledge from old members while training the new members) will not be elaborated.

Clear statement of work
In general, irrespective of tacit or explicit knowledge, it is suggested by Enberg (2012, pp. 778-779) that companies should have clear statement of work to balance knowledge sharing and knowledge protection. Clear statement of work provides details in planning and process, such as scope of cooperation, interdependencies between various parts and expected outcomes (Enberg, 2012, pp. 778-779). Based on those statements, members involving in coopetition can deal with different interdependencies between companies. Above of it, “a common understanding about the process of project work” is created which can facilitate an open yet systematic operation for coopetition (Enberg, 2012, p. 779).

3.7. Conceptual framework
In light of the above, we present herewith a conceptual framework used as the guidance to balance the tension between knowledge sharing and knowledge protection in coopetition. Our conceptual framework is mostly driven by Yin-Yang principles where opposing forces are understood in interrelated relations. Also in accordance with Yin-Yang principles, harmony is the approach to balance such opposites. Accordingly, the mechanisms to answer the research question is placed in the middle of Yin-Yang. However, adopting Yin-Yang principles to understand the tension between knowledge sharing and knowledge protection where high-tech companies cooperate with competitors, we find it significant to have a holistic view about the problem. Hence, we also put in the conceptual framework the circle representing the tension related to knowledge in coopetition.
As reviewed previously, we study coopetition at an inter-organisational level as a dyadic relationship between direct competitors where both cooperation and competition are involved (Bengtsson & Kock, 2000, p. 415). Accordingly, coopetition is a strategy where companies cooperate with competitors to maximize the value creation by enjoying the synergy effects from both cooperation and competition (Bouncken, 2015, p. 589; Brandenburger & Nalebuff, 1996, p. 16). The synergy effects are created through coopetitive relationships in which competitive situation urges companies in improving their activities to sustain competitive advantage (Boucher et al., 2013, p. 73), at the same time, cooperative manners allow the companies to benefit the complementary resources from partners (Dyer & Singh, 1998, p. 676). Our model begins with the drivers that makes coopetition to prevalent among high-tech companies. Because, this strategy assists them in coping with specific characteristics of high-tech industry including short product life cycles, technological convergence and high R&D costs (Gnyawali et al., 2008, p. 13).

To overcome the above specific characteristics in high-tech industry, it is imperative for companies to share knowledge or make knowledge available to others (Ipe, 2003, p. 345). Through collective learning, they may achieve several mutual benefits including innovation, competitive value, and the ability to access to competitive knowledge (Gnyawali et al., 2008, p. 11; Ilvonen & Vuori, 2013, p. 214; Keeble & Wilkinson, 1999, p. 398; Kock et al., 2010, p. 112; Zhang et al., 2010, p. 74). Although sharing knowledge in coopetition is valuable, it is potentially associated with some risks suggested in the literature; learning race, absorptive capacity, knowledge spillover and
opportunistic behaviours from competitors (Bogers, 2011, p. 96; Cheng & Tang, 2013, p. 241; Ilvonen & Vuori, 2013, p. 216; Norman, 2002, p. 178). Hence, while companies aim to access knowledge from coopetition and further formalize internally the complementary knowledge shared by alliance partners, they will also protect their core knowledge (Bounce & Kraus, 2013, p. 2061; Gnyawali & Park, 2011, p.651). This is in accordance with the knowledge-based view of firm in coopetition where protecting company’s core resources from being acquired and imitated from competitors is necessary to achieve competitive advantage and superior performance (Norman, 2002, p.180; Tidd & Bessant, 2014, p. 42).

Beside the purposes of preventing risks from knowledge sharing, mechanisms for knowledge protection can also serve as the basis for gaining company’s bargaining power and image. For example, protecting rare, valuable and interesting knowledge through appropriability mechanisms (e.g. patents cross-licensing) can turn a company into an attractive alliance partner (Hurmelinna-Laukkanen, 2009, p. 286; Hurmelinna-Laukkanen, 2011, p. 306). Knowledge protection also encourages networking and collaboration for innovation purpose on the principle that “the less the company has to worry about other organizations abusing it, the more likely it is to engage in different joint operations and share its knowledge more freely in joint innovation” (Hurmelinna-Laukkanen, 2011, p. 306). We therefore argue that knowledge protection can be an engine for coopetition and knowledge sharing later.

Based on the above discussions, we believe that tension between knowledge sharing and knowledge protection challenges coopetition success. Companies face the dilemma related to knowledge in which knowledge sharing (representing cooperation) is necessary so that mutual goals can be fulfilled, while knowledge protection (representing competition) is also essential to prevent exposing critical knowledge to partner (Ilvonen & Vuori, 2013, p. 211; Norman, 2002, p. 178). Knowledge sharing and knowledge protection need to be managed appropriately so that knowledge flow is provided enough to accomplish the common goals of coopetition (Norman, 2002, p. 178). Considering coopetition as a simultaneous pursuit of cooperation and coopetition, the challenges of companies are to extend knowledge portfolio by sharing knowledge with alliance partner, at the same time, limit absorptive capacity of competitor (Cohen & Levinthal, 1990, p. 128). The matter is not choosing between cooperation or competition but finding a balance for an optimal results of knowledge sharing and protection (Clarke-Hill et al., 2003, p. 10). We suggest that balancing the tension between knowledge sharing and knowledge protection can be achieved through finding the harmony based on Yin-Yang principles as suggested by Mattsson & Tidstrom (2015, p. 349). Our model is therefore placed on a Yin-Yang to call for the harmony between sharing and protection. The harmony is accomplished when both parties identify that processes of sharing and protection are consistent and well-matching (Mattsson & Tidstrom, 2015, p. 360). The processes also illustrate every dimensions of harmony (i.e. enrichment of products/services, synchronizing efforts from every partner towards common goals and bridging the needs of both parties with goodwill collaboration and commitment).

The center of Yin-Yang is mechanisms proposed to find the harmony between knowledge sharing and knowledge protection in coopetition. Our suggestion is based on important questions asked by several authors in order to achieve such objective: what to share, whom to share with and under which conditions to share (Levy et al., 2003, p. 642; Loebbecke et al., 1999, p. 15). The following answers serve as certain mediating mechanisms for companies in acquiring knowledge from external sources and sharing knowledge without fear of losing their competitive advantage (Alwis & Hartman, 2008, p. 137; Kogut & Zander, 1992, p. 631; Lau et al., 2002, p. 187). First of all, it is important to determine what should be shared in the alliance. Using information management principles from Fernandez & Chiambaretto (2016, p. 10), we believe that, when deciding to share or not to share, companies should consider value of knowledge towards objectives coopetition and
appropriability from competitors. According to the principles, knowledge can be critical (to coopetition) and appropriable (to competitors). Any knowledge which is not critical to reach the goal of coopetition should be protected. In contrast, knowledge which is critical to achieve coopetition’s objectives and determined as non-appropriable from competitors should be shared. Where knowledge is critical and at the same time appropriable, protecting or sharing with caution should be decided by companies. In this case, managers from companies play a significant role as a decision-maker.

The balance also concerns relationships with partner and trust elements. It calls for the consideration of choosing right partner and becoming a good partner from focal company. However, “good partner” creates “prisoners’ dilemmas” when inviting opportunistic behaviours from more selfish partners with little transparency and more competitive intent (Hamel, 1991, p. 93; Larsson et al., 1998, p. 285). Hence, trust is an important coordinating element. We concentrate on goodwill trust which represents the belief in partner’s behaviours that benefit both alliance and focal company (Norman, 2002, pp. 183-184). Trust here serves as a means to enhance an open knowledge-sharing atmosphere (Bogers, 2011, p. 103). However, it should be noted that trust does not absolutely eliminate but partly reduce the need for knowledge protection (Argandona, 1999, p. 217; Norman, 2002, p. 184). Furthermore, relationship and trust require for the familiarity and mutual understanding, they are therefore subject to change depending on specific time and context (Nooteboom, 1996, p. 993). It is also in accordance with one of Yin-Yang principles that the balance between opposing forces constantly changes and should be observed over time (Mattsson & Tidstrom, 2015, p. 349). In case there is change in relationship and trust between partners in coopetition, the balance between knowledge sharing and knowledge protection can be interrupted. Companies may choose only cooperation or competition instead.

Finally, we believe that appropriate management during knowledge exchange in coopetition can enhance knowledge sharing, at the same time, support knowledge protection, in turn, harmonize knowledge flows. This is due to the fact that two opposing forces (e.g. knowledge sharing and knowledge protection) are correlated and support each other (Mattsson & Tidstrom, 2015, p. 349). Nature of knowledge (i.e. tacit or explicit knowledge) can assist companies in choosing appropriate measures for governing knowledge. Several requirements to manage tacit and explicit knowledge are implied by Loebbecke (1999, pp. 20-22). Basically, it is suggested that explicit knowledge is controlled by formal information systems while tacit knowledge is held by people-based management (Levy et al., 2003, p. 643). Above all of that, clear statement of works and standardized forms are significant to balance knowledge sharing and knowledge protection, irrespective of nature of knowledge (Enberg, 2012, pp. 778-779). Such two factors can create a common understanding about tasks, make individual sense and facilitate an open yet systematic operation for coopetition (Enberg, 2012, p. 779).
4. Practical Methodology

In this chapter, we discuss the methodological framework of this study. We provide explanations of our philosophical standpoint and the reasoning behind the selection. We further review different research techniques and motivate the reasons behind our research approach, research design, data collection and data analysis techniques. In addition, we also argue on ethical considerations for our research. All our methodological choices aim at answering our research questions.

4.1. Data collection

According to Bickman and Rog (1998, p. 18), data are often described as falling into one of the two broad categories: primary data and secondary data. The term “primary data” refers to the data that is new and collected for the specific purpose, such as a specific study (Blaikie, 2009, p. 161; Bryman & Bell, 2011, p. 312). On the contrary, one could use and re-analyse secondary data that already has been gathered for other purpose than the one at hand and used as the basis of analysis (Blaikie, 2009, p. 161). Primary data sources for research can be from people (e.g. leaders, managers, program participant, and the public in general). While the secondary sources can include administrative records, management information, systems, and various types of document (e.g. prior research studies) (Bickman & Rog, 1998, p. 18). In accordance to Saunders et al. (2009, p. 268), secondary data is cheaper and does not require many practical arrangements thereby saving enormous resources (e.g. travelling expenses). However, the disadvantage is that the secondary data might have been collected for a specific purpose that is very different from the study you intend to accomplish, thus the data may not be useful for the particular study.

We consider primary data for our study. As discussed in knowledge gap, there is limited research with regard to knowledge sharing and knowledge protection in coopetition. Our aim is to explore the tension between knowledge sharing and protection and identify mechanism that can be used to balance this tension. Therefore, secondary data may not provide enough materials upon which we can draw inferences for hypothesis testing. Furthermore, with regard to our ontological stance of constructivism, we aim to explore our participants’ subjective meanings and perceptions of the subject (Saunders et al., 2012, pp. 170-172), as we deem this to be of beneficial for our study in terms of analysing the data.

Creswell (2007, p. 129) asserts that qualitative data can be collected through observations, interviews, documents and audio-visual materials. After evaluation of the aforementioned criteria, we decided upon using interviews for our study because you get the first hand information. Accordingly, Saunders et al. (2009, p. 320) indicate that the research questions, research design and research strategy should be linked to the type of interviews used. In similar vein, Neuman (2004, p. 161) suggests that data collection strategies influence research design. With this regard, the qualitative data collection method may be highly formalized and structured or informal and unstructured depending on the kind of question asked (Saunders et al., 2009, p. 320). Structured interviews, at times referred to as standardized interview, allows for the carrying out of an interview by an interviewer, which aims at giving interviewees precisely the same set of questions (Bryman & Bell, 2011, p. 202). Notably, is the idea that standardized interviews are always recommended if the purpose of the interviews is to generate findings that can be generalized over a population (Bryman & Bell, 2011, p. 204).

In contrast, when the purpose is to understand the perspective of the respondent and seek deeper meanings, unstructured interviews best applies (Bryman & Bell, 2011, p. 466; Saunders et al., 2012, p. 374). For our study, we apply what Bryman and Bell (2011) refer to as semi-structured interview. This is defined as a type of informal or non-standardized interview (Saunders et al.,
the researcher has themes and questions of interested area. We select semi-structured technique because it based on a question guide, the content of which will be asked to the respondent. According to Greener (2008, p. 89), since the questions are not fully structured, it gives the interviewee and opportunity to focus on the interesting areas of the study and further, the interviewee are also allowed to divert the questions. We also want our participants to express themselves freely to allow us to capture their insights and opinion.

4.2. Sampling technique
According to Patton (1980, p. 100), research question should determine what kind of sample is most appropriate for the study. Basing on our question and ontological stance, we aim to explore our participant’s subjective reasoning and perception towards the tension between knowledge sharing and knowledge protection when cooperating and competing at the same time. In this regard, in order to select our sample for participants to this research will use a non-probability sampling technique (Saunders et al., 2012, p. 287). One can further classify our sampling technique as purposive sampling, because we will select participants that our subjective judgements believe is the most suitable in order to answer our research question (Saunders et al., 2012, p. 287; Patton, 1987, p. 51-52; Silverman, 2011, p. 388). The goal of purposive sampling is to select a sample population of interest with particular characteristics, which will enable one to answer the research question (Tracy, 2013, p. 134). Our focus is high-tech companies which are currently involving in coopetition.

Neuman (2004, p. 121) asserts that purposive sampling is used in situations in which an expert uses judgement in selecting cases with a specific purpose in mind. Further, it is appropriate in situations where the researcher wants a unique case that it is informative and when the selected members of the sample are difficult to reach and the researcher opt to use subjective information like location and experts rather than a list of contacts available to the sample population. In addition, it can also be used when a researcher wants to identify a particular type of case for in-depth investigation. Therefore, purposive sampling provides the researcher with the justification to make generalization from the sample being studied.

4.3. Participants Selection
We aimed interviewing managers in high-tech companies currently engaging in coopetition. It is important to highlight that, due to the nature and sensitivity of our research topic, coupled with time and resource limit, gaining access to companies for the purpose of collecting data was very challenging. One of the reasons we received from our selected participants is that the companies are bound by privacy and they were not willing to reveal certain information regarding cooperating with competitors. This can be in accordance to Bryman and Bell (2011, p. 473) where he posits that gaining access and scheduling appropriate time to interview managers or senior level employees is a challenge. Therefore, in this regard, we decided to open our options and interview participants internationally. We selected our participants based on Neuman (2014, p. 121) arguments for purposive sampling that we can use this technique situation where the selected members of the sample are difficult to reach and the researcher opt to use subjective information like locations and experts. We selected multinational corporations (MNCs) which according to Williams and Lee (2009, p. 1378) are characterised by unity of control. The Multinational corporations control their business activities of their branches in foreign countries through the head office located in the home country. Therefore, management of the branches operate within the policy framework of the parent corporation. The reasoning behind this was to ensure that our data interpretation will not be affected by cultural difference in different geographical settings. Because of the central unit of control, the MNCs have a unified culture in the way they carry out their business activities across all countries.
In terms of company criterion, we based our selection on the characteristics and features of high-tech companies discussed in Section 2.1.2.1 of Chapter 2. This was to ensure that we did maintain our study focus on high-tech companies. With this goal in mind, we utilised all our networks to reach companies. Accordingly, we sent emails attached with interview request and recommendation letter from our supervisor to available companies. Then upon receiving any responses, we had a brief discussion with them to confirm whether they are qualified for interviews (i.e. the company is currently cooperating with competitors in any specific areas) and fixed the appointment for interviews.

We first targeted Uminova website to search for network of high-tech companies in Umea. Through Uminova website, we looked at the core business areas companies act on, then tried to reach them through contact provided. However, the challenge we experienced is that companies in Uminova are small size with just few employees, hence, most of them tend to focus on their core business rather than cooperating with competitors. We also screened companies through Linkedin, a business oriented social network services where we received mostly negative feedback with a few positive feedbacks.

Due to the low responses, we decided to use relevant contacts from our previous jobs to find participants. Both of us previously worked either in consulting company or telecommunication company. Hence, we had the advantages of having a network of companies to approach through our known contacts. Most of our interview participants came from this group of contacts as we were able to gain access to the companies and in addition they recommended the relevant person to participate in the interview where appropriate.

### 4.4. Interview guide

When conducting semi-structured interviews, an interview guide is often used (Bryman & Bell, 2011, p. 467). According to Tracy (2013, p. 143), interview guide refers to a less formal list of questions, which can be more flexibly drawn upon depending on situations of the participants. It is a representative of what questions will be asked and the order in which the researcher asks them. One advantage related to the interview guide is that it allows flexibility as the interviewer can ask other questions that are not included in the interview guide depending on the respondent answer (Bryman & Bell, 2011, p. 467).

We constructed our interview guide based on our research question and our theoretical framework. Firstly, we decided on themes to cover that will help us gather the relevant data that will answer our research topic, and then devised open-ended questions. We further ensured that the questions did not lead the respondent towards a specific direction as suggested by Saunders et al. (2012, p. 393), thus achieving neutrality. The themes we included in our interview guide are coopetition, knowledge, knowledge sharing, knowledge protection, the tension of knowledge sharing and protection and balancing the tension between knowledge sharing and protection. In addition to these themes, we also had background questions to get an overview of the company, and what duties and responsibilities our respondents are involved.

### 4.4. Conducting interviews

Our interviews were conducted within two weeks. Only two of our interviews were conducted through face-to-face, while the rest were conducted through phone calls, Skype calls and Viber calls. Bryman and Bell (2011, p. 489) suggest that phone interviews are suitable when access is hard due to the distance barriers. As mentioned before, we opted for multinational corporations in different geographical setting because of the difficulties we experienced in getting respondents;
therefore, carrying out face-to-face interviews was not possible due to limited financial resources. Although we employed different methods for our interviews, Abascal et al. (2012, p. 529) assert that while investigating the response difference in face to face and phone surveys, the results show no variations and researchers find common results regardless the settings. Therefore, our data collected was not affected by the different modes of conducting the interviews. This is because we also made observations from the voice, for example, picking up emotional cues like hesitations and fluctuations in vocal tone (Tracy, 2013, p. 140) when the respondent was talking about certain issues. With this in mind we believe that there is no variations whatsoever in our data.

During our interviews, we established a smooth environment to make our respondent feel comfortable by ensuring we had prior information regarding their company. According to Saunders et al. (2012, p. 389), it is important to gain the respondent trust and establish yourself as researcher. Therefore, we used the first few minute of the interview to talk about the participant company mainly to build trust and a conducive atmosphere with the respondent. This was followed by an elaboration on our research topics. However, we had initially sent an interview request with a description of our research topic, we felt it was necessary to elaborate more on our research topic to ensure that we were on the same page with our respondents. In addition to this, both of us carried out all our interviews together. According to Saunders et al. (2012, p. 398), interviewing can be a time consuming process. However, we believed that it was beneficial to conduct the interviews together rather than individually. Being both present at the interviews helped in terms of asking the main questions on our interview guide and asking the probing questions. Because both of us were present in all interviews, it was easy to discuss the responses and ascertain their meanings.

We further recorded all our interviews. According to Daymon and Holloway (2002, p. 179), recording is useful since it enables you to capture the exact words of the interviewee, inclusive of the questions. This means that you do not forget important answers and words afterwards. We used phone recording applications to record our interviews. It is important to note that all our participants issued us permission to record the interviews. Daymon and Holloway (2002, p. 177) assert that researchers need to ask permission to record when setting up interviews. Even if the consent has been given, it is not uncommon for participants to change their mind at the last minute, in this case their wish is paramount. This is in accordance with respect for autonomy, which includes choice and free decision with regard to informed consent of the participant (Daymon & Holloway, 2002, p. 178). We ascertain that none of our respondent changed their mind on recording the interview. However, some participants requested to remain anonymous and we should not include their names or the company names, we assured them that all names mentioned will be censored, so that they would feel comfortable and speak freely without fear of compromising the company's name. Because Saunders et al. (2009, p. 334) asserts that it is important to ensure the anonymity of interviewees, as it is considered a very useful measure to make respondents feel more convenient and talking freely.

Thereafter, we did a transcription of the recordings. Tracy (2013, p. 178) posits that transcribing in data analysis process facilitates close examination of data, which is imperative for interpretation. We transcribed the recording of the interviews immediately after the interviews so that we do not forget the important parts held during the interviews.

4.5. Ethical Consideration
The choice of research is normally governed by a set ethical consideration. According to Saunders et al. (2012, p. 226), these are the agreed behaviour of the researcher which gives guidelines to conduct a research in a way that it respects and values the participants in the study. The participants in this context are the people who are the subject of the study and anybody else who might be
affected by the study. If the researcher does not pay much attention and consideration towards ethical standards, then the initial thoughts for the research areas may fail and render the study impossible and challenging one commenced (Saunders et al., 2009, p.168). Therefore, we take into consideration the ethical standards that are important for our study with the aim of increasing the quality when answering our research questions which we discuss below.

4.5.1. Harm
Bryman and Bell (2011, p. 128) indicate that harm can be observed from different sides; either through affecting the participants’ confidence and growth or creating tension with regard to views and opportunities for the participants. We acknowledge the sensitivity of our topic, since it is notable and agreeable that knowledge is a critical resource towards innovativeness and achieving competitive advantage, therefore some of questions raised might create conflicts between the alliance firms’ perception of one another. In this regard, firstly, we did a thorough description of our topic, especially what it means by “Coopetition” to give our participants a clear purpose and objectives for our study and thereby making our intentions clear. By doing so we ensure that, no harm whatsoever may develop because of our study for both participants in coopetition and the participant were freely to make an informed choice.

4.5.2. Lack of informed consent
Saunders et al. (2009, p. 190) argue that if participants agree to participate with providing the researcher with data, it does not necessarily mean that they have given consents about how the data is going to be used. Basing on the nature of coopetition, where the information published may be of advantage to competitors or may in other way be conflicting towards the initial contractual agreements. We stated clearly to our participants that the data collected is mainly for academic purposes and personal data will not be revealed. Notably, according to Bryman and Bell (2011, p. 133), it is very challenging to present to the potential participants with all the information needed in order for them to make a well informed decision about their participation. Therefore, we took into consideration all the relevant information required such as time needed for conducting the interviews. Further, also let them understand that since the questions are open ended, then the time will basically depend on their responses. By doing this, we ensured transparency and truthfulness in our intentions because we intended our participants to be on the same page with our research purpose and we are not engaging in any deception about our study (Creswell, 2007, p. 142).

4.5.3. Invasion of Privacy
Invasion of privacy is critical when it comes to revealing the names and personal data of the participants (Saunders et al., 2009, p. 194). Maintaining the privacy and anonymity is essential for getting access to companies and participants. Therefore, researchers must be cautious and avoid any probable connections or identification of the interviewees or the company (Bryman & Bell, 2011, p.130). Another central consideration with regard to invasion of privacy is pressuring participants to get access to data. Saunders et al. (2009, p. 188) state that if a researcher forces his initial participants to take part in the study, then he might be causing harm. Therefore, one should be prepared to take rejections from participants. Basing on this, we kept all the participants’ identity anonymous and we did not use any information regarded as private by our participants. Further, we offered our participant enough information to make an informed decision on whether participate or not.

4.5.4. Deception
Saunders et al. (2009, p. 190) posit that deception is being dishonest about the main objectives of the research. For instance, using the information collected for other purposes rather than the ones mentioned in the study. In addition, deception can include the presence of a private connection
with another company that might access the data and use it for their own business advantage (Saunders et al., 2009, p. 190). It is advised that once the researchers have the access of the data from the participants, they should not change the purpose and objectives of their study without informing the participants. We took note of these arguments and our study objectives will not have any deviations from the stated objectives.

4.6. Data analysis

According to Saunders et al. (2003, p. 482), the nature of qualitative data has effects on its analysis. Qualitative data is based on the meanings in form of words, hence, the results of non-standardised data collection need to be classified into categories and analysis is conducted by conceptualization (Saunders et al., 2003, p. 482).

We use thematic analysis, a method for “identifying, analyzing and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 79), as our analysis technique. Thematic analysis is considered as the foundational method for qualitative analysis (Braun & Clarke, 2006, p. 78). One of the advantages of this method is the flexibility where it can be applied for a diversity of theories and epistemological approaches (Braun & Clarke, 2006, p. 78). Hence, thematic analysis is potential to “provide a rich, detailed, yet complex, account of data” (Braun & Clarke, 2006, p. 78). Accordingly, we follow 6 phases of thematic analysis as advised in the Table 5 below by Braun and Clarke (2006, p. 87).

Table 5: Phase of thematic analysis (Braun & Clarke, 2006, p. 87)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description of the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Familiarizing yourself with your data</td>
<td>Transcribing data (if necessary), reading and re-reading the data, noting down ideas.</td>
</tr>
<tr>
<td>2. Generating initial codes</td>
<td>Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code</td>
</tr>
<tr>
<td>3. Searching for themes</td>
<td>Collating codes into potential themes, gathering all data relevant to each potential theme.</td>
</tr>
<tr>
<td>4. Reviewing themes</td>
<td>Checking if the themes work in relation to the coded extracts (level 1) and the entire data set (level 2), generating a thematic map of the analysis</td>
</tr>
<tr>
<td>5. Defining and naming the themes</td>
<td>Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.</td>
</tr>
<tr>
<td>6. Producing the report</td>
<td>The final opportunity for analysis, selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.</td>
</tr>
</tbody>
</table>
Phase 1 – Familiarizing with data
Firstly, we prepared the data for analysis (Creswell, 2003, p. 191) by transcribing right after each interview was conducted. Although slow process is recognised as one disadvantage of transcription, it is the best opportunity for interviewers to get familiar with the interviews (Howitt & Cramer, 2008, p. 342). Also as per Bird (2005, p. 227), transcribing is the critical phase of data analysis in interpretative qualitative methodology. Accordingly, we converted interviews words by words into written data to evolve our thorough understanding of the data. After that, we read through the whole data set before moving to the second phase, at the same time, search for meanings and some patterns mentioned by interviewees to immerse ourselves in the depth of the content. We also believe that an overview about companies together with their specific competencies, and the role of interviewees in companies can be in assistance of bringing us closer to the data. This is due to the fact that we would have clear understanding about the examples or matters mentioned by interviewees later. In addition, since our research targets high-tech companies involved in coopetition, it is also necessary to understand how such companies are currently cooperating with competitors. Hence, “The companies & key competences” and “Coopetition in the companies” are the first sections presented in empirical results. Writing these two sections is one part of our efforts in getting familiar with the data. However, fully aware that interviewees may mention important information related to knowledge sharing and knowledge protection, the part of “Coopetition in the companies” was coded as mentioned in the next phase.

Phase 2 - Generating initial codes and categories
According to Boyatzis (1998, p. 63), codes relate to “the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon”. The initial codings tend to be a short note rather than a sophisticated analysis (Howitt & Cramer, 2008, p. 343). In this phase, we also need to organize the data by “naming segments of the data” and then forming into categories (Charmaz, 2006, p. 43; Creswell, 2003, p. 192). Since several conceptual categories were built before conducting interviews, our empirical results (Chapter 4) are presented based on categories of questions we have in the interview guide. These categories include Coopetition, Knowledge sharing, Knowledge protection, and Strategies to balance the tension between knowledge sharing and knowledge protection. These categories are reviewed and restructured to adopt the new ideas and insights if any from the interviews. To make it easier to follow, we further use some subcategories. For example, category of Knowledge sharing includes two subcategories: What knowledge is shared and benefits, and Formal systems and routines for sharing knowledge.

Coding can be done manually or using software on line-by-line basis (Howitt & Cramer, 2008, p. 342). However, where the lines represent too small units of words, coding per two or three lines is acceptable (Howitt & Cramer, 2008, p. 343). Bearing in mind that software specialised for qualitative analysis is in assistance of organising data on line-by-line, we initially used OpenCode 4.0 freely offered by Umea University for coding purpose. The advantage of this software is user friendly while providing basic functions of coding (e.g. assign codes, create memos). Hence, it is useful for people who do coding for the first time like us. Despite these benefits, after coding one example company (C2), we moved to codes manually for several reasons. Firstly, it is not flexible to adjust the text in OpenCode (e.g. bold or lengthen the lines to have more words in each line). Secondly, we cannot transfer lines from software to normal MSWord. The final and main reason is when reviewing codes, the software only shows one short original line instead of the whole meaningful sentence. Hence, it is rather time-consuming to recheck if the code is correct. The final reason is presented as below example.
Figure 3: Sample of coding using OpenCode software

Although we did not use OpenCode for coding purpose, this software provides valuable format to follow. Vogt et al. (2014, p. 56) implied that spreadsheets (e.g. Excel) are normally underutilized for organizing qualitative data by students. Excel is easy to study and adapt to requirements of qualitative analysis. It is also simple to include all questions or different parts of interviewing (Vogt et al., 2014, p. 56). Hence, we finally used Excel as our coding tool. An example of coding is attached in the Appendix 2.

Phase 3 - Searching for themes
This phase starts after coding and categorizing of data (Braun & Clarke, 2006, p. 89). We focus broader on potential themes which are distinguished and collated from different codes (Braun & Clarke, 2006, p. 89). A theme should capture important ideas to answer the research questions (Braun & Clarke, 2006, p. 82). It is noted that in qualitative analysis, the themes are based on authors’ judgement rather than “quantifiable measures” (Braun & Clarke, 2006, p. 82). At this stage, we already have a holistic view about data. It is recognised that when sharing and protecting knowledge in coopetition, companies may consider a lot of factors such as type of knowledge, who they have in the other side or their compliance towards regulations and company’s rules. It comes out obviously also with the questions 23 of “What strategies do you use to manage the process of knowledge sharing and protection?” where interviewees had chance to speak freely about strategies or mechanisms the companies are adopting. Hence, we used three potential themes which are What to share, Whom to share with and Under which condition to share together with several sub-themes. The final themes will be summarised in Phase 4 below.

Phase 4 - Reviewing themes
After finishing phase 3, a collection of candidate themes or subthemes is available for considering if enough data is provided enough to support a theme or any themes need to be combined or separated. Two levels of reviewing are involved firstly at the coded data and secondly at the whole
data set. It is significant that the candidate themes create “coherent pattern” and have strong validity not only when putting in the collated extracts but also when seeing thoroughly the data (Braun & Clarke, 2006, p. 91). The purpose of reviewing the whole data set is to ensure that the current themes make sense to the data set and any data within themes which may be missed in the earlier stages will be coded additionally (Braun & Clarke, 2006, p. 91). At the end of this phase, a thematic map is ready with a general idea of “what the different themes are, how they fit together, and the overall story they tell about the data” (Braun & Clarke, 2006, p. 92). The following figure demonstrates themes and subthemes we generated in this phase.

**Figure 4: List of themes and subthemes**

**Phase 5 - Defining and naming themes**
Defining and refining themes mean recognizing the primary content of each theme and “determining what aspect of the data each theme captures” for the last time (Braun & Clarke, 2006, p. 92). In this phase, we note the suggestion from Braun and Clarke (2006, p. 93) that we should avoid just rephrasing the contents of data extracts but need to further identify interesting points about them with appropriate reasons. Detailed analysis for each individual theme should be written with the consideration of fitting in the whole empirical data. Name of themes to present in the final analysis is initialized at the end of this phase. All above themes and subthemes were kept in this phase with supporting data from interviews, except for Subtheme 1 of Theme 1. Reasons for removing this subtheme is further discussed in our Analysis and discussion chapter.

**Phase 6 - Producing the report**
In this “write-up” stage, our aim is to provide “a concise, coherent, logical, non-repetitive and interesting account of the story the data tell” by choosing vivid examples to demonstrate relevant themes (Braun & Clarke, 2006, p. 93). Chapter 5 “Analysis and discussion” presents our final work after using thematic analysis. Only outstanding statements from interviewees are quoted in this part. The discussion also provides relevant theories to assist in clearly understanding empirical findings. Applying Yin-Yang principles in understanding and find solutions for the tension, we
also further elaborate if the mechanisms suggested are oriented by harmony with three dimensions of *Enrichment, Bridging*, and *Synchronizing*. Finally, a proposed framework is written to present our final findings.
5. Empirical results

In this chapter, we present our empirical findings. The chapter is in accordance with thematic analysis steps suggested by Braun and Clarke (2006). We present our findings in relation to our theoretical framework. We aim to present the result of our research on the tension between knowledge sharing and knowledge protection.

5.1. The company's background & key competences

According Braun and Clarke (2006, p. 87), the first step in thematic analysis involves familiarising with the data. We began with transcribing our interviews and present herewith a brief overview of the companies. The purpose is to get familiar with the background information of the companies and what industry they operate in. Further, we look at what key competences the companies consider as knowledge. Based, on our interview guide, this is first questions were important because we can highlight what knowledge the companies share while working together and what knowledge they protect accordingly. The table below represents the high tech companies in different industries we interviewed:

Table 6: Overview of companies studied

<table>
<thead>
<tr>
<th>Code of company</th>
<th>Industry</th>
<th>Title of interviewee</th>
<th>Country</th>
<th>Mode of interview</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Health Care</td>
<td>IPR Manager</td>
<td>Switzerland</td>
<td>Skype call</td>
<td>51’</td>
</tr>
<tr>
<td>C2</td>
<td>Electronics &amp; Software</td>
<td>Country Manager</td>
<td>Vietnam</td>
<td>Viber call</td>
<td>42’</td>
</tr>
<tr>
<td>C3</td>
<td>ICT</td>
<td>CEO and Founder</td>
<td>Sweden</td>
<td>Face-to-face</td>
<td>39’</td>
</tr>
<tr>
<td>C4</td>
<td>Telecommunications</td>
<td>Risk Control Executive</td>
<td>Sudan</td>
<td>Phone call</td>
<td>47’</td>
</tr>
<tr>
<td>C5</td>
<td>Robotic Simulations</td>
<td>Sales Executive</td>
<td>Sweden</td>
<td>Face-to-face</td>
<td>48’</td>
</tr>
<tr>
<td>C6</td>
<td>Data Analytics &amp; Software</td>
<td>Project Manager</td>
<td>USA</td>
<td>Viber call</td>
<td>35’</td>
</tr>
</tbody>
</table>

We will henceforth refer to the companies by the codes allocated to them respectively as shown in Table 6. This is due to the fact that most of our interviewees requested that we should not use the names of interviewees and companies for ethical purposes.

5.1.1. Company C1

Company C1 manufactures dental implant and CAD/CAM-based individualized prosthetics. The company is based Zurich, Switzerland. We interviewed the manager in charge of IPRs who works closely with knowledge protection (IP protection, trademarks, licensing, and trade secrets etc). She has worked with the company for two years. Her main role is maintaining intellectual property when the company is involved with any kind of buyout or when they need new technology to
complement their own. Therefore, she is very experienced in the area of knowledge sharing and protection.

Company C1’s main competences are the technological knowledge to manufacture dental implants, and products used to treat teeth loss.

5.1.2. Company C2
Company C2 manufactures and markets computer hardware, middleware, and software. They also offer infrastructure and consulting services. The company is based in Vietnam, and its headquarter is in USA. We interviewed the country manager which has been with the company for eleven years. Hence, she showed solid knowledge about the topic.

Company C2 has the capability in designing the whole project. They also have expertise, experience, and practices in electronics area. In addition, company C2 has technologies that has been proved in other successful projects for other countries.

5.1.3. Company C3
Company C3 develops system solutions which assist individuals and companies in travelling in consideration of economic, environmental, and social factors. We interviewed with the CEO of the company. He has been with the company for five years and has worked with several aspects such as technology development and business model. Company C3 is located in Umeå.

The key competences of C3 are in software systems, programmes, and codes. The company also has good connections with the government and the university thanks to previous working experience of the CEO.

5.1.4. Company C4
Company C4 is a telecommunication company providing a comprehensive range of mobile voice and data service. The company is based in Sudan. We interviewed the leader of risk control, business continuity and disaster recovery. He is currently working closely with risk management, recovery and control for the company. He has been with the company for one year but has 15 years of experience in the area of business continuity and risk control.

Company C4’s key competence is in trade secrets and data. The company is currently the leader in the market.

5.1.5. Company C5
Company C5 is a leading provider of software and services for visual and interactive physics based simulations. The company is based in Umeå and currently the global leader in vehicle simulation markets. We interviewed the sales executive manager who works closely with customers and the product developers.

Company C5’s key competence is the capability in the simulation solutions with a dedicated physics staff. They consider it as their core skill and competitive advantage. They also have detailed solutions for working with robotics.

5.1.6. Company C6
Company C6 is the leader in data analytics. They provide innovative analytics and data management software and services. They also offer consultancy in terms of analyzing data to determine the cause of failure or detect fraudulent behaviour. We interviewed the project manager
in consulting division. She has five years of experience. She works closely with customers and manages projects to implement solutions for customers.

Company C6’s key competence is in data analytics. The company works with big data and creating business solutions surrounding the use of data.

5.2. Coopetition in the companies

As mentioned in the participant selection, to gain practical insights about our topic, it was essential for us to interview the high-tech companies which are involved in cooperating with competitors. The criteria was communicated with companies in our interview request so that they can decide if they are suitable for the interviews. However, it was essential for us to understand clearly how the companies cooperate with their competitors by asking general questions on coopetition. Those questions also created the flow of the interview which in turn assisted us in gathering data for answering our research question. Hence, this part will describe examples where the companies work jointly with competitors together with the reasons and motives for them to implement such coopetition.

5.2.1. Company C1

There are three key companies competing with C1 in the dental field (e.g. sell implants, software solutions) namely Straumann, Densply and Neodent. C1 also has some other smaller competitors. Giving an example of coopetition, the company is currently cooperating with a competitor for mutual developing a dental software solution. However, since the project is in the negotiation period and the information was confidential, thus, further details are not provided.

C1 cooperates with their competitors on the consideration of market share.

“When it comes to cooperation it depends on having ideas, it is all about winning the market share in a particular field or technology.”

According to interviewee, the company has a diverse portfolio of technology. Hence, when cooperating with competitors, they also consider complementary technology:

“We have some technology that we are good at and others we are really struggling with. When it comes to cooperation, we always tend to focus on companies that have the strength that we lack. It is all about how do we collaborate with that company to get what they have based on what we have.”

When coming to the competitors who have large market share, the reason for them to cooperate is:

“There are competitors with the biggest market share, so probably what we do is look at what they have and what we have, and how can we bridge the gap to share the market that we are all in, or how to basically survive in the industry.”

5.2.2. Company C2

C2 is competing and partnering with most of the IT companies. Some main competitors serving in the same market include Vietnamese companies such as FPT; and other international companies such as HP, Microsoft and Apple.
Two examples are given to illustrate for the cooperation between C2 and competitors. The first example is the cooperation in a big project of government where C2 and competitors involved with several roles as required by government.

“One is we call “X”, it’s the modernization and transformation project of the Treasury and Financial system of Vietnam government [...] We are the primary contractor but for database, they use our competitors and they pick one local company for services.”

Another example is in a project serving for one of the biggest oil and gas companies in Vietnam. The customer needs to implement the overall system for their production and manufacturing control. Hence, new system needs to be implemented so that they can measure the output of the oil and then also be able to control the production as well as the resources. In this project, interviewee implied that:

“Similarly, we cannot do all of the job, we need the helps from other local companies, and other competitors. We provide the licenses while they implemented.”

As shown in the above examples and as stated by interviewee, in some cases, their customers will decide which competitors they partner with. Furthermore, they can also select competitors to cooperate depending on the requirements of capabilities and resources to implement specific projects. It is for “win-win purposes” as mentioned by interviewee:

“In some big projects with the government of Vietnam, they prefer to have, for example, set someone as the prime contractors, [...] subcontractors, or sometimes they will have the project owner. And because their capability doesn’t allow them to do the whole project, they have to outsource to us and also some other projects, we cannot do it ourselves, we have to outsource some parts of the job to other companies, especially in the services like you know sometimes they have the advantage of having local resources.”

5.2.3. Company C3
C3 has some competitors internationally. They also have some other potential competitors who were trying to sell similar ideas as theirs. Before giving one example on how C3 cooperates with their competitors, the interviewee clarified:

“Now we are selling our system as internal car to book systems, a booking system for company and then we have other companies who are competitors to us, but they don’t have the whole palette of services that we can offer. Because our idea is not offered specific service, our source is to offer services combine other services.”

Currently, they are working towards a cooperation agreement with an international group which provides rental car service and a lot of other services that are similar to theirs.

“So we want to integrate their service into ours and they want to cooperate with us [...] They have found that we are owning neutral platforms and they have their own services which they can sell to customers. And by working together with us, they can have a more complete offer to the customers.”

Beside considering the competences of competitors, interviewee also added that they cooperate with competitors based on customers’ requirements:

“Our criteria (to choose competitors to cooperate with) is that we should have a customer who is interested in some sort of cooperation between us and this other company. So either
they buy our services and they want to combine their service with ours, and then we can start to discuss cooperation with this other company; or we see that this company really has very good service that we would like to add to our service and then we can contact them.”

C3 pursues copetition to compete in a larger market with better service:

“By working together with competitors, we can together deliver service which we can compete with in a larger market. So by working together instead of fighting in this market share, if we can combine our resources and work together with them, we can together work in a much larger market and provide better service and compete better in that market.”

At the end of our interview, he emphasized the importance of cooperating with competitors is for market share purpose.

“And we decide that we are not interested in conquering the whole market. It’s better for us to divide market with a competitor which we have a good relationship to instead of having an aggressive competitor.”

5.2.4. Company C4

Main competitors of C4 are Safaricom and MTN in providing telecommunication systems. They share the same markets and customers. When asking about cooperating with competitors, interviewee mentioned that it is more on the competition side than on the cooperation side. However, they did the cooperation to some extents according to the local regulatory body’s requirements. The regulator may ask them to cooperate with competitors to “share common national transformer of the country” or to manage national crisis.

“They (the regulator) allow us to use equipment from our competitors’ side, to use other competitors’ gateway, or our competitors’ special LANs. We cooperate with our competitors during crisis and it is imposed by the regulators [...] Sometimes regulators have decided which competitors to share the facilities with”

In addition, interviewee also mentioned several reasons to cooperate with competitors including sharing the common risks of market, enhancing their capability, lowering the efforts and costs for them in production and R&D and in return, reducing the cost for customers. In which, sharing risks is considered as the most significant reason:

“In our case telecommunication business as one example, if we manage to cooperate with the competitors, it will save lots of efforts, lots of costs, maybe of production [...] If we cooperate, it will enhance our capabilities by providing us with other capabilities. And it will also enhance the weight of consumers. It will reduce the cost and also the budget that they face [...]”

5.2.5. Company C5

C5’s strongest competitor is Y, one Canadian company, in providing ingredients of physics engine. According to interviewee, their competitors provide the physic engine but they also provide much more on top of that, such as their hardware solutions together with the ingredient. In addition, the companies who integrate C5’s core technology inside such companies own solutions (e.g. via technology licensing) can also be their competitors in some aspects. This is due to the fact that sometimes such companies would like to build the same technology as provided by C5 by themselves instead of using C5’s products.
To give one example where they cooperate with competitor, interviewee mentioned about the cooperation with company Y in developing a product called Z.

“They (Company Y) have a full portfolio of simulators together with the ingredient of physic engine called Z, instead of other product which we have […] Our chief officer of technology here actually wrote that Z ingredient that they have. So here now together with us, we make the next generation of that product.”

C5 works together with competitors since they can build up the knowledge about market (e.g. robotics and maritime offshore markets) from their competitors while they can add power to competitors with their dedicated physics team.

5.2.6. Company C6

Some big competitors of C6 are Oracle, IBM and SAP. They also have smaller competitors such as Adobe. Since C6 has a lot of solutions for data management, they may have different competitors depending on what type of solution. Some examples are given where they work jointly with competitors:

“We compete with Oracle, depending on what they may have (e.g. data access engines) […] So that we can have the access engines, we can top to our software access. IBM is one of our biggest competitor but we work with them as well, because they have something that we need to run on top of the software. Or even SAP.”

As can be seen above, they cooperate with competitors based on which capabilities the competitors have. Among those capabilities, the relationship which such competitors have with customers may count:

“…depending on how deeply that competitor works with the customer, because they might have a team already. Even our division, we would work with IBM on delivering a solution to a customer in which case we are their partner.”

The main reason for such cooperation is to reduce the cost to build solutions so that C6 can have opportunities in providing services for them.

“Basically we build our solution and it is very costly. […] It will be very difficult to penetrate if we do not create sort of this access engine. Because otherwise if they (customers) buy our solution then they will have to buy brand new stuff, or license somewhere else, or buy hardware which can be extremely costly. So the way that we work around is to create this access engine so that our software solutions can top to those as well.”

5.3. Balancing the tension between knowledge sharing and knowledge protection in coopetition

5.3.1. Knowledge sharing

What knowledge is shared and Benefits

All of our studied companies agreed they share knowledge with competitors to gain what they could not achieve if they worked independently as a company. However, it was noted that some companies are willing to share their knowledge more openly and freely while other companies have restrictions on how much knowledge they share and what benefits they get.
**Company C1**
They are very willing to share their knowledge. However, it depends mostly on what they lack as a company and what they cannot produce by themselves that will help them win a bigger market share. When sharing knowledge with competitors, company C1 benefits in terms of knowledge that will help them win a bigger market share. They gain new innovative ideas that they can incorporate with their own knowledge to innovate more unique products.

“It is all about winning the market share in a particular field or technology, the company is not willing to share the idea unless they are lacking something within the portfolio that would be very interesting for us to gain to a bigger market. The idea that we are trying to acquire is actually what we gain for example how to a process, what kind of process or breakthrough ideas that can re-evaluate how we think”

Basing on C1’s quotation, we find that the collective learning, innovative ideas, and competitive value are some of the benefits that C1 gains when cooperating with competitors. Therefore, the company uses coopetition strategy as a means to survive in the market.

**Company C2**
Company C2 shares knowledge with competitors when working on a specific project. Normally, the customers require them to cooperate with particular competitors to incorporate different software that the customers want. They only share the ideas or provide license while the technology still belongs to the company. Nevertheless, they also acknowledge that the competitors have knowledge that compliments their own knowledge (e.g. local resources). Thus, they also benefit from the alliance. Therefore, company C2 benefits is also related to collective learning in order to deliver products for customer.

“If we do not share the knowledge, then we do not know what to do and how to do it, so the project cannot be successful”

**Company C3**
Company C3 is also very open when sharing their knowledge with competitors. Because they believe when they share knowledge, they gain something better that increases the value of the company. It is on “give and take” basis.

“We are sharing then we can get something back from them. They must have something we are interested in, so we have to get something and give something away.”

**Company C4**
Company C4 shares knowledge with their competitors because it is a requirement from the regulators. Therefore, they are strategic on what they share. However, company C4 acknowledges that regardless of the regulators requiring them to cooperate with competitors, they have other benefits they get when sharing knowledge with their competitors. From C4 response, the company benefits can also be considered as innovativeness and competitive value.

“We give information that would benefit us, the competitors, and the regulators. But at the same time will not harm our company. We gain in terms of accelerating delivery of new products and services, and maximization of the value of new initiative for business innovation.”

**Company C5**
Company C5 shares the theoretical knowledge on the physic solutions they have. However, the knowledge on how to program and hard-code such solutions considered as their core skills is not shared. As per interviewee, the primary reason is it becomes too risky for the company where the competitors might end up knowing their codes. The company gains in terms of innovative functioning of simulation because their solutions run in the competitors’ high technology machines.

“We share theoretical knowledge [...] But there’s sometimes the competition who should do the implementation and own the code, and we would of course like to own everything that has core physics to do.”

Company C6
Being the leader in the market in data analytics solutions, C6 does not want to share their core knowledge with competitors. However, some of their programmes need to be integrated with the competitor’s software, in this vein, the company partners with competitors to solve the customer's problem. C6 response to what they benefit can be associated with collective learning. Where they lack knowledge in some areas and they need the competitors’ knowledge in order to satisfy the customers.

“When we work with our competitor is more on out of necessity and creating the synergy so that we can help the customer. So it is not so much that we want to work with them in that sense, but because we cannot do it by ourselves depending on where they are in implementing the life cycle in that particular software solution.”

Formal systems and routines for sharing knowledge
In order to find out how companies exchanged their knowledge when working jointly together we asked the interviewees if they have any formal systems and routines for sharing knowledge. It was evident that non-disclosure agreements (NDAs) is the most preferred formal mechanism for sharing knowledge. The companies indicated that when a they have a detailed NDA then the competitors cannot use the knowledge shared to harm the company. Therefore, it was important to be critical when drafting an NDA and taking into consideration all the aspects that will protect the company’s core value. This is illustrated by the response from C1 which was similar in most companies.

“First of all before we go into details on what the project is about, we have NDAs. This is the key before entering any kind of discussions [...] NDA is more like a formal governing agreement that allows us to know that we are protected, and whatever we discuss here will be of mutual beneficial to all parties.” (C1)

Company C4 revealed that they have no specific formal systems to govern how knowledge is shared when cooperating with competitors. In their case, they have regulatory bodies in charge of overseeing how the competitors work together. However, they acknowledge that controlling cooperation and competition is quite challenging.

“Whatsoever attempts in some narrow areas is governed by the regulators. The truth is there is no matrix that can be used to regulate or control the cooperation with your competitors. But in our case it is done by the regulator. For example, we have National Telecommunication Corporation that regulates how we work with our competitors.”
Similarly, Company C5 response was different from how other companies reasoned. The company indicated that they try to use informal routines such as trust by stating that they are “selling the trust in scientific correct technology.”

Company C6 have global forums they attend to discuss the progress on projects. In addition to this, they have project teams who are in charge of particular projects with the competitors.

“We have a global forum. So the global forum is where we share knowledge from the technology point, we have also to present the solutions that we have for our customers.”

5.3.2. Knowledge protection

The interview questions in this part were designed to go through why and how companies protect their core knowledge when cooperating with competitors. As argued in the theoretical framework, the risks associated to knowledge sharing that prompt companies in coopetition to protect their core knowledge, which in turn leads to tension. With questions in this section, we sought to explore the tension between knowledge sharing and knowledge protection in practice. Our first question was on how the companies evaluate the cooperation part of coopetition (i.e. knowledge sharing) so that creating a chance for interviewees to mention about the tension if any. We also wanted to find out if the knowledge shared between competitors was enough to sustain coopetition.

Most companies we interviewed said that they work together with their competitors on specific projects. Therefore, evaluation of the cooperation part of coopetition (i.e. knowledge sharing) was done differently depending on the project.

Company C1

Company C1 does the evaluation before starting to work together. Being a leader of dental implant high technology products, they are aware of the risks involved, therefore, they perform a screening on what the competitors offer before committing to the project.

“What we do is that we go out there, we do such e.g freedom to operate, what have they said, have they already communicated the idea to someone else? What is the value of the information we are getting? There is a lot of analysis done even before the negotiations and within the negotiations even before we start the knowledge sharing”

Company C2

Company C2 carries out the evaluation from the customer's perspective. As mentioned earlier, it is the customers who decides which competitors they should cooperate with. Therefore, when the customer is satisfied with the end product, then the coopetition was successful. Similarly, company C3 also evaluates the cooperation part based on the customer's satisfaction. In their case, they set up a case together with competitor, then they become corporate partner where they work together. They acknowledged that there are a lot of problems when cooperating and still customers don't get satisfied. In addition, C3 make more formal agreements on how they are going to work together and what they will get from this cooperation.

“[…] each project we have quite clear description of the role of each partner in the project, it can be easily measured which part is not working right or what should be fixed, or in what stages that we need to relook at. So I mean based on those merits, and also we have review of the project, the customers themselves will be the one who say whether the work is done or not. And also, you know, it’s reviewed quite frequently, so anytime it doesn’t work, it will be shown.”
Company C4
Company C4 evaluates the cooperation part of coopetition by looking at what they have gained when they started working together. Since it a requirement by the regulators to work together with the competitors, they also play a role to ensure that the cooperation is successful.

“We have a well-established cooperation, but generally, in because of the growing markets, this cooperation model is expected to be successful and to empower business. Considering the benefits, considering saving on research and development in addition to establishment of very costly infrastructure that deliver products to and services for competitors, then we tend to cooperate more, otherwise, each competitor is trying to hold relations towards personal goals.”

Company C5
Company C5 have an annual meeting to evaluate the performance and how they can make the alliance more beneficial.

“We do have fundamental agreement that OEM partner agreement with all our middle level clients. And in that, now they have added one section said that we should sit down once a year to discuss the alliance and how we can make it more beneficial, how we can business develop it and pinpoint the top five most important end customers of the middle level provider”

Company C6
Company C6 evaluates depending on the success of the project, however they also have in between meetings with the competitors to discuss on the project progress.

“It depends. Like when the project is successful and then it was good. But, then again there sometimes that not all projects are successful. In that case, we do call them our partners and we work with them very closely. And we have a separate group like a division to manage nothing but the partners.”

Risks of knowledge sharing
In order to understand the risks of knowledge sharing, we asked the companies if they experienced any conflicts when working jointly together and what caused the conflicts. The question was intended to grasp the risks the companies face when working together with their competitors. All the companies acknowledge that working with competitors is a challenge and they face risks. The risk observed in the companies we interview was mostly associated to opportunistic behaviour and knowledge spill over.

Both C1 and C2 responses had similarities. The companies indicated that the competitors take advantage of the knowledge shared during meetings and proceeds to produce products that benefit only that particular company. Thus, evidence of the risk related to opportunistic behaviour and knowledge spillover as shown by the quote below from C1.

“It’s always a risk. They do copy and they sale them and we cannot do anything. Then we are in meetings together discussing about projects, about what is going to happen in the next 5 years. But the next day you find they have copied the idea and released it. [...] It becomes very difficult to monitor this thing or even litigate this thing. My view is that, if you are going to share any kind of knowledge it is a risk.”

C4 answer to this question also further highlight the risk of knowledge spillover, however, in their case, they see it more in terms of staff movements to the competitors. When a staff involved in
certain projects transfer to work with competitors, then the risk of the stuff sharing the company core knowledge is also prevalent.

“Sharing your innovative technologies with your competitors is a risk. I can benefit from the cooperation through sharing of innovative ideas, in cost reduction, enhancing customers’ welfare, reducing environmental impacts. All matters concerning the impacts of environment. But I have to look at the risks before sharing.” (C4)

C5’s response highlights the risk of learning race, where the company wants to go directly to the end users with the knowledge acquired from collaborating thus benefiting more.

“There is conflict because as I said, we want to try to run directly towards the end clients. So that’s one way of and the conflict is of course I steal business from the resellers if we work directly with them (end-users).” (C5)

Company C3 and C6 indicated somewhat different responses from the rest of the companies. the risk was mainly linked to the competitors not being able to deliver their part of the agreement thus making the company to lose their customers. For C3, the risk was more related to the competitors not delivering their end of bargain. While for company C6 the risk was more linked to controlling the cooperation and the nature of solutions to be shared.

“Risk depends on what solution is built. Sharing your IP is a risk. Basically the conflict is about the corporate control, the process is complicated. Mostly that is the source of conflicts. Because every big company or every company is kind of marrying, the two process even within the companies or more or less between cross companies.”

What to protect
Further, we also asked the companies on what knowledge they felt more or less willing to share with their competitors and how they protect knowledge. The risk associated to knowledge sharing is what motivates most companies to protect their knowledge; therefore, these questions were designed to help us explore how companies sustained the uniqueness and value of their technological competence in practice while cooperating with competitors.

From the responses, all companies are not willing to share their core knowledge with the competitors. Thus, that is the knowledge they protect when working jointly together. The companies also use IPs and licensing as a formal knowledge protection mechanism, in addition, the companies have a detailed NDAs to protect their core competence from being used by the competitors when working on specific project. This was observed across all the companies.

“The only thing that can protect you is the NDA. If you don’t have a NDA, then of course it is a bigger risk. so it is the protection of knowledge where you just have the NDA which would protect you and once you have come up with a project, come up with the idea, you have to specify it in the NDA who gets what kind of knowledge protected. Like if you come together to develop an idea, who gets the patent, and how do you share the royalties of the patent? In what percentages to share? And how do you evaluate that? The value of the patent in the market etc.”

Based on the responses from the companies, in as much as all the companies acknowledge the benefits they get when sharing knowledge with competitors in different project. They are not willing to share the company’s key competence. The knowledge that provides the company with the advantages to compete in the market is protected. However, not all the knowledge can be
protected. To avoid this challenge, the companies devise a detailed NDA as an additional protection mechanism to shield themselves against the risks.

5.3.3. The balance
The two above parts have provided us with the companies’ insights about tension related to knowledge (i.e. knowledge sharing and knowledge protection) in coopetition. For example, interviewees shared their opinions about the benefits and risks of sharing knowledge as well as the reasons for protecting knowledge. Furthermore, those parts also give us an idea about the way the companies share and protect their knowledge when cooperating with competitors in practice. The next questions (i.e. from number 20 to 25) were designed for the purposes of gaining our deeper understanding about the specific mechanisms or strategies each company is adopting for exchange of knowledge. We also added some elements, such as relationship and trust, that affect the companies in finding a balance between knowledge sharing and knowledge protection in coopetition as mentioned in literature review part. Furthermore, interviewees can freely talk about the other influencing factors (if any) with questions 24 and 25 given. We find it would be interesting and useful to know about their points of view regarding such issues so that we can in turn propose a comprehensive framework for our topic.

Accordingly, the relationship between company and competitors, and trust will be first discussed. Specific mechanisms and strategies followed by the companies together with potential factor influence on such directions will be present in the end of this part.

5.3.3.1. Relationship and Trust

Relationship - Case by case and people-based
In this part, we aim to understand how the relationship between company and competitors, and investigate whether such relationship has any influence on the way they share and protect knowledge. When describing the relationship, most companies interviewed implied that it is case by case and depends on scope of each project. Furthermore, they considered it as the relationship between people rather than between companies. Some of them also mentioned broadly that they try to maintain good relationship with competitors they work with, at the same time, extend the network to other companies.

Company C1 described their relationship with competitors as following:

“It depends on the scope of the project and sometimes we can have long term relationship. However, I cannot say that we have a long term relationship with our competitors because most of time it is based on case by case.”

Interviewee from C1 also mentioned that they have relationship with some competitors for a long time before they worked jointly together. However, it is interesting to find out that such relationship does not ensure the smooth collaboration between them. In addition, the interviewee also gave an example to clarify her idea. The relationship mentioned below is built between individuals rather than between companies. This was also observed in C2 where the relationships are also based on particular projects depending on the situations.

“Some of them we have had a very long relationship with them, but we have also sued them or paid a lot of money to them. Some we do not, it is a chain. It’s back and forth. [...] For example, this year we can collaborate very well together with the CEO of the other side. The next time he probably moves and the new CEO just wants to sue us. It changes every other year, it’s all about the relationships you have heard in the past.”
C3 also builds relationship based on specific project. However, in their case, they indicated that the relationships are people based and not the company. They further outlined that honesty in such relationships is important.

“I build relationship not with the company. I build the relationship with the person who are representing the company and then you try to adapt. You give something away, then you get something back. [...] I give away this information to you, but there’s thing that you don’t tell others”

C4 only cooperates with competitors as required by regulators. So when talking about relationship with competitors, the interviewee also stated that it depends on project.

“We consider ourselves as the market leaders in terms of capabilities, in terms of knowledge, in terms of technological innovation. Therefore, our company is cooperating with competitors as a requirement of the regulators.”

C5 utilises reference from other companies where they have long-term relationship to select the competitors to work with. Interviewee also indicated that as a software company, they cannot only maintain relationship with one exclusive company but need to extend the network.

C6 emphasized on the importance of relationship where they actually have a separate department in charge of maintaining relationship with other competitors.

“We have a dedicated business unit dedicated to the partners like Oracle, IBM, we see them as part of our ecosystem. We try to maintain a good relationship with them definitely.”

**Trust**

All companies cooperate with competitors with trust. They partly believe that competitors will not take actions which harm the companies and the relationships (i.e. *Goodwill Trust*). However, most of interviewees also showed their concerns on this issue and implied that trust should have limits. It means that everything needs to be controlled under agreements.

C1 considered trust as the most important factor even at the beginning when two companies working together. However, they do not completely trust competitors to avoid potential problems. They showed concerns regarding trusting competitors because they believe that trust is an issue especially when you do not have the opportunity to walk away. Similarly, C4 believes that trust is critical however they also trust with governing documents (e.g. NDA). Interviewee gave an example on the issue of their staff re-employed by competitors. During staff movement it is hard to monitor what kind of the company knowledge they can share to their competitors therefore, they control such issues by issuing NDAs that they employees have to sign before moving.

“Trust is very important. It is like number one. Before you even go for negotiations, when you are thinking like how are we going to generate this idea or work together. Before you even invite someone for a strategic negotiation, you need the trust. But you cannot trust them as much as possible, you never know what you are getting into if something happens.”

Interviewee from C2 initially did not agree on the existence of “trust” in business. She in turn elaborated that the company mainly trusts on partners’ capabilities (e.g. *Competency-based Trust*).
But when it comes to trust generally in business (e.g. Goodwill trust), they only do if clear statement of works is provided.

“No, there isn’t such a thing called trust. I mean, you trust that you have good product, you have good partners. [...] You trust them when you do business but to be clear to protect the benefits of the company and to protect yourself and to protect the company, to protect the project team, you have to have things in black and white. [...] When it comes to competitors, when it comes to IP, everything has to be in written.”

Basically, C3 trusts their competitors. However, C3 usually asks people around about one company they (plan to) cooperate with. They also recognize the dilemma of this issue when some of information may not be the truth. Hence, they implied the role of good network in finding the appropriate partners.

“"I try to trust them. I trust them as far as they prove something else but I do make round check in the network and see. We can ask people what experience do you have from them and so on. [...] For example who knows anything about this company or this person that I’m gonna talk with, are they honest or can you rely on them. [...] It’s important to try to have a good network within the field where you are working so that you can round check.”

As mentioned above in the part of knowledge sharing, C4 also mentioned that they only share knowledge when they believe that competitors also act the same and will not use such knowledge against the company.

“"Of course it is a dilemma. Because I cannot share my knowledge unless I am confident and trust that the competitor will also share their knowledge. And that the competitor will not misuse my information to harm me.”

Same as other companies, C5 cooperates based on trust. However, interviewee suspected that not all of other companies are honest. During the interview later, he also showed the concerns in finding an effective governing system so that they can benefit more from the collaboration.

“We build more less everything on trust. But that’s also a problem. Because as I said, we cooperated based on first that is fixed license price per year to develop with our technology. Then we have a commercial license for reselling, that’s another way. And we hope that reselling part should be hockey stick to go like this, that becomes thousands of products, thousands of licenses. But we haven’t seen that during my 3 years. [...] It’s a tricky situation.”

Final company, C6, trust competitors when working together. However, they act cautiously.

“I would say if we do not trust them, then we will not work with them. But only to the extent that you can trust your competitor. Of course when we have to work with everything we always proceed with caution.”

5.3.3.2. Strategies to share and protect knowledge and influencing factors

Various strategies to share and protect knowledge

We found out the diversity among companies interviewed where some companies clearly take strategies to manage knowledge sharing and knowledge protection for the cooperation while others do not. Strategies may include NDA, information systems to control and manage knowledge, internal procedure with the reviews from different management level and a project team with clear
vision about the project. Open communication about goals is also mentioned as a way to facilitate a smooth collaboration between company. In addition, most of company believe that work-in-progress meetings are necessary. However, the frequency of meeting is ranging from rarely to regularly, except for one company where they would like to have meetings to evaluate the collaboration but have not had so far.

For those who do not have specific strategies, it is due to the fact that either the size of company is small, or the company does not have many collaborations with competitors.

**Company C1**

C1 demonstrated a consistent strategy when working with competitors. They first base on the goals of the collaboration, then adopt NDA and IP as the most important parts.

“When you get into a project, it is all about the money, as long as you are going to gain money, you tend to lean towards goals, or milestones that will not make you walk away. If you have IPs and NDAs, NDAs are very important, it is the number one thing that you should have if you are going to share any kind of information to anyone, not just your competitor but anyone; and then if you have an IP because it is concerned with the patent of what you have.”

Interviewee confirmed that they concentrated on drafting NDA as a strategy to govern the knowledge sharing and knowledge protection in coopetition. Furthermore, since the interviewee from C1 is working as an IPR manager, she could also give valuable information on the way they tailor NDAs, for example, NDA should cover as broad as possible to protect their knowledge. Although we do not focus further on the details of NDA, we still find the following information is very useful in understanding how NDA works.

“We have an idea where we are sharing with someone, we decide this part of the invention will be protected by us and the other part will be protected by the other party. [...] Basically what we do is that within your NDA, we have clauses that govern that all the ideas would be protected by certain parties. Sometimes who is going to cover the costs is also very important. Our strategy is to draft the NDA to a point where you are very broad. It is better to be broad than to be narrow. Cover as much as possible because you do not know how the market will look like in 5 years time. Therefore, our strategy is basically we work very hard on our NDAs.”

When mentioning about the way to facilitate a smooth collaboration with competitors, interviewee considered open communication as the most important factor.

“The most important thing is to communicate about your goals, communicate openly about what you want to achieve. If people come in with hidden agendas, usually it becomes very difficult. [...] Therefore, it is important to be open about your goals. If you go silent then the other party will feel like something is amiss. So it is very important to be open about what your goals are, what are the milestones and actually how much time it will take to implement what we trying to achieve.”

In fact, they have regular work in progress meetings to check the progress of the project, taking patent filing as an example.

“We do (have meetings) a lot. Sometimes we brainstorm to see the process of the project. Some of these projects have timeline because we want the product in the market at a particular period of time. We have to file a patent for example on the idea, we need to have
the all information over a period of time so that we can file the patent. [...] So that we can always proceed in a smooth way.”

Company C2
When asking about which strategies they used to manage the process of sharing knowledge in coopetition, C2 emphasized on the role of regulations.

“It’s not strategy, it’s more regulations. If you say about strategy, of course, it’s always you know you don’t share too much, you have to be the primary contractor, rather than the sub-contractor. That’s the strategy always. Whether we’re able to do it, it’s the problem. So it’s more regulations, it’s more company’s processes that regulate the sharing rather than the strategy.”

To be more specific, interviewee referred regulations to NDA and the company’s rules as well as local and international law. She also indicated the importance of reviews from different management levels in the company.

“We have the long NDA process for each of the project. Each time we say anything in any project we have to be reviewed by the legal. [...] for any such involvements, we have to have legal, the project managers, the company’s general manager and the product manager that have to sign in those agreements and it’s reviewed. So that’s why we have, we need legal in all of such things before we share anything with customers, or with partners or competitors to make sure that we don’t violate the regulations, the company’s as well the local or international law.”

In contrast to C1, C2 does not meet competitors regularly. They only do where necessary.

“We don’t do it on regular basis. Of course, I don’t work with Oracle or HP on regular basis. Like ok, they come to our office, we come to their office very rarely, just like because in project where clients require us with each other, or we don’t have that technology, we don’t have that capability, then we have to return to them. Otherwise we will do it actively.”

Company C3
When being asked about what strategies they use currently to share and protect knowledge, interviewee talked more about the general strategy to have an agreement with competitors before going to clients. Their strategy is that they let the competitors talk first, then they can arrange for a collaboration.

“You should try to let the other counterparts describe their situation and their needs. [...] So if you can get that sort of talking going, then at the end you can evaluate at the end. [...] Maybe it’s stupid that we go to customer and compete. Maybe it’s better that we together go to the customer and then deliver something. [...] And together we can compete better towards these other guys.”

This is due to the fact that C3 is a small company so as mentioned by interviewee, they do not have policies to manage such issue. According to interviewee, it depends on the size of the company and the company should have specific policies when the number of people grows.

“Now we are not so many people so I mean we work with this way. Further on, maybe you can work another way, you have more policies about how it’s supposed to work with competitors, or how much knowledge can share and so on.”
C3 also indicated that they have regular meetings with the competitors they work with.

**Company C4**

C4 uses information systems to classify and manage knowledge sharing and protection. They also have a unit specifically in charge of collaboration issue to assess the potential risks. When coming to information sharing, approvals from different management level in the company are required. Accordingly, people needs to follow internal process before sharing any information.

> “We have companies’ systems for authorisation, like controlling information sharing through information security classification and information security management. We also have an internal cooperation committee. [...] So we do internal control and assessment on what we are going to share through our risk assessment. [...] Some information you actually need authorisation before you can even share it.”

**Company C5**

In fact, C5 does not have many projects where they cooperate with competitors, hence, no specific strategy to govern the knowledge sharing and knowledge protection is provided. When being asked about such issue, interviewee tended to illustrate the way they approached competitors to cooperate with. The strategy is showing their cooperative attitude.

> “As a salesman, I mean the first meeting, I try to be very humble and talk about complement rather than kicking someone out. And also give them time sometimes.”

Also, they are looking for to have meetings to evaluate the collaboration, beside meetings on technological issues. However, according to interviewee, the section where regulates such meeting is just added recently in their agreement. Hence, he has not attended any evaluation meeting so far.

> “Now they have added one section said that we should sit down once a year to discuss the alliance and how we can make it more beneficial, how we can business develop it and pinpoint the top five most important end customers. So far I haven’t been able to sit down yet with anyone. But it’s due to the fact that less than one year ago, we started with it.”

**Company C6**

Mentioning about strategies, C6 briefly indicated that they have a particular team in charge of partnering with competitors and such team will facilitate the process of knowledge sharing and knowledge protection.

> “This relies on the partnership team. They have a specific group that is dedicated to this.”

Later, interviewee provided further details on how they guide people internally regarding contracts. They expect to have clear goals of the project. Then they will have kick off meetings to ensure that project teams understand about the contents and purposes of the contracts.

> “We look at the contract very closely, and then depending on what it says in the contract. [...] We are very clear in terms of setting the expectations of the contracts. So when we get into it we make sure that the project teams are aware of what the contract with the partners is, we have kick off meetings to talk to the about that.”

C6 arranged meetings to check work’s progress during the collaboration with competitors.
“When it comes to specific projects, I am sure they (project teams) have meetings. They set up check-point meetings and things like that. It is more like a project progress communication.”

**Multiple factors influencing knowledge sharing and protection**

The above strategies are subject to change according to most of interviewees. It can be listed as people from competitors, how competitive competitor is, market, the size of the company, internal resources and strategic plan of the company.

Interviewee from company C1 provided a list of factors which they need to consider. First of all, she again mentioned about people “who do I have on the other side”, then markets and some other factors (e.g. products, strategic plans, internal resources).

“... like today you have this CEO, then next year you have a totally different CEO whom you met in another company and probably do not like him [...] and change the strategies. Market also I mean there are so many other factors, not just people, the market also changes. And maybe you have a 5-year strategic plan but that also changes depending on which side your company decides to go. And things get on hold. For example, we have projects that have been sitting on hold for up to 10 years, the question is who is sitting on the other side to drive. Strategies depend on people or other factors that you cannot control. [...] So there are other factors depending on how the markets looks like, depending on your products, depending on your strategic plans for 5-10 years, who the people are, the resources that you have internally, not just the other party but sometimes even the budget to cut. So today what looks like very important might not be that important tomorrow.”

She also gave one example where the change in structure of competitors (e.g. mergers and acquisitions) may affect to the strategies of cooperation.

“For example, let’s say I am company A and I have been in talks with company B about an idea and then suddenly company C comes in and want to buy company B, then you see such factors will affect the negotiations that company A and B are trying to have. Because company C is the deciding factor now, then you cannot really have control over such occurrences, then you have to put things on hold. Or mergers and acquisitions which takes ages before things are approved.”

For company 2, interviewee mainly referred to strategic plan of the company as an influencing factor.

“As I said, the competitors can be partners and the partners can be competitors so you never know. So when you share it (knowledge), you have to stand the risks of losing some projects, I mean in other examples, to competitors. But at the same time, you can educate them of your technology, and then you know in some cases, they may return to you and then cooperate with you in another projects. So it’s something win and lose, you have to consider.”

As mentioned above in the strategy part, interviewee from C3 thought that the size of the company affects the strategies of sharing and protecting knowledge in coopetition.

C4 stated as the following:
“I think cooperation with competitors depends on the market structure, the nature of the product and the ways in which competitors compete. There is a thin line on how you corporate and compete.”

C5 referred to market structure also and strategic plans of the company when thinking towards sharing or protecting knowledge with competitors.

“There is space for actually thinking in new ways because software market is quite new market and how to deal that value, how to protect version, how to be fast enough, if you are too protective, I have the feeling that you are risky to become a slow mover. [...] So it’s a balance I would say.”

C6 seemed consider the position of company in the market as a factor influencing their strategy.

“Given the fact that we are leaders in analytics, we tend to compete more that we collaborate with the competitor.”
6. Analysis and discussion

In this chapter, we discuss and analyse the empirical data we gathered. Drawing from our theoretical framework, we aim to find the consistency, contradictions and new insights from the data we gathered. Further, we will draw assumptions accordingly.

The aim of this part is to answer our research question of “How do high-tech companies balance the tension between knowledge sharing and knowledge protection in coopetition?”. It allows us to find the mechanisms to balance knowledge sharing and knowledge protection in coopetition. The chapter is final phase in accordance with thematic analysis presented in the section of analysis technique. We will also discuss the results and link them to theories. Connecting all themes to harmony concept is also one significant discussion of Chapter 5. At the end of this part, a framework with the mechanisms for high-tech companies to balance the tension between knowledge sharing and knowledge protection in coopetition will be developed.

6.1. What to share: Value of knowledge towards coopetition and competitor

All our studied companies were well versed with knowledge classification and valued knowledge differently. When discussing what knowledge the companies share when working jointly together, our interviewees displayed that the type of knowledge and the value of that knowledge is what determines whether they will share the knowledge or protect the knowledge. Further, it was also observed that the tacit knowledge was highly valued by the companies as compared to the explicit knowledge. The companies believed that when it is the specific technology or the company software, the competitors could have access. This is due to the fact that such technology is protected either with IPs or licensing. Therefore, the competitors pay certain fee to continue using it. Although this was also done with caution as it was noted the companies invest a lot of resources to develop such technologies. However, when it comes to consultancy knowledge (tacit knowledge) it was not shared freely because the companies believed that this kind of knowledge would have an impact in the company’s future project. Moreover, it was also observed that all the studied companies were interested in individual’s experience rather than the whole competitor’s company. When it comes to particular project where they have to work with competitors, someone from that company with specific expertise would be involved in the project and not the whole company. This is a further indication that tacit knowledge was more valued when working jointly with competitors.

Moreover, it was more evident that the knowledge sharing was influenced depending on the value of knowledge. Each company had specific knowledge regardless of whether it was tacit or explicit knowledge that they perceived as valuable to the company. They considered the specific value attached to a particular knowledge as the company's key competence, which was the company’s main competitive advantage. The companies were reluctant to share this particular knowledge unless they were sure that what they benefit are more valuable towards gaining a bigger market share. Therefore, most companies protect their key competences from the competitors. This knowledge is what they termed as the one that gives them competitive advantages.

Similarly, in the literature, Borgers (2011, p. 101) indicates that a central dimension in the tension field of knowledge sharing and protection is the type of knowledge and the value of knowledge. As it determines how knowledge can be both shared and protected. Accordingly, Ipe (2003, p. 343) identified that knowledge naturally exists in both tacit and explicit forms. However, tacit knowledge has further received greater interest and attention than explicit knowledge (Alavi and Leidner, 2001, p. 112; Ipe, 2003, p. 344). This is mainly because tacit knowledge has both the cognitive and technical elements; where the cognitive element of tacit knowledge refers to the
mental models consisting of mental maps, beliefs and paradigms while the technical part consist of the concrete know-how (Alavi & Leidner, 2001, p. 110). Because of this technical know-how embedded in tacit knowledge, it is more likely to create competitive advantage as compared to explicit knowledge (Amit & Schoemaker, 1993, p. 33). Therefore, when knowledge is tacit, companies use the more protective mechanisms according to Norman (2002, p. 182).

Moreover, consistently to our findings, different authors also argue that knowledge must be seen more than just explicit and tacit in nature, but on what value it is associated with (Ipe, 2003, p. 344; Fernandez & Chiambaretto, 2016, p. 10; Norman, 2002, p. 181). This is because the value attributed to knowledge has a significant impact on whether and how individuals share and protect knowledge. According to Andrews & Delahaye (2000, P. 803), knowledge sharing is a complex process with knowledge holders actively making decisions about what they will have to share. Especially in the current competitive environment where knowledge is perceived as a valuable commodity and should not be shared casually. Therefore, we found that knowledge sharing is not an automatic process and decisions on valuable knowledge to be shared and protected should be made wisely, thus, emphasising more on Andrews & Delahaye (2000) arguments.

To decide on what knowledge to share when working with competitors, we suggested Fernandez & Chiambaretto’s (2016) principle. In this principle, the authors asserts that in order to achieve successful coopetition, critical and non-appropriable knowledge towards the coopetition project should be shared, while critical and appropriable knowledge should be protected or shared with caution to avoid the risk of opportunistic behaviours from competitors (Fernandez & Chiambaretto, 2016, p. 24). We found this to be consistent with our findings (see chapter 4, item 4.3.1 and 4.3.2). The companies displayed that they may share technical solutions without any explanation on the steps led to such solutions. For instance, a demonstration by C3 showed that they will share their software codes with the competitor, however, how they developed that particular code is valuable knowledge that is protected. The reasoning behind this was that, since the companies are in the similar technological areas, when they share such knowledge, then the competitors could work around the codes and create their own products. This was also illustrated by C1, where a competitor company attending the same meetings steal their ideas and develop products in the market. Therefore, cautioning while sharing appropriable knowledge is highly recommended.

6.2. Whom to share with: Relationship with competitor and trust

6.2.1. Relationship with competitor

Choosing right partner

It is observed that all of our studied companies select competitors to cooperate mainly on the basis that the competitors can provide them with complementary knowledge. It means such competitors own particular capabilities which the companies lack or they are not good at. The knowledge here varies such as technology (C1), local manpower (C2), consumer behavior information (C4) and market information (C5). The basis is also applicable for companies which cooperate with competitors according to requests from customers (e.g. governments). In fact, in some large projects with the requirement of huge resources, one single company cannot handle all of the jobs. Hence, either customers or companies involved as service providers believe that partnering with competitors with the complementary capabilities will assist in completing project (C2), delivering better services (C3), sharing risks (C4) and lowering the cost (C6). Our finding is in accordance with several studies including statement of Jordan and Lowe (2004, p. 245) that the common criteria to select right partner is “alignment or fit” (e.g. complementary skills or capabilities).
Furthermore, it also goes along with Twardy’s study (2009, p. 7) that the most frequently used principle to select a partner is “knowledge of the partner” as mentioned by most of our respondents.

As discussed in literature review of Chapter 2, several articles (Gulati, 1995, p. 92; Inkpen, 2000, p. 1032) indicated that prior relationships or prior ties are possibly important factor in choosing partners. These researchers based on arguments that prior relationships serve as a base for inter-organizational trust and therefore lead to more trustworthy actions during cooperation. Our empirical data however showed the difference. Although companies may have long-term relationship with some companies, it seems that such prior relationship is not a common standard when cooperating with competitors. Further investigating on literature, we found out that the result is consistent with Norman’s suggestion (2002, p. 193) that prior relationship may not be necessarily linked to trust or future alliances. In our study, the result is due to the fact that most studied companies referred relationship to a relationship in specific project rather than a relationship in general. According to them, the relationship depends on situation and case by case, hence, it is context-based and will be built during the collaboration. It is also interesting to find out that prior relationship does not ensure a smooth collaboration later. The issue comes out obviously from one example of C1 where the company used to cooperate well but also have a lot of conflicts with another company despite a long mutual relationship (i.e. C1 either sued or paid a lot of money to them). Changing the CEO who is the representative for such competitor is one of the reasons. Interviewee from C1 stated that: “It changes every other year, it’s all about the relationship you have heard in the past.”

The above example together with opinion from another company (C3) implied that the relationship between companies is constructed between people (e.g. the person represents the company). Relationship between companies is people-based. This outcome guides us to summary of Jordan and Lowe (2004, p. 245) that alliances are associated with “personal courtship rituals” with the consideration of “personal relationships” or “social relationships”. Accordingly, the indication on selecting the appropriate partners proposed that social relationships is critical in facilitating inter-organisational relationship (Jordan & Lowe, 2004, p. 245). This is an additional point to our previously suggested conceptual framework.

**Becoming a good partner**

As discussed in the theoretical part, this dimension is not our focus when discussing about the relationship between the companies and competitors. One of the reasons is we assume that the studied companies will consider themselves as a good partner. The assumption is actually reflected explicitly by companies during our interviews where all of them stated that they want to extend and have good relationship with several companies in the market. We also do have examples show that companies tend to be a good partner in collaboration. C1 implied the importance of open communication in facilitating a smooth collaboration with competitors. According to C1, it is essential that the company communicates openly about the goals without any hidden agendas so that the trust can be built with the other party. This finding is in accordance with Kanter’s emphasis (1989, cited in Jordan & Lowe, 2004, p. 245) that becoming a partner with “open communication and behaving in honourable ways” is necessary to build mutual trust. In addition, some companies admitted that when coming to a specific project, they tend to be very committed. “Good partner” can also be displayed through C3’s statement that the company needs to be honest when cooperating with other companies. However, such integrity raises the concerns from C5 whether all of other parties will act the same way, which can be referred as “prisoners’ dilemmas” as mentioned in many articles (Hamel, 1991, p. 93; Larsson et al., 1998, p. 285).
6.2.2. Trust
According to the companies studied, trust is perceived as an important element, even the most significant element, in coopetition. Principally, all companies cooperate based on trust. Some companies demonstrated that they will not work jointly or share knowledge to competitors without trust. Trust is required even before starting any strategic negotiation when two companies plan to come and generate ideas together. During cooperation, sharing knowledge is mainly implemented on the belief that the other party will act the same and they will not abuse such knowledge in harming the other company. Hence, we also suggest that the confidence about “give and take” serves as the basis for any collaboration. The finding is in accordance with several studies identified that trust is the central element and has positive influence on the process of sharing knowledge (Khamseh & Jolly, 2014, p. 411; Panteli & Sockalingam, 2005, p. 604). Also as per Bogers (2011, p. 103), trust is the means for the exchange of knowledge.

Existing literature also suggests that trust does not absolutely eliminate but partly reduce the need for knowledge protection (Argandona, 1999, p. 217; Norman, 2002, p. 184). Hence, trust leads to the reduction of safeguarding procedures and monitoring costs (Inkpen & Currall, 1998, p. 11), less usage of formal contracts and less detailed agreements (Norman, 2002, p. 184). Nooteboom (1993, p. 1001) even implied that controlling structure and trust are alternatives. However, our finding reveals that trust is the base for knowledge sharing but does not reduce knowledge protection. The reason is “trust is important but very difficult to rely on” (C4). This is also due to the fact that the procedure of sharing and protecting knowledge involves approval from several management levels. Hence, written agreements are required to protect team members and company. Our cases studied also referred trust as an issue, a problem or a dilemma in business. Indeed, as shared by some companies, especially in coopetition where companies work with competitors, potential problems are possibly happened. The solution proposed is taking various actions to support the trusts. Checking around for network’s reference is an informal way to do while almost companies rely on formal written agreements or formal internal procedures as an insurance against risks. Even for companies in which the formal ways to support the trust has not established, they also expect to have governing system in the future. All companies considered that formal process in cooperation is critical to protect the company. Such formal solutions will be elaborated further in the next part of our discussion.

6.3. Under which condition to share knowledge
6.3.1. Managing explicit knowledge
Explicit knowledge has the ability to be specified and documented (Alavi & Leidner, 2001, p. 112), and this enables storage, transfer and sharing by means of corporate documents of information systems (Loebbecke & Van Fenema, 1998, p. 1632). Accordingly, as discussed in the theoretical framework, Loebbecke et al. (1999, p. 20) suggested contractual knowledge exchange contents and procedure, inter-organizational coordination by mutual adjustment, and intra-organizational planning and control procedures as the requirements for sharing explicit knowledge.

6.3.1.1. Contractual knowledge exchange contents and procedure
According to Malhotra (2000, p. 169), contracts formalize the contents, the procedures and the deliverables supplemented by control procedure to verify that the actual delivery of knowledge occurs within contractually pre-defined standards. The empirical findings indicate that all our case companies have contractual knowledge exchange contexts and procedure in terms of NDAs. The companies displayed that having a contract that stipulates how the project will be carried out is very critical and further used as a formal governing agreement that allowed them to know that their key knowledge is protected and what they share will be of mutual beneficial to all parties. This is further discussed under clear contracts section.
6.3.1.2. Inter-organizational coordination by mutual adjustment

In accordance with our empirical data, companies used work in progress meetings, which are necessary to access performance on the ongoing projects. Top management who were involved in that particular project attended the meetings from both companies. Basically, most companies indicated that due to the risks involved in knowledge sharing, they selected few individuals to oversee the project (for example, five people from both company A and B). These individuals were the only authorised personnel who had information regarding the ongoing projects. Therefore, they will meet from time to time and brainstorm further on the idea being generated. One company (C1) indicated that some projects were based on particular time limits. Thus, the faster the project was implemented, the faster it took the company to file for IPs to protect that particular knowledge. Therefore, it was necessary to have work-in-progress meeting to appraise performance.

In addition, some companies cooperated with competitor because the customers required some integrated product from both companies, therefore, such meetings were necessary in order to make readjustments in the case where customers’ expectations were not met. However, in other companies, mutual readjustment was based on other external factors. Their argument was due to the complexity of knowledge, knowing the exact value the company will benefit was also perceived as a challenge with regard to the changing business environment. The companies indicated that during the beginning of the projects, it was hard to predict the uncertainties prevalent in the business environment. It was even hard to ascertain the exact value the company will get from collaboration and whether projects will run smoothly. A good example was displayed by C1. They stated “let’s say I am company A and I have been in talks with company B about an idea and then suddenly company C comes in and want to buy company B, then you see such factors will affect the negotiations that company A and B are trying to have. Because company C is the deciding factor now, then you cannot really have control over such occurrences, then you have to put things on hold. So today what looks like very important might not be that important tomorrow”

It is therefore evident that clear mutual adjustments between organisations objectives are necessary to facilitate a smooth knowledge sharing and knowledge protection. This is in accordance with a study of Hendrikse et al. (2008, p. 65). They assert that in business environment where organisations depend upon other organisations to achieve its objectives, inter-organisation coordination mechanisms is used as a collective action managing mechanism. The mechanism shows what role each organisation will play and how it is integrated into inter-organisation networks. The process allows for creation of rules as a code of conduct under which exchange of resources and coordination takes place. According to Pfeffer and Salaricik (1978, cited in Hendrikse et al. 2008. p. 66), such mechanisms can be classified according to what extent the organisation absorbs and its dependence on the other organisation and one such classification is through mutual adjustment. Gulati (1998, p. 296) argues that with mutual adjustment, firms develop routines that decrease the need for formalization and enables interaction and adjustments. Therefore, it is through the mutual adjustments that companies maintain a smooth collaboration and thereby achieving the intended objectives.

6.3.1.3. Intra-organizational planning and control procedures

Basing on our empirical data, we found that internal communication is considered important towards smooth collaboration with competitors. Most companies implied it was advantageous to have open communication towards the specific objectives and to access the progress of the projects. Therefore, most companies displayed that they have kick-off meetings between involved individuals to communicate the project objectives in terms of what knowledge they can share and what knowledge to protect. For example, one company (C5) indicated that their employees are engineers who are very knowledgeable and passionate when it comes to robotic simulations.
Therefore, when interacting with competitors, it becomes very easy to share the company’s core knowledge that was not intended for sharing. Thus, open communication helped to prevent unintended knowledge spillovers. In addition, the top management also played a critical role in enhancing loyalty and commitment through their actions and communication. For example, our interviewee in company C1 stated that “the most important thing is to communicate about your goals, [...] be open about your goals”.

Similarly, company C6 emphasized that they look into details the stipulated contract and communicate the same to the project teams who are in charge of the projects involving sharing of knowledge. By doing so, they are able to protect their core knowledge from competitors and at the same time do an appraisal on projects. On the other hand, one of our company cases explained that some of the project was very critical in that if the information was available to everyone, then the risk of that particular information being leaked to the competitors was very high. Controlling how individual exchange information is challenging to every company, therefore, authorisation on certain knowledge was critical before sharing.

Daft (1997, p. 559) explains that one of intra-organisation planning and control mechanism is communication. He defines it as a process by which information is exchanged and understood by two or more people, usually with the intent of motivating or influencing behaviour. According to Troy et al. (2001, p. 96), knowledge sharing is highly influenced by open communication. In addition, freely sharing of knowledge within an organization can increase the value of knowledge when members use it to generate new ideas. Nuanlaong and Phapruke (2010, p. 30) further suggest openness communication effectiveness is an intra-organisation communication strategy. The authors define this strategy as sharing perception through information exchange and trustworthiness of communication. Accordingly, DeVito (2008, p. 246) asserts that willingness to interact openly with others, to self-disclose as appropriate, willingness to react openly to incoming stimuli and willingness to own your feelings and thoughts is what constitute to effectiveness in communication.

6.3.1.4. IPRs and Information Systems

In addition to these aforementioned mechanisms, our findings also revealed that the companies further used formal systems to facilitate knowledge sharing and protection. All the companies were well versed with IPs and license protection. In fact, it is evident that this was a basis for negotiations for most companies. They argued that they spent a lot of time and resources in developing technology, therefore, in order to protect the company from harm, such technology needed protection. Company C1, however, pointed out that it was also important to include IP protection in the negotiations it is important to have a bigger picture of what the company is getting into. They stated “like if you come together to develop an idea, who gets the patent, and how do you share the royalties of the patent? In what percentages to share? And how do you evaluate that? The value of the patent in the market. Therefore, you need to discuss the numbers”. Similarly, C2 also agreed that they were aware of IP protection and licensing. They viewed the risk of competitors misappropriating the software for other purposes than the one at hand to be high. Therefore, through licensing, the company gains more because the competitors will have to pay in order to use the licence “but they can buy our technology and pay for licences”.

According to Spence (2007, p. 45), IPR system consists of a range of various IPRs, some of the most common being patent rights, trade secret rights, design rights, copyrights, and trademark rights. Bogers (2011, p. 95) posits that the use of IP enables external technological exploitation, for instance by patent sale and various types of licensing schemes. Accordingly, licensing promotes both knowledge sharing and knowledge protection, therefore, presenting a concrete way of tension coping strategy. For instance, as we discussed in the theoretical framework, one method
of licensing protection is cross licensing as suggested by Gnyawali and Park (2011, p. 655). Cross licensing according to Baltes (2003, p. 10) happens when companies aim at receiving the benefits of gaining access to another patented technology. In fact, one company confirmed that they use this particular method to protect their knowledge.

However, some companies’ information systems to govern knowledge sharing. The top management governed the knowledge sharing flow where specific authorisation was necessary before sharing that knowledge. This helped in controlling what the companies considered as their trade secrets. For instance, C4 stated “We have to access the risks of sharing information. If we share this information, what the risks might be, what harm it can cause to our company. So, we do internal control and assessment on what we are going to share through our risk assessment. Therefore, based on the risk, we do not do full information sharing or share such information at all. That is how it is. Some information you actually need authorization before you can even share it. Approval from the information owner, approval from information security management and approval from the leader.”

According to Orlikowski and Baroudi (1991, p. 4), information systems are closely associated with the coordination of knowledge sharing protection through information storage, retrieval, and transmission capabilities. Information systems accomplish this by providing technical vocabularies to mediate meanings ascribed to events, objects, and relationships, and through coordinating activities over time and space. Thereby, presenting an array of social structures for possible usage in interpersonal interaction, communication and coordination. In similar vein, Fernandez and Chiambaretto (2016, p. 17) argue that information systems can be applied to balance knowledge sharing and protection. According to the authors, companies design information systems to provide a common platform that coordinates the knowledge flows by sharing critical information required by coopetition while preventing competitors from accessing confidential information of company (Fernandez & Chiambaretto, 2016, p. 17). To manage tensions arising from sharing and protection of knowledge, companies can create a specific formal control mechanism through development of a dedicated information system that will allow partners to knowledge necessary for the formulation of a joint venture. For example, when information system is applied in a financial joint venture, each partner could share confidential and strategic financial information through the IS, but financial details remained in the system and could not be accessed by the competitor (Fernandez & Chiambaretto, 2016, p. 18).

6.3.2. Managing tacit knowledge

It seems that project team is commonly designed to handle knowledge sharing and knowledge protection in coopetition among our studied cases. One interview directly reveals that the company (C6) relies on project team as a specific strategy when working with competitors. The first reason is this team can be dedicated to a particular project with full awareness of the goals of such cooperation. Saying in a different way, the establishment of a project team aims to work closely with competitors to achieve common objectives as per our study. Also according to one case of ours (C1), they aim to work directly with specific people in the project team who own valuable knowledge to them. It is consistent with finding of Loebbecke et al. (1999, p. 21) that project team will ensure the “close interaction” to enhance tacit knowledge exchange. Another purpose for forming project team from our finding is to limit the number of people involving into the meetings or projects so that the information leaked is minimized. Project team members can come from different departments in the company and will be systematically invited into various meetings in different stages of coopetition. One example is the coordination method of C1 where top management level will join the initial negotiation, then head of R&D department will be invited to evaluate the idea, followed by IP department and lastly will be the involvement of technical
people. According to Kendrick (2009, p. 67), limiting the number of people in project team is an effective management method against confidentiality risks.

As certified through our interviews, controlling people to avoid knowledge spillovers by accident is a challenging task for companies when engaging in coopetition. However, several companies believed that the issue does not go beyond their management. Beside the systematic process as mentioned above, it is practical that people involving in the project needs to work closely with the contracts to have clear vision about what to share and what should not be shared with competitors. The contracts with clear statement of works will be discussed in the next section.

6.3.3. Managing knowledge in general: Clear statement of works

Enberg (2012, p. 778-779) proposed companies to have clear statement of work to balance knowledge sharing and knowledge protection in coopetition. Clear statement of work provides several valuable information such as scope of works and expected outcomes. Hence, it can facilitate an open yet systematic operation for coopetition (Enberg, 2012, p. 779). Our interviews showed that when coming to coopetition, all companies rely on NDA as a “formal governing agreement” which provides clearly scope of works and goals of the coopetition (C1). According to several companies, NDA is the key document required before starting any discussions between two companies. This is due to the fact that companies feel secured with signed NDA that regulates which ideas would be protected by certain parties. Furthermore, through NDA, company will recognize how cooperative the other party is. Hence, it enhances the belief that the information shared in the discussion will benefit both parties. Our finding is in contrast to a study of Baumard (2010, p. 75) where he suggested that using NDA is considered as a method to protect knowledge only and therefore, trigger anxiety and poor response among parties.

NDA serves not only as a formal governing agreement between two companies but also an internal guidance for staff. Hence, as discussed above, it should be referred by people when working jointly with competitors. Based on such clear contracts, people will have confidence when communicating with competitors. In the meanwhile, they work with caution since they definitely know the consequences of leaking information where not appropriate.

6.4. Balancing knowledge sharing and protecting with harmony orientation

Purpose of this part is to discuss whether the above mechanism implemented by companies when sharing and protecting knowledge in coopetition is oriented by harmony. Harmony means complementing, supporting or depending each others of any coexisting individual elements to create a whole unity (Chow, 2004, p. 1). Through our interviews, when cooperating with competitors, one party is complementary, supportive and dependent to the other one in the purpose of building a successful alliance. We also argue that the mechanism of considering what to share, whom to share with and under which condition to share reflects dimensions of harmony orientation.

Enrichment: According to Chow & Yau (2005, p. 189), enrichment of products or service to meet different needs from customer is imperative by integrating effectively complementary knowledge. Most of our companies admitted that they share knowledge so that together with competitors, they can offer a full package of services/products to customers with the lower costs (e.g. enriching services/products). The enrichment is also represented where the priority to choose competitors to cooperate with is the complementary knowledge of competitors as mentioned in “whom to share with” section. It can be technology (C1), local manpower (C2) or market knowledge (C5). Basically, mutual support is visible when sharing and protecting knowledge towards common goal.
However, in practice, whether one party is willing to fix problems from competitors or provide solutions to fulfill competitor’s weaknesses as mentioned by Chow and Yau (2005, p. 191) is not examined in our study.

**Bridging:** Strongly-linked bridge ties is emphasized on the effort of collaboration together with the commitment from individual party (Chow & Yau, 2005, p. 191). Indeed, as discussed in “becoming good partner” of “whom to share with” part, our cases studied showed their commitment towards competitors in specific project. Furthermore, some of them also mentioned that they are very open in sharing knowledge to competitors considering the mutual benefits such as winning in a bigger market. Finally, controlling alliance based on clear documents demonstrate the goodwill collaboration and commitment from partners which is considered as bridging dimension of harmony orientation.

**Synchronizing:** As per Chow and Yau (2005, p. 191), goodwill supports from each party are significant to reach the synchrony. Accordingly, decision making considering common interests and overall benefits of alliance is required (Chow & Yau, 2005, p. 191). In our study, deciding what to share firstly based on common goals of coopetition reflects the efforts of companies to reach the synchronizing dimension of harmony orientation. In addition, cooperating with trust also reflects the synchrony where trust serves as the condition for every partner to synchronize their efforts towards common goals. The efforts to find governing systems so that the knowledge sharing can be enhanced show the harmony orientation from both companies in coopetition. By such efforts, every party notices that what they are working will provide mutual benefits or reach common objectives.

According to Mattsson and Tidstrom (2015, p. 360), the alliance reaches harmony when two parties recognize that both competitive and cooperative processes are well-matched. Such processes of cooperation and competition are not stable based on the changes of market context or the perception, goals and experiences of each parties (Mattsson & Tidstrom, 2015, p. 360). In practice, studied companies also indicated that the mechanism for knowledge sharing and knowledge protection in coopetition is subject to change depending on size of company, strategic plan of the whole company, market structure and products.

**6.5. Proposed framework**
Figure 5 below provides the mechanisms to balance the tension between knowledge sharing and knowledge protection when high-tech companies cooperate with competitors. Our findings indicate that to balance the tension related to knowledge in coopetition, high-tech companies involve the processes of decision making on whom to share with, what to share and under which condition to share towards a harmony orientation.
The most outstanding finding is the important role of trust (whom to share with) and NDA (under which condition to share) in balancing the tension between knowledge sharing and protection. The importance of trust and NDA was reflected consistently through interviews with most of companies. Trust is perceived as an important element, even the most significant element, in coopetition. All companies basically share their knowledge based on trust which refers to the belief that the other party will not misuse such knowledge in harming the company. In addition, they also trust that the collaboration aims for mutual benefits. Although trust is the means for sharing knowledge, it does not reduce knowledge protection. A formal governing system to support trust is required. In this case, NDA is the most used formal mechanism. NDA is a formal governing agreement that clearly specify scope of works and goals of the coopetition. It also regulates which knowledge is shared and protected by certain parties. Hence, with NDA, both parties generate the feeling of being protected. NDA is not only an agreement between two companies but also the internal guidance for staff. It generates the confidence of employees when communicating with competitors, at the same time, forces them to work with caution.

Moreover, to achieve harmony between the parties in coopetition, admittedly, companies should note that what to share (the value of knowledge and the company goals), whom to share with (choosing the right partner and becoming a good partner) are very critical mechanisms. These mechanisms are clearly shown in the figure below.
Companies need to consider firstly whom to share with, referred to the relationship with competitors. The relationship with competitors is built between people based on specific project and context-based. In this section, choosing right partner and becoming good partner are reflected. It is suggested that companies select competitors with complementary knowledge so that they can accomplish goal of coopetition or share risks, just to name a few benefits. Besides, focal company needs to become good partner with the focus on open communication about the goals of coopetition. Being honest and committed is also regarded as a good partner.

In the next phase, we found that companies should decide on what to share based on value of knowledge. Knowledge can be critical to reach the goals of coopetition or appropriable by competitors. We conclude that critical (to coopetition) and non-appropriable (by competitors) knowledge should be shared in the alliance. Knowledge which is critical (to coopetition), at the same time, potentially appropriable (by competitors) should be considered more carefully. Based on company’s evaluation, such knowledge is protected or shared with caution. In this case, companies can convert appropriable knowledge into non-appropriable knowledge. For example, they provide technological solutions without disclosing source code.

Finally, companies should identify under which condition they can share the knowledge. Knowledge should be distinguished as tacit and explicit knowledge to ensure that companies find appropriate method to balance knowledge sharing and knowledge protection. Management of explicit knowledge requires contractual knowledge exchange contents and procedure, inter-organizational coordination by mutual adjustment, and intra-organizational planning and control procedures. Companies are encouraged to use contracts to formalize the contents, the procedures and the deliverables of coopetition. To evaluate the coopetition so that appropriate adjustment can be made where necessary, companies should conduct work-in-progress meetings. It is also
significant that companies maintain open internal communication as well as an internal systematic approval procedure to control knowledge sharing and knowledge protection. Our study also finds out that IPR is a common method for companies to govern explicit knowledge. The companies can share the knowledge while ensuring that such technology still belongs to themselves. Information system is also a helpful instrument in balance the flow of knowledge where limited authorization is provided to avoid knowledge spillovers. Managing tacit knowledge is more challenging task. Project team can enhance tacit knowledge exchange while prevent knowledge leaking by limiting the number of people involving in the project.

Based on discussion in previous part, considering whom to share with, what to share and under which condition to share in coopetition reflects the harmony orientation between the engaging parties. The main reason is both companies in coopetition identify that the processes of sharing and protecting knowledge is consistent. The harmony orientation is also represented through three dimensions of enrichment, bridging and synchronizing. For example, they can be listed as enrichment of products/services, synchronizing efforts from every partner towards common goals and bridging the needs of both parties with goodwill collaboration and commitment. We hence suggest that the management of knowledge sharing and knowledge protection in coopetition is oriented by harmony.
7. Conclusion

In this chapter, we aim at answering our research question by presenting our main findings and conclusions. We further present our theoretical, managerial and societal contribution of our study drawing from our findings. In addition, we provide our study limitations, suggestions for future research and the quality criteria for our study.

7.1. Research findings

Combining empirical data and conceptual framework, we suggest mechanisms for high-tech companies to balance the tension between knowledge sharing and knowledge protection in coopetition. As mentioned, the tension is understood as the difficulties of companies in ensuring that the knowledge is shared enough to achieve the common goal, while maintaining the company's competitive advantages.

In conclusion, our key finding is the importance of trust and NDA in balancing the tension between knowledge sharing and knowledge protection in coopetition for high-tech companies. Trust and NDA are the most significant tools to balance the knowledge flows when used simultaneously. Our primary finding also emphasize that balancing the tension related to knowledge in coopetition for high-tech companies involves processes towards harmony orientation where three questions of whom to share with, what to share and under which condition to share are considered. Answering whom to share with focuses on relationship with competitors. The relationship is identified to be case by case and people-based. Furthermore, high-tech companies are encouraged to choose right partner with the complementary knowledge, at the same time, become a good partner with open communication about the goals when engaging in coopetition. Value of knowledge towards coopetition and competitors should also be considered when asking what to share in coopetition. Knowledge is critical (to coopetition) and non-appropriable (by competitors) should be share while knowledge is critical (to coopetition) but potentially appropriable (by competitors) should be considered carefully. Finally, knowledge should be appropriately managed based on types of knowledge of tacit or explicit knowledge. High-tech companies have different ways to control explicit knowledge. They require a contractual knowledge exchange contents and procedure, inter-organizational coordination by mutual adjustment, and intra-organizational planning and control procedures. IPR and information system are also considered as effective tools to manage explicit knowledge. Regarding tacit knowledge, project team is the proposed option so that companies work closely enough to share tacit knowledge, at the same time, number of people involving in coopetition is limited to avoid knowledge spillovers. We also find out that the efforts in answering whom to share with, what to share and under which condition to share aim to reach a harmony. The harmony orientation is reflected through dimension of enrichment of offered products/services, bridging the needs of single party through collaboration and commitment, and synchronizing individual effort towards common goals.

Applying Yin-Yang principles to understand the interactions between knowledge sharing and knowledge protection, it should be noted that the above mechanisms are subject to change constantly under several influencing factors of market structure or product itself.

7.2. Theoretical contributions

In assessing the theoretical contributions of this study, the research gaps from the Introduction chapter will be addressed. Accordingly, Bogers (2011, p. 94) identified that several trends have given rise to the need of studying the tension between knowledge sharing and protection, most importantly because firms have started to open their boundaries to tap external knowledge. Further, Fernandez et al. (2014, p. 71) emphasized that to achieve competitive advantage from coopetition,
careful management of knowledge sharing and protection is required. Mainly because the ability to create unique value is compromised if the company’s knowledge and skills are duplicated in any way. We identified a theoretical gap in on how to balance the tension between knowledge sharing and protection. The balancing act was widely recommended but no study had been done in the area of knowledge sharing and protection.

Our finding generated from this study contributes to knowledge management literature in coopetition. The Yin-yang principle and harmony orientation is a new perspective that we bring forth in business context. Our aim was to find out how companies balance the tension between knowledge sharing and protection. From the literature, we find that researchers have stated that coopetition is paradoxical as it relies in two contradictory logics of interactions thus leading to tensions (Bengtsson & Kock, 2000, p. 415; Das & Teng, 2000, p. 43; Gnyawali et al. 2012, p. 7). This in turn inhibits the effectiveness of the company’s performance. Knowledge sharing and knowledge protection was suggested as one of this prevalent tension (Bengtsson & Kock, 2000, p. 415; Das & Teng, 2000, p. 43). Instead of trying to reduce or eliminate tension entirely in coopetition, consistently with Chen (2008), we argued that it should be efficiently managed. Following Mattson & Tidstrom (2015) recommendations, we considered the Yin-Yang principle to balance the tension between knowledge sharing and protection through harmony orientation to achieving successful coopetition.

By presenting our final framework, our research contributes empirical evidence on how to attain harmony orientation as a mechanism for balancing the tension between knowledge sharing and protection in coopetition. Our findings revealed that harmony orientation could be achieved when both formal and informal mechanisms to manage knowledge are applied simultaneously. Where the formal mechanisms builds and facilitates a smooth knowledge exchange between competitors while at the same time protecting the companies from the risks. While the informal mechanisms offer cushioning for a smooth collaboration. In addition to this, it further important to take into consideration what knowledge to share (the value attributed to the knowledge), whom to share that particular knowledge with (being a good partner and choosing a good partner) and finally under what conditions should the company share knowledge (managing tacit and explicit knowledge accordingly).

7.3. Managerial implications

Managers should understand that the coopetition phenomenon is shifting the conventional way of doing business. Our study helps managers to have a grasp on how companies successfully manage knowledge in coopetition. Due to challenges such as short product life cycle and technological convergence in high tech companies, the pressure to create new knowledge in order to stay competitive is prevalent. Thus, it is important for companies to work together with their competitors to integrate different but complementary knowledge with aim of creating better value for customers. In doing so, managers need to be aware on how to balance knowledge sharing and knowledge protection because this is a risky process involving unavoidable tensions between partners.

Based on our findings, to manage the tension between knowledge sharing and protection, managers need to apply formal (NDA) and informal (Trust) mechanisms simultaneously. We found that the NDA facilitates a smooth access to new knowledge from the cooperation but at the same time protect what they consider core knowledge because if the firms’ knowledge and skills are duplicated in any way, their ability to create unique value is compromised. On the other hand, trust offers cushioning to the entire process. It was evident that trust was a mediating factor when working with competitors, it made knowledge to be smoothly shared. However, managers should
trust with caution, because when it comes to figures in terms of money, then companies are compared to psychopaths. Therefore, it is important for managers to understand what extent they should trust their competitor. In addition to this, open communication, work in progress meetings, and project teams are also other mechanisms that oversee a smooth exchange of knowledge and accordingly reduce the inherent tension between partners. By using this mechanism, companies can effectively benefit from knowledge sharing while at the same time minimize the associated risks in order to sustain their competitive advantage in the market and accordingly decrease the alliances failure rates.

7.4 Societal implications
Harmony orientation can further have a broader societal implication. Basing on Mattsson & Tidstrom (2015, p. 360) arguments, competition and cooperation interact across broader market context than the individual dyad or specific market or industry. Therefore, from a broader societal perspective, the market context is characterized by dynamic changes in relationships, which can directly or indirectly affect and influence how competitors interact. For example, our findings revealed the third party influences cooperation and competition between companies. Customers who wanted an integrated product between the competing companies sometimes maintained the coopetition. Thus, the customer’s opinion influenced the cooperation. This influence can further lead to tensions and harmony orientation can accordingly be used in such cases. In addition to this, changes in the business environment can also lead to market restructuring. According to Mattsson and Tidstrom (2015, p. 350), Yin-Yang have been applied in various phenomenon predominantly with focus in Chinese and Asian societies. Therefore, considering Yin-Yang principle as new perspective in business context especially in the western environment, we can only argue of its positive impact in the society as whole based on our findings. However, balancing act is a never-ending process. It is subject to changes in market context, objectives, and experiences of the involved parties (Mattsson and Tidstrom, 2015, p. 360). Therefore, companies to achieve sustainable competitive advantages through coopetition, this perspective can be used strategically. Although, since it is a new way in which business can balance the coopetition tensions, it should be further subjected to different test to find concrete results.

7.5. Limitation and Future Research
This study is subject to some limitations. Note the least time constraints. In particular, given the sensitivity of our topic, many of our potential participants did not want to reveal in detail how they share knowledge with competitors. Some companies were bound by privacy, thus, many interviewees declined our interviews request citing they were not allowed to share such information. Further, since our focus was on high tech companies competing in the same markets and similar products, it was difficult to find companies in that category who are involved in coopetition. Due to these challenges, we expanded our participants’ selection in MNCs located internationally and in different industries. This also limits our generalizability of this study. However, it should be noted as argued earlier, our aim was not to generalise the results to the entire population but rather build on the existing theory.

In regards to our interviewees, they seemed protective about revealing in-depth information about how they cooperate with their competitors. They showed interest in talking more on the competition side rather than on the cooperation side. Most companies also indicated that they only cooperated with competitors out of necessity; mostly it was a requirement by customers and in some cases the regulatory bodies. Thus, this further increased the challenge of getting the companies reveal more on how they share and protect knowledge. In some cases, the companies revealed that they preferred cooperating with companies offering different products in the market.
but can still complement their knowledge in particular areas rather than companies competing with the same products.

However, it is important to note that despite these limitations, the tension between knowledge sharing and protection have foremost been grasped and scrutinised thorough analysis of the risks and benefits that companies experience in practice, and how it is managed accordingly. From our findings we proposed a mechanism that companies can use to balance this tension based on Mattsson & Tidstrom (2015) Yin-Yang principle and harmony concept which further opened avenues for future research.

In this regard, future study could focus more on the role of different players in the business environment towards coopetition in trying to address the tension between knowledge sharing and protection. Our findings indicated that the customers played a key role in determining which competitors the companies should cooperate with to offer them the desired products. In some other cases, it is the regulatory bodies. It will be interesting to find out how different players influence knowledge sharing and protection when cooperating with competitors and how this affects the harmony orientation in balancing the tension between knowledge sharing and protection.

Moreover, basing on our methodology, the underlying argument behind this method was to focus managers involved in coopetition. By virtue of their position in the organisation, they are able to provide opinions and perceptions that are valid reflections of what takes place in practice, because they are knowledgeable about the issue and willing to communicate. In this study, managers from different high-tech companies were identified as our key respondent. In future studies, multiple informants approach could be adopted with respondent from both sides of the partners in coopetition included in the sample. It will be interesting to compare and contrast views from different parties involved.

Another promising future avenue for future research could be based on Mattsson & Tidstrom (2015, p. 360) arguments that harmony can never be stable owing to changes in the market context, objectives and experiences of one or two counterparts. Our findings revealed that that coopetition in companies was based on projects which were subject to changes in the business environment. For example, when key personnel involved in particular project change companies. Therefore, further research could focus on how such disruptions could affect the balancing of conflicting dualities in coopetition.
8. Quality Criteria

Validity and reliability are central issues in research with regard to quality measurement. They concern how concrete measures are connected to constructs, thereby important in establishing believable of research findings (Tracy, 2013, p. 228). Accordingly, reliability means dependability and consistency. It suggests that the same results are achieved if the study is repeated under identical or similar conditions. For example, in the daily language, a reliable person is one who is dependable, stable and responsible, this means that the person responds in similar predictable ways in different times and conditions. If the same is applied in research context, therefore, the methods of conducting a study can be reproduced or replicated by other researchers (Neuman, 2004, p.116). On the other hand, validity “is concerned with whether the methods, approaches and techniques actually relate to, or a measure, the issue you wish to explore” (Daymon & Holloway, 2002, p. 90). In simple terms, validity refers to how well an idea about reality “fits” with the actual reality (Neuman, 2004, p. 116).

However, according to Bryman and Bell (2011, p. 43), qualitative studies ought to be judged and accessed based on different standards from those used in quantitative research. Neuman (2004, p. 119) asserts qualitative researchers accept the principle of validity and reliability but use them infrequently because of their close association with quantitative measures. Daymon and Holloway (2002, p. 90) argues that, even though validity and reliability offers the most effective means of evaluating the quality of research, they are measurements of objectivity, which is a central issue in quantitative research while subjectivity is more salient issue in qualitative research. One difficulty observed by qualitative researchers is that, they often study processes that are not stable over time, they emphasise on the value of a changing, or developing interactions between the researcher and what he studied (Neuman, 2004, p. 119). Therefore, this measure ignores the benefits of having a variety of researchers with many approaches and may neglect key aspect of diversity that exists in the social world (Neuman, 2004, p. 121).

Based on these arguments, we therefore apply other alternative measures for qualitative studies guided by our interpretivism paradigm. According to Bryman and Bell (2011, p. 395), qualitative research is assessed by criteria such as trustworthiness and authenticity. Trustworthiness is categorized into four different criteria such as: credibility, transferability (generalizability), dependability, and confirmability (Daymon & Holloway, 2002, p. 90). Below we explain how the quality criteria for our study has been enhanced.

8.1. Credibility

The effort and capacity of the researcher is what determines the credibility of the research (Golafshani, 2003, p. 600). In similar vein, Bryman and Bell (2011, p. 396) assert that credibility demands the assurance based on the principles of good practice and submitting research results to the individuals of the social world who were studied for the validation that the researcher understood the social world. For our study, we ensured credibility through our semi structured interviews, which will allow us ask more clarifying questions. Further, we engaged in respondent validation where, we provided the results of our studies to the participants to ensure that we did not misinterpret what they said. It is also important to note that during the interviews, we verified our understandings through a summary of what our participants’ said at the end of the interviews. This is in accordance with Saunders et al. (2009, p. 334) arguments that, by giving a summary at the end of the interviews, the respondents have the opportunity to correct and evaluate our understanding. Thereby, it avoids biases or partial interpretation of the data.
8.2. Dependability

Daymon and Holloway (2002, p. 94) assert that credibility and dependability are closely linked, the latter replacing the notion of reliability. According to Bryman and Bell (2011, p. 398), dependability involves guaranteeing that the complete records of all the phases of the research are kept in an accessible manner. Therefore, dependable findings must be consistent and accurate; the reader should be able to evaluate the accuracy of the analysis through following the author's decision-making process (Daymon & Holloway, 2002, p. 94). We ensured this by keeping a complete documentation of all the relevant information for our research process (i.e., our interview guide, our participants’ information, transcripts of our interview and the records of interview, and data analysis). This is in accordance with different authors suggestions that one way of achieving dependability is by demonstrating an “audit trail” (Bryman & Bell, 2011, p. 398; Daymon & Holloway, 2002, p. 94). This means that the researcher should keep a detailed record of the decisions made before and during the research, and a description of the research process (Daymon & Holloway, 2002, p. 100)

8.3. Conformability

According to Daymon and Holloway (2002, p. 94), conformability is more suited in qualitative research that the conventional objectivity or neutrality. The authors argue that a research is judged by the way in which the findings and conclusion achieve the aim of the study and not the results of the researchers’ prior assumption. Therefore, for a study to be comfortable, researchers need to show how data are linked to their sources so that the reader can establish that the conclusion and interpretations are from them (Daymon & Holloway, 2002, p. 94). Our research aim was to balance the tension between knowledge sharing and protection, we clearly described this tension with support from the extant literature. Furthermore, we used open-ended questions in our interviews to limit the prejudice of interviewees’ answers and we tried as much as possible to avoid the manipulation of our participants. We can attest that by conducting most of our interviews through phone we minimized the possibility of manipulating the answers of our Interviewees in comparison to face-to-face interview (Bryman & Bell, 2011, p. 207). In addition to ensuring our confirmability, we made sure we used information and perceptions we deemed important in the best objective manner and avoided using our personal opinion.

8.4. Generalization (Transferability)

Transferability replaces the notion of external validity and it is close to the idea of theory-based generalizability (Daymon & Holloway, 2002, p. 94). According to Tracy (2013, p. 229), generalizability refers to the capacity of findings to be transferred from one study to another and make predictions about how these findings relate to each other.

Interesting to note however, is that generalizability is clearly not strength in qualitative research (Firestone, 1993, p. 16). The underlying claim has been when researchers generalize, they assert conclusion that cannot be fully proven to be applicable in different phenomenon. In the context of qualitative research, and particularly in our study, extended the result from the multiple cases to other similar individuals can be questionable. For example, if a behavioral technique is demonstrated to be effective in the treatment of some problematic situation, in our case, issues of knowledge spillover and opportunistic behaviour, then it is hard to ascertain that the same technique will be equally effective in other settings. Another reason that is commonly given is that posited by Falk and Guenther (2006, p. 2), “you cannot make generalization from the results when the sample is not statistically representative of the whole population”

However, recently there has been an overlapping view on generalization with regard to qualitative research. More or less, the view on issues of acceptance that generalizability is not the main
purpose of a qualitative research (Myers, 2000, p. 2) and secondly, the issue that generalization can only be done with caution about on the limited capacity to do so (Benz and Newman, 1998, p. 382). Scholars that support the second view have proposed standards of good practice about what must be done to make generalizability plausible in qualitative study. For instance, when deciding whether to generalize, judges compare precedent to current case based on criteria such as material fact, appropriateness, reason for decision and generality of the decision (Firestone, 1993, p.18). On the other hand, May and Pope (2000, p. 52) suggested that a degree of generalizability can be achieved by ensuring that the researcher report is sufficiently detailed for the reader to be able to judge whether or not the finding apply in similar settings. This can be achieved through a detailed description to reveal the social relations that underpin the phenomenon (Wainwright, 1997, p.30). Another suggestion was from the work of Yin (2003, p. 38), he argues that in qualitative research, researchers can generalize findings to theory similar to the way scientists generalize from experimental results to the population.

Basing on these arguments therefore, we aim to generalize our study not to the entire population but toward theory. Our research objective is to contribute to the already existing theory through our final conceptual framework. Morse (1994, cited in Daymon & Holloway, 2002, p. 94) claims that theory is able to contribute to the greater body of knowledge when it is reconceptualised into a variety of settings. We ensured this by relating our study findings to the theoretical literature in order to achieve our own concepts

8.5. Authenticity

According to Neuman (2004, p. 116), authenticity means giving fair, honest and balanced account of social life from the viewpoint of someone who lives it every day. It is an important aspect in discussing the truth criteria of qualitative research, therefore, in order to guarantee fairness interviewees must present distinctive perspectives from various standpoints (Bryman and Bell, 2011, p. 399). We can attest that for our study, we tried to be as fair as possible in terms of our participants’ selection. Further, we aimed at knowing more from the managers on how they balance the tension between knowledge sharing and protection and made sure that we presented all the different opinions shared by our interviewees.
Reference list


96


## Appendices

### Appendix 1: Interview questions

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I  Background questions</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Please introduce yourself and your role in the company?</td>
</tr>
<tr>
<td>2</td>
<td>How long have you been with the company?</td>
</tr>
<tr>
<td><strong>II Questions on coopetition</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Who are the company’s competitors? Do you cooperate with any of them?</td>
</tr>
<tr>
<td>4</td>
<td>Why do you consider to cooperate with your competitors? What criteria do you use to select the competitors to cooperate with?</td>
</tr>
<tr>
<td>5</td>
<td>How long has the company been working jointly with your competitors?</td>
</tr>
<tr>
<td>6</td>
<td>Can you give a description of how you have been working jointly with a selected competitor?</td>
</tr>
<tr>
<td><strong>III Questions on knowledge sharing</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>What are your key competences which can be considered as your knowledge?</td>
</tr>
<tr>
<td>8</td>
<td>Do you share knowledge with your competitors? What (knowledge) do you share with your competitor when you cooperate with it?</td>
</tr>
<tr>
<td>9</td>
<td>Why do you share knowledge? (Reasons)</td>
</tr>
<tr>
<td>10</td>
<td>What do you gain from the knowledge shared when working jointly with your competitors? (Benefits, satisfaction)</td>
</tr>
<tr>
<td>11</td>
<td>Do you have any formal systems or routines for sharing knowledge, both external and internal? If yes, which are they?</td>
</tr>
<tr>
<td><strong>IV Questions on knowledge protection</strong></td>
<td></td>
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<tr>
<td>12</td>
<td>How do you evaluate the cooperation part when working with your competitors (i.e. exchange of knowledge)? Why?</td>
</tr>
<tr>
<td>13</td>
<td>Do you have any conflicts with your competitors during cooperation? What is the conflict about? Any difficulties (disagreement, uncertainty, risks) in cooperating with the competitor?</td>
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<tr>
<td>14</td>
<td>Do you think knowledge sharing may reduce the advantages you have over your competitors? What are the negative sides?</td>
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<tr>
<td></td>
<td>Question</td>
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<tr>
<td>---</td>
<td>---------------------------------------------------------------------------------------------------</td>
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<tr>
<td>15</td>
<td>Is there any knowledge you feel more/ less willing to share with your competitors? Why?</td>
</tr>
<tr>
<td>16</td>
<td>What knowledge do you protect? How do you do that?</td>
</tr>
<tr>
<td></td>
<td><strong>Sum-up questions on tension between knowledge sharing and knowledge protection</strong></td>
</tr>
<tr>
<td>17</td>
<td>Do you think that what you gain from working jointly with your competitors outweighs what you lose?</td>
</tr>
<tr>
<td>18</td>
<td>Do you think the knowledge shared is enough or it is available more/ less than necessary?</td>
</tr>
<tr>
<td>19</td>
<td>How does it affect the coopetition (e.g. the relationship, the result)?</td>
</tr>
<tr>
<td></td>
<td><strong>Questions on balancing knowledge sharing and knowledge protection</strong></td>
</tr>
<tr>
<td>20</td>
<td>How did the company manage knowledge sharing and knowledge protection in coopetition?</td>
</tr>
<tr>
<td>21</td>
<td>How strong is the commitment between your company and your competitor? (e.g. do you tend to cooperate or compete? Is it on long-term or short-term basis?)</td>
</tr>
<tr>
<td>22</td>
<td>How would you describe your relationship with your competitors? How is your insight about trust in the cooperation with competitors? How does it affect the way you share knowledge or protect knowledge?</td>
</tr>
<tr>
<td>23</td>
<td>How does your company facilitate a smooth collaboration with your competitors? Do you have any regular work-in-progress meetings to evaluate corporate/alliance performance?</td>
</tr>
<tr>
<td>24</td>
<td>What strategies do you use to manage the process of knowledge sharing and protection?</td>
</tr>
<tr>
<td>25</td>
<td>Would you describe the strategies to be effective?</td>
</tr>
<tr>
<td>26</td>
<td>Do you think the strategies will change overtime? If yes, depending on what factor/situation?</td>
</tr>
<tr>
<td>27</td>
<td>Would you like to add anything else to this interview?</td>
</tr>
</tbody>
</table>
## Appendix 2: Sample of initial codings and categories

<table>
<thead>
<tr>
<th>Component</th>
<th>Sentence</th>
<th>Coding</th>
<th>Categories</th>
<th>Subcategories</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>173</td>
<td><strong>C2</strong> Do you think you share your knowledge will reduce advantages over your competitors?</td>
<td>Many knowledge is just IP</td>
<td>Knowledge sharing</td>
<td>What is shared and benefits</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td><strong>C2</strong> It’s you know, to be honest, many of the knowledge, it’s just that you know, because it’s just your IP or any IP, it’s not that I don’t know it. So sharing knowledge, of course, there are risks but we have to, yeah.</td>
<td>Risks when sharing IP</td>
<td>Knowledge protection</td>
<td>Risks of knowledge sharing</td>
<td></td>
</tr>
<tr>
<td>177</td>
<td><strong>C2</strong> So, I mean, as I say, to look at the big picture, we have to sacrifice, or we have to give in. Yah, oh so any knowledge, just like you say, sometimes you have to sacrifice, so you mean there’s some kind of knowledge you’re less willing to share with competitors, but you have to share it.</td>
<td>Give in for big picture</td>
<td>Knowledge sharing</td>
<td>What is shared and benefits</td>
<td></td>
</tr>
<tr>
<td>178</td>
<td><strong>C2</strong> Oh, then, actually, I mean, this one will be more with the consultancy. So it’s not the software. Software is is key, it’s the license, you use it much or use it less, or use you more, you make more. But the consultancy is ah of course, there is clearly something that we don’t want to share like too freely because we know that it will impact our future projects. But you know, so we have NDA clearly, we have NDA. And also what we think that can help us to be over the competitors in experience, and also the quality control. So someone may know it, whether they can do it or not, the clients they know that it’s not easy. I mean, I’m talking about big projects. For clients, big projects.</td>
<td>Less willing to share consultancy</td>
<td>Knowledge protection</td>
<td>What to protect</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td><strong>C2</strong> We don’t want to share consultancy. Knowledge sharing may be shared and benefits.</td>
<td>Share software, license</td>
<td>Knowledge sharing</td>
<td>What is shared and benefits</td>
<td></td>
</tr>
<tr>
<td>181</td>
<td><strong>C2</strong> Share software, license, knowledge sharing, what is shared and benefits.</td>
<td>Don’t want to share consultancy</td>
<td>Knowledge protection</td>
<td>What to protect</td>
<td></td>
</tr>
<tr>
<td>182</td>
<td><strong>C2</strong> Don’t want to share consultancy. Knowledge protection may be shared and benefits.</td>
<td>Share like too freely because we know that it will impact our future projects.</td>
<td>Knowledge protection</td>
<td>What to protect</td>
<td></td>
</tr>
<tr>
<td>183</td>
<td><strong>C2</strong> But you know, so we have NDA clearly, we have NDA. And also what we think that can help us to be over the competitors in experience, and also the quality control. So someone may know it, whether they can do it or not, the clients they know that it’s not easy. I mean, I’m talking about big projects. For clients, big projects.</td>
<td>Impact future project</td>
<td>Knowledge protection</td>
<td>Risks of knowledge sharing</td>
<td></td>
</tr>
<tr>
<td>184</td>
<td><strong>C2</strong> Experience, quality control. Key competences.</td>
<td>Experience, quality control</td>
<td>Background</td>
<td>Key competences</td>
<td></td>
</tr>
<tr>
<td>185</td>
<td><strong>C2</strong> Clients, not relevant.</td>
<td>Background</td>
<td>Key competences</td>
<td>Clients, not relevant</td>
<td></td>
</tr>
<tr>
<td>186</td>
<td><strong>C2</strong> Clients, not relevant.</td>
<td>Background</td>
<td>Key competences</td>
<td>Clients, not relevant</td>
<td></td>
</tr>
<tr>
<td>187</td>
<td><strong>C2</strong> Clients, not relevant.</td>
<td>Background</td>
<td>Key competences</td>
<td>Clients, not relevant</td>
<td></td>
</tr>
<tr>
<td>188</td>
<td><strong>C2</strong> Clients, not relevant.</td>
<td>Background</td>
<td>Key competences</td>
<td>Clients, not relevant</td>
<td></td>
</tr>
<tr>
<td>189</td>
<td><strong>C2</strong> It’s in business world, you need to accept it.</td>
<td>It’s in business world, you need to accept it.</td>
<td>It’s in business world, you need to accept it.</td>
<td>It’s in business world, you need to accept it.</td>
<td></td>
</tr>
</tbody>
</table>