

Supply Chain Collaboration – From Dyads to Triads

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DECLARATION

I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarized the work of others.

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01/02/2017

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ABSTRACT

Collaborations in supply chain are regarded as activities of value-adding partnership construction in achieving competitive advantages. The dyadic collaboration is the starting mode in value creation encourages individual parties to pool their resource and information to improve supply chain performance. However, due to the increasing complexity within a supply chain and the rise in outsourcing, the supply landscape is now more relying on networks. A triadic view on supply chain collaboration is regarded as the first step in exploring firm's relational behaviours of collaboration in network perspective, which is significant to the development of supply chain management.

This research aims to explore the configuration patterns of triadic collaborations in supply chain. To fill the gaps in literature review, this research defined three research questions (What are the patterns of supply chain collaboration with a triadic view? How do dyads come together into triads in supply chain collaboration? How do triadic collaborations impact on supply chain performance?). This research aims to investigate supply chain collaboration but with a triadic perspective, rather than a traditional dyadic perspective. The main purpose of this research is to identify the configuration patterns of collaboration triads in supply chain, and to identify its impacts on supply chain performance.

It is an exploratory research, and the methodology has been applied is multiple case studies. In regarding the industry background (pharmaceutical industry), firm size (small-to-medium sized enterprise, SME) and region (China mainland), case companies are selected to be involved. Techniques of pattern matching, explanation building, logic models, and cross-case synthesis have been applied to generate high quality data analysis.

This research makes contribution to knowledge on multiple aspects. It enables relevant stakeholders (business practitioners and academia) to better understand supply chain collaboration, which also can help to guide them how to collaborate in achieving more benefits.

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Chapter One : Introduction

1.1 Introduction

This chapter provides an overview of the research. This study aims to investigate supply chain collaboration, but from a triadic, rather than a traditional dyadic, perspective. The main purpose of the research is to identify the configuration patterns of collaboration triads in the supply chain, and to identify their impacts on supply chain performance. With the explanation of the research design and thesis structure, this chapter helps to provide an overview of the study.

1.2 Motivations of the Research

In recent years, a considerable body of literature has emerged around the theme of collaboration in supply chain management. The term “collaboration” has been used to refer to the situation of multiple stakeholders jointly working in approaching competitive advantages (Van Hoof and Thiell, 2014) to maintain continuing good performance and opportunity to access new markets. It has been acknowledged that high pressures can be caused by the requirements of innovation and costing in the progress of manufacturing (Ellram, 1991; Handfield et al., 2009). Collaboration is noted as a systematic and strategic method (Vallet-Bellmunt et al., 2011) to coordinate the relevant business functions, which is vitally important to the field of supply chain management.

In previous studies, it has been argued that the supply chain is no longer about a simple construction formed by a few entities that can be counted easily (Scholten and Schilder, 2015). The supply chain has been observed as a network (Scholten and Schilder, 2015) or system (Touboulic and Walker, 2015) to convert basic commodities into finished products (Harrison et al., 2014). By linking a firm’s internal functions with other channel members like the external operations of suppliers and customers, supply chain participants are encouraged to collaborate to enhance work efficiency (Sahay, 2003). As a precondition required by integration (Boon et al., 2009), collaboration encourages business stakeholders to pool relevant resources at different levels. This

integration could be at the highest level of collaboration, which can make the professions into a single organizational framework (Boon et al., 2009; Peyrefitte et al., 2002). Liao and Kuo (2014) point out that collaboration could happen at different levels, hence more investigations on this are needed to support the value co-creation process (Osei-Frimpong et al., 2015).

Previous research has established that a dyadic partnership is the starting mode of collaboration (Choi and Wu, 2009; Wu et al., 2010). Two related supply chain participants are encouraged to pool their resources and information to create value jointly (Sahay, 2003). The basic dyadic collaboration is in a one-to-one mode (Anderson et al., 1994), which can be observed as buyer–supplier or supplier–customer. However, due to the increasing complexity of the supply chain (Braziotis et al., 2013), it has become a common understanding that investigating only the dyadic relationship is not sufficient to reflect the complex nature of the supply chain with the features of a network (Choi and Wu, 2009; Wu et al., 2010). Hence, collaboration in a triadic view (collaboration built by three relevant participants) has increasingly been regarded as the first step (Choi and Wu, 2009) to further exploring the complex relational behaviours of organizations in a supply chain, which is crucial to the development of supply chain management.

Unfortunately, very little research has been carried out on triadic collaboration in a supply chain context. Within the current literature, the research on triadic construction is largely based on studies of outsourcing conducted in the service sector (Choi and Wu, 2009; Wu et al., 2010; Yakhlef, 2009; Scherrer-Rathje et al., 2014). It has been noted that a third party is invited to co-work via outsourcing and can play an important role in building collaborations by connecting relevant dyadic partnerships. To better understand how triadic collaboration is formed and the impact it can have on supply chain performance, it is critical to study collaboration from a dynamic viewpoint (Hudnurkar et al., 2014a), namely from dyads to triads in this research.

1.3 Theoretical Background

1.3.1 The development of collaboration in supply chain management

Collaboration is a hot topic that has been studied in numerous business environments (Alonso and Bressan, 2014). It can be commonly referred to as organizational actors working together with collective responsibility and shared interests to approach complex goals (Kark et al., 2015). In supply chain management, collaborations can be executed by resource pooling and activity coordination (Boehm and Hogan, 2013).

In the development of supply chain collaboration, the concept of vertical integration was frequently discussed in previous supply chain research (Rudie Harrigan, 1986; Ellram, 1991; Peyrefitte et al., 2002; Mpoyi, 2003), which can be defined as a strategy where a firm combines parts of functions operated by other separate organizations and makes them partly or fully belong to the focal company (the key participant in the central position, who is able to have a significant impact on the relevant business). It is believed that if vertical integration is done properly and excellent communications are possible, the resources and knowledge can be well leveraged (Leavy, 2006); external specialists can be aligned to enhance supply chain performance (Kohl et al., 2015). However, it has been noted that the above benefits brought about by vertical integration of functions can be less effective and visible in the market (Ellram, 1991) due to the limiting of competition from non-integrated firms and diseconomies caused by increased difficulty in managing business at a larger scale.

In order to tackle this challenge, Cao and Zhang (2011) point out that firms need to look outside for more opportunities to collaborate with other partners in the supply chain, to make sure that the supply chain can be efficient and responsive to the dynamic market. The supply chain should be able to respond to any change quickly and then address related challenges with feasible strategies. The question of how to coordinate the participants internally and externally to get strategic collaborative advantages has then become one of the main concerns in supply chain management (Montoya-Torres and Ortiz-Vargas, 2014).

1.3.2 Collaborative relationships in a dyadic view

In the current literature, much of the research on supply chain collaboration has adopted a dyadic view. Dyadic collaborative relationships refer to one-to-one value-adding (Anderson et al., 1994) co-working, which has been the paramount interest of

scholars, consultants and business practitioners (Croom et al., 2000).

Buyer–supplier is a common pattern of dyadic relation (Cannon and Perreault, 1999) that is heavily studied in current supply chain management research. The buyer refers to companies that would like to purchase commodities or services, and the supplier (or seller) is usually known as the company that provides the required products or services. The interaction between a pair of companies can be described by a dyadic framework (Choi and Wu, 2009), and the relationship can be cooperation but also competition (Choi et al., 2002).

However, more and more scholars have realized that the conventional dyadic view does not reflect the complex nature of collaboration in a supply chain. For one thing, within the dyadic perspective, collaboration normally refers to both cooperative and competitive relationships, but collaboration activities are not necessarily in direct competition with each other (Wilhelm, 2011). For another, besides the direct buyer–supplier relationship, various alliances that contain more than two participants are required to be formed due to the trend for outsourcing (Li and Choi, 2009). As an activity of purchasing equivalent services outside the firm, it is said that outsourcing is a good method to approach the advantages of effectiveness and cost efficiency in the supply chain (Peng et al., 2013).

It has been argued that the isolated dyadic relationship analysis does not capture the essence of a supply chain with the nature of a network (Choi and Wu, 2009). With remarkable progress made in the dyadic study of buyer–supplier relations in the past decades (Wu and Choi, 2005), it is suggested that an extended study in supplier–supplier relationships should be conducted, as it has strategic implications for buyers as well (Choi and Wu, 2009). The framework should be upgraded to a more complex one – a triadic context.

1.3.3 Collaborative relationships in a triadic view

Increasingly, a triadic perspective has been regarded as the first step to understanding the intricacies of the underlying relationship (Choi and Wu, 2009) in the supply chain, which is expected to better interpret firms' relational behaviours in a comprehensive way. It has been reviewed as a network construction that represents the engagement of

not only interconnected relationships between supply chain members, but also substantial work relationships generated by industrial marketing (Braziotis et al., 2013). Dyadic relationships can be connected into triads via goal congruence, information and resource sharing, and even joint knowledge creation (Ramanathan and Gunasekaran, 2014). It has been argued to be a dynamic process (Hudnurkar et al., 2014) where participants can be tied in or excluded under different circumstances (Burt, 1992; Burt, 2009; Squire et al., 2009).

Since the 1950s when Caplow first proposed the triadic structure of business relations, there has not been very much progress until recently (Choi, Ellram and Koka, 2002; Choi and Hong, 2002; Wu and Choi, 2005; Choi and Wu, 2009; Li and Choi, 2009; van der Valk and van Iwaarden, 2011). In published research on supply chain collaboration from a triadic view, there is very limited empirical evidence provided to explain the details of how to build triadic collaborations and what strategic benefits can be achieved, especially in a long-term perspective (Ramanathan and Gunasekaran, 2014). One weakness of the current investigation of supply chain collaboration is that it usually focuses on the buying companies (Wu and Choi, 2005). Another shortfall is that, when discussing the influence on the supply chain, it concentrates on single activities (Russo-Spena and Mele, 2012), which limits its interpretation of the influence on the entire supply chain. This research aims to fill such a gap and to investigate supply chain collaboration from a triadic view.

1.4 Business Context

Manufacturing industry is a system for production and for satisfying customer requirements that involves multiple resources of raw materials, energy, technology and the labour force (Susilawati et al., 2015). A company's business in a manufacturing industry is usually more than just production. From the view of supply chain management many other activities should be considered, including research and development (R&D; Lai et al., 2015), sourcing (Sajadieh and Thorstenson, 2014), marketing (Green et al., 2012) and logistics (Harrison et al., 2014).

Manufacturing industry can be divided into two categories: traditional (Humphreys et al., 2001; Chen et al., 2004; Wu and Choi, 2005) and innovative (Elder et al., 2015;

Fynes et al., 2005; Shah, 2004; Soh and Subramanian, 2014). Traditional manufacturing refers to industries that rely heavily on manual labour, while innovative manufacturing can be regarded as an emerging industry (Beck et al., 2016; Dambrin and Robson, 2011; Shah, 2004) that needs more attention, and is very sensitive to any change in policies and regulations.

It has been argued that to maintain and enhance competitiveness (Kuivanen, 2008), companies in traditional industries are trying to develop their innovation function (Laforet and Tann, 2006). Some innovations rely on Standard Industrial Classifications (SIC; Fixler and Siegel, 1999), and manufacturers have tended to outsource the R&D function in recent years (Teirlinck and Spithoven, 2013) to make their innovations more efficient. Sometimes, non-core businesses like logistics can be outsourced to save more money for the development of the core business (innovation; Rees, 2011). Due to the activity of outsourcing, a number of third-party service providers are involved to collaborate with the key participants in the supply chain.

It is said that the future of manufacturing industry depends on the development of collaborations within the industrial sector (Kuivanen, 2008). Supply chain collaboration has been widely developed in manufacturing industry, yet its theory building is from a dyadic view (Wu and Choi, 2005) and on the basis of scarce empirical evidence. The investigations of embedded dyads are dispersed (Humphreys et al., 2001; Chen et al., 2004), which weakens the persuasiveness of related explanations. Therefore, this research will focus on manufacturing industry with outsourcing activities. The investigations will be made not only from a dyadic view, but also a triadic view.

1.5 Aims and Purposes

This research aims to investigate supply chain collaboration but from a triadic perspective, rather than a traditional dyadic perspective only. The main purpose of this research is to identify the configuration patterns of collaboration triads in the supply chain, and to identify their impacts on supply chain performance.

By adopting both dyadic and triadic views to observe the phenomena of supply chain collaboration, this research can contribute to mapping out a more comprehensive

structure of collaboration and demonstrate a dynamic process of collaboration estimation. With the triadic patterns and their relevant impacts on performance to be identified, this research can reveal the principles of network building in the early stages and be used to assist business practitioners in approaching competitive advantages.

This is exploratory research. The concept of supply chain collaboration will be further developed by answering the following research questions.

1.6 Research Questions

The research questions can be defined as below:

Question One: What are the patterns of supply chain collaboration from a triadic view?

Question Two: How do dyads come together into triads in supply chain collaboration?

Question Three: How do triadic collaborations impact on supply chain performance?

It has been argued that to fully benefit from collaborations in the supply chain, visible patterns are required (Holweg et al., 2005). Research question one is to find alternative collaboration configurations for business practitioners in different circumstances to hit relevant targets. The identified patterns can be a paradigm (DiMasi et al., 2016) for supply chain stakeholders to be involved in approaching common goals.

As the smallest unit of a network (Choi and Wu, 2009), a triadic collaboration is made up of connected dyads. Dyads can be transformed into triads (Portier et al., 2014); in various conditions, suitable collaborative dyads can be matched (Chen et al., 2016) and connected. Research question two is to discover in what conditions and by what mechanisms dyads can be matched into triads to realize the new model of business in collaboration.

Bridge and bridge decay have been described as the key issues associated with outsourcing (Li and Choi, 2009), and have been regarded as the foundation of dyad-to-triad transformation (Portier et al., 2016). A bridge ties together two indirectly connected parties (Zahell and Bell, 2005), which means building up the connection across the structural hole between two business stakeholders who share the same partner

(in the central position). Maintaining these ties can be expensive (Li and Choi, 2009), and in a triadic collaboration bridge decay is normal when there are other strategic demands. Therefore, this research will also try to identify the role played by key triadic collaboration participants in outsourcing. To answer question two, this research will illustrate the detailed process of bridging and decay. It will help business practitioners find their niches in collaboration, and help them better manage the supply chain.

The purpose of collaboration is to achieve benefits (Yang et al., 2013; Guan et al., 2016). Measures of supply chain performance are needed to prove the value of any type of collaboration (Fabbe-Costes and Jahre, 2008). This research will explore the new patterns in supply chain collaboration, and research question three is vital and complementary to proving their value.

1.7 Research Design

This research will review the development of collaboration in supply chain management. There are many synonyms for collaboration (Cao and Zhang, 2011) that have frequently been used in relevant research, and this research intends to differentiate them. Any difference in the definition of collaboration will be picked out and used to redefine the collaboration. The features of collaboration in different conditions will be noted to identify levels of collaborative relationships.

The motivation can decide the results of any collaboration (Lee, 2011), and it is an important issue to help understand what sort of collaboration is needed in a particular business. Therefore, this research will take a look at the motivations of supply chain collaboration in certain conditions. This can help to picture the background characteristics of collaboration estimation. Motivations can also be regarded as the indicators (Cao and Zhang, 2011) of performance measurement, which apply to valuing different types of collaboration by confirming whether relevant targets have been achieved.

It has been agreed that collaboration is a dynamic process (Co and Barro, 2009; Touboulic and Walker, 2015) and there are many factors that can impact on relationship building, maintaining, decaying or dissolving (Hertz, 2006). This research will review the factors that can have the most impact on collaboration and then identify the most

significant ones to be used to assist further investigation.

The collaborative relationship is going to be reviewed from both dyadic and triadic perspectives. Outsourcing as a significant issue that helps to explain how dyads are transformed into triads will be reviewed as well. The literature review chapter will identify the gaps in the research area. A conceptual framework is expected to be built based on that.

The methodology that will be applied is the case study, which is said to be more suitable for research with an explorative purpose (Forsslund and Jonsson, 2007), when a more in-depth understanding of a contemporary phenomenon in the real world is desired (Yin, 2014). Regarding the research background, which has been reviewed above, it can be noted that no exact pattern of triadic collaboration has been identified. Compared to dyadic research, less empirical evidence has been collected to support relevant triadic studies. To further increase the knowledge of participants in supply chain collaboration and to make a contribution to new theory building (Caplow, 1956; Voss et al., 2002), the case study is a suitable method to be applied in the early stages to develop ideas.

When compared to a single-case study, a multiple-case study is preferred. Researchers are able to consider more information (Yin, 2014) and focus on data collection to extend theory building (Jia and Lamming, 2013) with less observer bias (Voss et al., 2002).

This entire research will cover two phases – pilot study (Phase I) and formal case study (Phase II). Case companies will be selected with regard to the factors of industry, firm size and region. The research strategy will be developed based on the methodology proposed and practised by Amaratunga and Baldry (2001). The explorative research will be generated with a series of descriptive and prescriptive activities from literature review to theory building.

Semi-structured interviews will be applied during the study, and the activity of data collection will be largely based on the interview tool (protocol; Yin, 2014), referring to the relevant literature review. Interview questions will be designed in accordance with previous studies (research questions, interview questions, surveys and questions that remained unaddressed; Appendix Two). Field visits will be made before the interviews. To ensure that more up-to-date data can be collected, a strategy of continuing a

connection with the interviewees until no more data is required will be applied. Question templates will be generated to help better record the data. Moreover, the data will be collected through investigations and other resources, including information online, mass media, documents and so on. Surveys following the interviews will be designed and sent out to confirm that relevant data has been collected.

Techniques of pattern matching, explanation building, logic models and cross-case synthesis will be applied to generate high-quality data analysis.

1.8 Thesis Structure

Table 1-1 outlines the chapters and the relevant highlights.

Table 1-1 Thesis structure

Chapter	Highlights
Chapter 1: <i>Introduction</i>	<ul style="list-style-type: none"> ▪ Motivation of the research ▪ Aim and purpose ▪ Overview of research background and research design ▪ Research framework
Chapter 2: <i>Literature Review</i>	<ul style="list-style-type: none"> ▪ Relevant key concepts and theories ▪ Research gap ▪ Research question ▪ Conceptual framework
Chapter 3: <i>Research Methodology</i>	<ul style="list-style-type: none"> ▪ Research approach ▪ Rationale of case study ▪ Research strategy ▪ Research design ▪ Data collection ▪ Methods and techniques applied in data analysis ▪ Trustworthiness of the study
Chapter 4: <i>Case Studies Profile</i>	<ul style="list-style-type: none"> ▪ Case description ▪ Supply chain mapping ▪ Highlights of interviews ▪ Highlights of surveys ▪ Summary of results
Chapter 5: <i>Configuration Pattern of Supply Chain Collaboration – a Triadic View</i>	<ul style="list-style-type: none"> ▪ To answer research <i>Question One</i> ▪ Related evidence collected ▪ Triadic collaboration pattern ▪ Partner selection of triadic collaboration

	<ul style="list-style-type: none"> ▪ Pattern selection in a dynamic view
Chapter 6: <i>Transformation of Collaborations from Dyadic to Triadic Construction</i>	<ul style="list-style-type: none"> ▪ To answer research <i>Question Two</i> ▪ Dyadic and triadic collaborations (a process of transformation) ▪ Outsourcing ▪ The role played by the focal company in transformation of dyadic and triadic collaboration
Chapter 7: <i>Impacts of Triadic Collaborations on Supply Chain Performance</i>	<ul style="list-style-type: none"> ▪ To answer research <i>Question Three</i> ▪ Impact on supply chain performance (dyadic collaborations) ▪ Impact on supply chain performance (triadic collaborations) ▪ A comparison of impacts on supply chain performance (dyadic vs triadic collaboration)
Chapter 8: <i>Conclusion</i>	<ul style="list-style-type: none"> ▪ Summary of the research ▪ Original contribution to knowledge ▪ Original contribution to practice ▪ Limitations of the research ▪ Future work

1.9 Summary

An introduction to how the research will be conducted has been provided. The motivation for the research, research background, aims and purposes to be achieved and research questions have been briefly illustrated.

This research will involve original studies with initial reference to the literature on supply chain management, logistics management, marketing and service management in general. Research questions proposed based on the gap identified from the literature review are to be answered. This research concentrates on having a more profound understanding of supply chain collaboration. In the following chapter, a conceptual framework will be verified.

Chapter Two : Literature Review

2.1 Introduction

This chapter will review relevant literature in supply chain collaboration and then identify the existing research gaps. At the beginning of the chapter, the concept of collaboration will be reviewed. In the following two sections, the motivations for supply chain collaboration will be illustrated. To investigate the progress of research in supply chain collaboration, a review generated from both dyadic and triadic perspectives will be presented. Research questions and a conceptual framework will be developed based on the identified gaps.

2.2 The Concept of Supply Chain Collaboration

Supply chain collaboration can be applied as a general concept to define the phenomenon of organizations working jointly to get competitive advantages in approaching certain goals (Heimeriks and Schreiner, 2010; Magdaleno et al., 2014). This topic has become very popular in recent years. It has been widely applied by business practitioners and frequently discussed by many scholars in the discovery process of pursuing progress.

2.2.1 Concepts relevant to collaboration

The definition of collaboration in supply chain management is very broad. The word collaboration can be replaced by synonyms like coordination (Singh, 2011a), cooperation (Ming et al., 2014), alliance (Sheu and Gao, 2014) and partnerships (Jia and Lamming, 2013a). Collaboration can be described as a phenomenon of stakeholders engaged in the interactive process of a supply chain to apply shared norms, rules and structures to operate or make related decisions. It is not easy to differentiate it from other terms that have a similar meaning in the discussions of supply chain collaboration

(Singh and Power, 2009).

Several characteristics have been conceptualized in the definition of these synonyms: goal congruence (Cao and Zhang, 2011), trust (Li et al., 2015), information/resource sharing (Liu et al., 2015), decision synchronization (Cao and Zhang, 2011; Grudinschi et al., 2014a) and incentive alignment (Chakraborty et al., 2014). These can be regarded as the basic configurations in forming each concept (Grudinschi et al., 2014a). In Table 2-1, the concepts relevant to collaboration have been listed.

Table 1-2 Concepts of collaboration theory in supply chain management

<u>Term</u>	<u>Definition</u>
<i>Collaboration</i>	<p>Two or more firms jointly and closely work to plan and execute operations within a supply chain in order to achieve mutual benefits and towards common goals (Cao and Zhang, 2011).</p> <p>All forms of agreements set between a focal company and other related parties to pursue common goals by pooling the resources and coordinating their activities (Boehm and Hogan, 2013).</p> <p>A collective process based on relationships and interactions among organizations and other active participants of the supply chain in achieving a common goal (Liao and Kuo, 2014).</p> <p>A leading business strategy to improve the performance of the supply chain (Ramanathan and Gunasekaran, 2014).</p> <p>Focus on networks (Van Hoof and Thiell, 2014).</p> <p>To achieve goals individually and collectively (Montoya-Torres and Ortiz-Vargas, 2014).</p> <p>A “two-way street” that asks for a trust-based relationship of supply chain partners in a long-term perspective (Liu et al., 2015).</p> <p>Organizational actors working together with collective responsibility and/or shared interests to approach complex goals (Kark et al., 2015).</p> <p>Close, functional and interdependent relationships that can be characterized by open and direct communication, support for experimentation and innovation, mutual influence and a goal of creating advantages for all partners involved (X. Wang et al., 2015).</p>
<i>Coordination</i>	<p>The act of managing related independent supply chain participants to work jointly as a whole, in order to gain a common goal in changing market conditions (Simatupang et al., 2002).</p> <p>Members of the supply chain perform different functions and activities with good communication and information sharing (Singh, 2011b).</p> <p>A model of communication and decision making between supply chain partners involved in the same task to approach the objectives; requires</p>

	<p>information exchange at a minimum level (Ming et al., 2014).</p> <p>“Coordination is managing the dependencies between activities” (Schuh et al., 2014).</p> <p>The aspect that organizes participants in the group to guarantee that the tasks can be performed as expected (Magdaleno et al., 2014).</p>
<i>Cooperation</i>	<p>An association formed for mutual benefit, which enables the partners to buy, sell or perform other economic functions to achieve advantages (Rebernik and Bradac, 2006).</p> <p>Individual goal-interdependent agents maximizing collective gain by working together in approaching a common goal (Schalk and Curseu, 2010).</p> <p>Closer collaborative relationships between an organization and related partners in the supply chain to maximize operational effectiveness (Gallear et al., 2012).</p> <p>An efficient means of cost reduction and competitiveness gained through information and resource sharing among supply chain partners (Adenso-Díaz et al., 2014).</p>
<i>Alliance</i>	<p>“An important form of inter-organizational cooperation”; partners of a supply chain work together in order to serve their customers best and better perform in business (Büyüközkan et al., 2008).</p> <p>“A joint venture”, which is able to create an entity separately through co-ownership in joint activities management (Rahman and Korn, 2010).</p> <p>Inter-firm cooperation that varies in its level of scope, degree of complexity and duration (Gammoh and Voss, 2013).</p> <p>The relationship acknowledged in the strategy of cooperation that rests on “the exchange of commitment” (Heimeriks and Schreiner, 2010).</p>
<i>Partnership</i>	<p>“Purposive strategic relationships between independent firms” that strive for mutual benefits and share compatible goals; interdependence at a high level (Gallear et al., 2012).</p> <p>A collaborative inter-firm alliance that is adopted widely (He et al., 2013).</p> <p>A collaborative relationship at the highest level, which implies structured and formal relationships between equal partners (Grudinschi et al., 2014a).</p> <p>An “on-going collaborative relationship” of two or more legally separated organizations, which depends on commitments to share costs and risks equally and rewards derived from joint working (Chicksand, 2015).</p>

In summary, a common project (Wang and Ma, 2015), task (Schuh et al., 2014), goal (Boehm and Hogan, 2013) or interest (Van Hoof and Thiell, 2014) can be the node that links each of the participants. In different concepts, the closeness of the linkage can be at different levels according to various requirements of information or resource sharing.

It has been argued that “collaboration should only be adopted when it has the

potential to produce better results than individuals working alone” (Magdaleno et al., 2014). However, when organizations decide to make a business connection or build a commercial relationship, the use of different concepts can lead to confusion in decision making and task execution. Challenges like the increase in related costs and the time-consuming nature of negotiation (Mishra et al., 2015), plus the inflexibility of collaborative modes (Cao and Zhang, 2011) and the risks caused by information leakage (Teirlinck and Spithoven, 2013), may arise due to the misunderstanding of different concepts. Although it has been realized that collaboration is probably a good operating strategy to create more benefits, most organizations are not sure how to encourage it properly (Magdaleno et al., 2014). A more accurate system of differentiating between concepts of collaboration is needed, which should be clarified before any further research is undertaken.

2.2.2 Collaboration pyramid

The collaboration pyramid is a concept proposed by Cahill in the 1990s and then improved by Grudinschi et al. in 2014. They summarized relevant collaboration theories, and then allocated levels to the concepts of coordination, cooperation, alliance and partnership. It is said that not all researchers agree to regard these synonyms as interchangeable, due to the different degrees of closeness of the collaborative relationships they describe (Ming et al., 2014).

The collaboration pyramid estimated how to differentiate those concepts and help to get a clearer identification (Cahill, 1996; Grudinschi et al., 2014a). In the pyramid, alliance and partnership can be put at the spire, which is the top of the pyramid, and the general business connection is at the bottom. However, due to the lack of a sufficient review, the application of the collaboration pyramid is limited. In the view of the collaboration pyramid, synonyms for collaboration can be regarded as different forms of collaboration (Grudinschi et al., 2014a). This research intends to review the details of each concept and then assign them to levels to improve the estimated collaboration pyramid.

Coordination is the synchronization of relevant activities, which requires information exchange or information sharing to be at a minimum level (Ming et al.,

2014). Besides negotiated contents, no more extra information will be provided in this situation. Basically, the action should only guarantee the fulfilment of the mutual tasks or projects (Magdaleno et al., 2014) with the necessary information and resources. It is collaborative behaviour (Blome et al., 2014), but executed in a much more voluntary manner rather than mandatory with commitment.

Cooperation is an upper level of a committed relationship, where the information exchange is required to be more regular (Ming et al., 2014). More strategic mutual benefits are expected to be obtained through the association rather than through merely operational goal achievement (Rebernik and Bradac, 2006). A comparatively long-term collaboration is desired by the participants of the supply chain through close joint working (Sepehri, 2011). More than that, the partners are willing to take out a certain amount of profits to share or reinvest.

An *alliance* is commonly used as a strategic alliance in supply chain management. In Table 2-1, it is suggested that the alliance is standing on the shoulders of cooperation, which has been regarded as the relationship acknowledged in the strategy of cooperation (Heimeriks and Schreiner, 2010). In order to get a strong relationship (Yang et al., 2008), a stable relationship to realize benefits in the long term can be enhanced by cooperative behaviours. When compared to the concept of cooperation, a strategic alliance tends to require relevant participants to show their willingness to make short-term sacrifices (Yang et al., 2008). As so-called joint planning work (Blome et al., 2014), it can inevitably be time consuming. Moreover, in the process of contract negotiation, concessions can be required to be made. In a strategic alliance, although it can be very risky to maintain the parties' individual competitiveness, more information and resources are welcomed to be pooled together (Büyüközkan et al., 2008). Parties in alignment prefer working as a whole. If the organizer is able to select the right ones to join (Lu et al., 2013), advantages can be expected in risk sharing, knowledge gaining and obtaining opportunity to access new markets. The focal company is even able to set up its own network (Kumar et al., 2006) in the long run.

Partnership can be regarded as a close purposive and strategic collaborative relationship between independent firms for mutual benefits. Partners would like to share compatible goals with a comparatively high level of mutual interdependence (Gallear et al., 2012). Similar to strategic alliances, business partnerships have the win–

win potential to access broader complementary resources and networks (Lee, 2011) and to achieve significant benefits. A partnership alliance depends on commitment (Ryu et al., 2009), which represents the efforts to be united. It can reflect partners' belief and is able to show that they are well prepared to make sacrifices for more stable relationships. It stands for loyalty with affirmative attitudes (Ryu et al., 2009). Sometimes, relational contracts can be signed among partners to sustain such commitment (Sun and Debo, 2014). It could even be informal, and they may not need to be governed by the court system. It is still helpful to remind partners of the possible loss of a future payoff if they fail to maintain such an alliance.

Above all, the collaboration pyramid is restructured in Figure 2-1 and further explained in Table 2-2.

Involvement is at the bottom level. In business relationships, when deals and offers (Nystén-Haarala et al., 2010) are made, the participants have become contracting partners, with the will, agreement, obligation, promise and commitment (Pesqueux, 2012) to stay in a contract that will connect individual organizations to fulfil mutual tasks. No more information relevant to each individual business is shared at this involvement level. Partnership, cooperation and coordination are stated as different concepts, which can be categorized based on the different levels of trust and commitment (Singh and Power, 2009). The partnership/alliance can be placed at the top (Cahill, 1996; Grudinschi et al., 2014a).

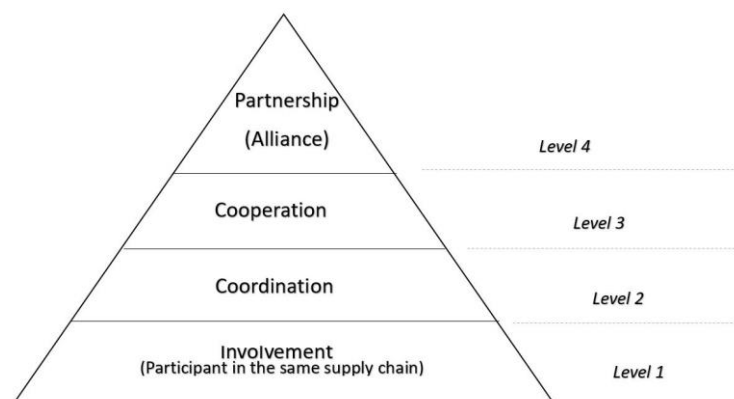


Figure 1-1 Revised collaboration pyramid

Table 1-3 Revised level division of supply chain collaboration

<u>Level</u>	<u>Characteristics</u>
<i>Level 1</i>	(1) Direct business connection (2) Goal congruence
<i>Level 2</i>	(1) Direct business connection (2) Goal congruence (3) Information/resource sharing at a minimum level
<i>Level 3</i>	(1) Direct business connection (2) Goal congruence (3) Information/resource sharing at a certain high level (4) Decision synchronization in mutual projects
<i>Level 4</i>	(1) Direct business connection (2) Goal congruence (3) Information/resource sharing at a maximum level (4) Decision synchronization in mutual projects (5) Incentive alignment

2.3 Motivation of Supply Chain Collaboration

Collaboration in the supply chain invites organizations across different sectors to join in to complete certain projects mutually that are based on the same interests. To better understand the collaboration, it is important to identify the partners' motivation (Lee, 2011) that drives these organizations to be involved, as it can have a further impact on their collaborative behaviours to a larger degree.

The motivation is defined as being stimulus driven (Moody and Pesut, 2006) and as urging those activities in response to environmental pressures and desired needs (Antikainen et al., 2010; Fiedler and Deegan, 2007). Goal directedness and a desire for potential advantages that sustain the actions of collaboration can also determine the motivation (Moody and Pesut, 2006). When referring to the research structure put forward by Fiedler and Deegan (2007) and other studies in relevant areas from the perspective of goal directedness, the factors that motivate individuals to collaborate can be innovation (Baloh et al., 2008), economic efficiency (Sellers-Rubio and Mas-Ruiz, 2006), stability (Nagarajan and Sošić, 2008), reciprocity (Inayat and Salim, 2014) and legitimacy (Fiedler and Deegan, 2007). From the perspective of potential advantages, the motivations consist of cost reduction/efficiency (Frödel, 2011), effectiveness (Singh and Power, 2009), flexibility (Kumar et al., 2006), sustainability (Van Hoof and Thiell, 2014) and opportunity (McKelvey et al., 2014). For details, see Table 2-3.

Table 1-4 Motivation for supply chain collaboration

		Definition	Reference
Goal Directedness	<i>Innovation</i>	To develop something that never existed previously, which could be products, service, logistics, skills and techniques, technologies, business modes etc. (which can be further addressed by outcome innovation, input innovation and process innovation).	Zhuang, Williamson and Carter, 1999; Antikainen, Mäkipää and Ahonen, 2010; Liao and Kuo, 2014; Kafouros et al., 2015
	<i>Economic efficiency (productivity/profitability)</i>	To create economic wealth for organizations, which can be revealed through productivity or profitability.	Fiedler and Deegan, 2007; Magdaleno et al., 2014
	<i>Stability</i>	At a minimum level of probability of failure in obtaining resources and risk of business suspension; stable in continuing operation and development.	R.J.A., 1978; Fiedler and Deegan, 2007
	<i>Reciprocity</i>	Willingness to collaborate with other organizations that are participating in the supply chain and prefer a win-win interactive business model rather than domination, power and control.	Fiedler and Deegan, 2007; Van Hoof and Thiell, 2014; Magdaleno et al., 2014; McKelvey, Zaring and Ljungberg, 2014
	<i>Legitimacy</i>	To appear as legitimate by rules and regulations, beliefs, expectations of external stakeholders, i.e. to collaborate with certain partners with intellectual property or production permission; associate with a government agency to obtain certain authorization etc.	Fiedler and Deegan, 2007; Boehm and Hogan, 2013; Ramanathan and Gunasekaran, 2014; Chin, Tat and Sulaiman, 2015
Potential	<i>Cost reduction/</i>	Money saving in certain processes	Yang et al.,

Advantages	<i>efficiency</i>	(nodes) of the supply chain, and at the same time the organizations' and chain's performance can be guaranteed or even improved to a maximum level.	2013; Le et al., 2013; Grudinschi, Sintonen and Hallikas, 2014; Kohl et al., 2015
	<i>Effectiveness</i>	Leveraging resources/knowledge and able to focus on core businesses; able to fulfil certain tasks or requirements in a comparatively short time with a quality guarantee.	Leavy, 2006; Cao and Zhang, 2011; Le et al., 2013; Grudinschi, Sintonen and Hallikas, 2014
	<i>Flexibility</i>	Able to quickly respond to the demands of changes in market/manufacturing/operation/customer (internally and externally); an effective strategy in addressing uncertainties.	Duclos, Vokurka and Lummus, 2003; Kumar et al., 2006; Stevenson and Spring, 2009; Tantoush, Lettice and Chan, 2009; Magdaleno et al., 2014
	<i>Sustainability</i>	Able to maintain continuing good organizational and supply chain performance to enhance their market position; able to address risk issues properly in time to pave the way for further development; able to create opportunities.	Schaltegger and Burritt, 2014; Beske and Seuring, 2014; Blome, Paulraj and Schuetz, 2014; Van Hoof and Thiell, 2014
	<i>Opportunity</i>	Able to access new areas or markets; able to align external specialists in various areas and further improve supply chain capability	Grudinschi, Sintonen and Hallikas, 2014; Mabey and Nicholds,

			2014; Kohl et al., 2015
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2.3.1 Motivation of supply chain collaboration from the perspective of goal directedness

(1) Innovation

Innovation aims to research and develop new things (Zhuang et al., 1999), which can be treated as one of the major factors that triggers supply chain collaborations (Fiaz, 2013). Organizations survive by being able to successfully generate and deliver products or services to customers in different tiers. Customers are the lead users (Russo-Spena and Mele, 2012) and their anticipation of broader choice and updated requirements in a way urge organizations that desire to survive to innovate. Innovation is always significant to any organization in satisfying buyers and further enhancing its market position with competitive advantages. Moreover, “the extent of innovativeness is largely influenced by supply chain relationships and collaborative practice” (Seo et al., 2014).

Research and development as an activity to support innovation requires ongoing investment. However, it is usually limited in organizations that may have to put more effort into other functions like manufacturing, marketing and so forth (Soh and Subramanian, 2014). Thus, sometimes external networking (de Jong and Hulsink, 2012) has been recognized as a good way for co-creation (Russo-Spena and Mele, 2012). Collaboration among participants in a supply chain is also able to provide a network mechanism for them to innovate in particular aspects of *input* (purchasing or sourcing), *output* (producing or serving or packing or delivering) and process (skills and techniques or operating or administrating; Zhuang et al., 1999). An appropriate collaborative pattern at a specific stage can help to bring about more creative efforts.

(2) Economic efficiency

For businesses, one of the most important purposes is wealth maximization (Watson and Head, 2010). With the desire to create more economic wealth, organizations are motivated to form collaborations (Fiedler and Deegan, 2007) to pursue potential benefits that are not easily obtained by individuals through joint working (Magdaleno et al., 2014).

Economic wealth can be transformed by productivity and measured by profitability (Watson and Head, 2010). In some research, productivity is said to be interchangeable with efficiency (Sellers-Rubio and Mas-Ruiz, 2006). The supply chain is a dynamic process (Hudnurkar et al., 2014a) that consists of material flow, information flow and finance flow among chain members across multiple functional areas, which favours the achievement of great benefits, communication and cooperation. Comparatively less input by individuals to a particular process in a supply chain is able to redeem more output through a cooperative mechanism (Trigkas et al., 2012); with less cost, the increase of profitability can be anticipated.

(3) Stability

Stability refers to a stable relationship with key resource providers (Fiedler and Deegan, 2007); sufficient supplies when required are expected to be guaranteed through such a connection. A stable relationship with suppliers is a good way to acquire sustained benefits in the long run, and it is a fundamental requirement of a strong partnership (Yang et al., 2008). To build a collaborative relationship, an exchange of commitment (Heimeriks and Schreiner, 2010) is always required in any business, which is regarded as a kind of “fail-safe” (R.J.A., 1978). Participants in the collaborative network have the responsibility to keep the commitment to minimize the probability of any suspension of resource availability.

(4) Reciprocity

As no business is done by individuals, organizations that participate in the same network are connected. Reciprocity is defined as the expectation of a sustainable win-win situation in trading (Fiedler and Deegan, 2007). When there is a unified viewpoint, collaborations begin to be formed voluntarily and can be formally set up eventually (Chakraborty et al., 2014). Participants' incentives are aligned to make more benefits for every member. Different from purely the pursuit of benefits, reciprocity counts on the willingness to collaborate for mutual advantages rather than the domination, power and control of partners (Fiedler and Deegan, 2007).

(5) Legitimacy

Government and related regulatory agencies and environmental institutions tend to intervene more in particular industries (Shah, 2004). They generate different institutional pressures (Kafouros et al., 2015) for players in the supply chain and require them to appear legitimate by following the rules and regulations or to be acceptable by their beliefs and expectations (Fiedler and Deegan, 2007).

However, it is not enough to act as the executors of policies or supervise relevant external institutions, as more communications are needed among stakeholders. Collaborations involve government agencies and institutions and enable business practitioners and authorities to better understand each other (Hendriks et al., 2015). More favourable and applicable policies and support can be expected. With an accurate understanding of the rules and regulations, participants can better perform to meet the beliefs and expectations of the public.

2.3.2 Motivation of supply chain collaboration from the perspective of potential advantage

(1) Cost reduction/efficiency

Cost competitiveness is one of the winning strategies when competing with primary

competitors (Cao and Zhang, 2011), and refers to using comparatively low costs in supply chain processes but with an acceptable quality guarantee. Collaboration can bring benefits to the supply chain including cost reduction or cost efficiency (Ramanathan et al., 2011; Ramanathan and Gunasekaran, 2014), as pooled resources financially, technologically and physically are a way to enable organizations to share; a certain amount of money can be saved from such collaborative relationships when required (Teirlinck and Spithoven, 2013).

Especially for some small to medium-sized enterprises (SMEs) with limited resources and capital, collaboration is an excellent possibility to optimize their costs and to fulfil a desired project at the same time (Kohl et al., 2015). But it does not mean that big firms will not benefit from collaborations. Although in such a relationship they are the ones who contribute the most, and although more frequent collaboration is said to be cost prohibitive, the total benefits of cost efficiency are still impressive (Xu et al., 2015).

(2) Effectiveness

Effectiveness as a competitive advantage is always repeated in many studies of supply chain collaboration (Grudinski et al., 2014a; Li et al., 2015; Liao and Kuo, 2014). However, there is no clear definition of it so far. A common statement can refer to the extent of how physical resources and invisible assets can be better utilized (Cao and Zhang, 2011) to create supernormal value. The effectiveness that is expected in supply chain management is the possibility of addressing specific issues in good time with an appropriate portion of resources and efforts (Harrison et al., 2014). To manage organizations to perform well in the supply chain requires broader resources (Kohl et al., 2015), which can be satisfied by collaborations formed in the supply system (Chakraborty et al., 2014; Ramanathan et al., 2014).

Moreover, with the emergence of outsourcing (Scarlett, 1996; Pedroso and Nakano, 2009; Azzi et al., 2013), companies tend to outsource their non-core businesses to other practitioners in the supply chain, and this enables them to focus on their core business (Rees, 2011). To work with a third party is a tendency for organizations seeking ways

to increase the effectiveness of supply chain capability, as it is never possible to isolate their own functions from external support.

(3) Flexibility

Flexibility in business usually refers to the extent of change that can be made by any firm in offering support like products or service provision, which is in response to the change of business environment (Cao and Zhang, 2011). The expectation of flexibility in the supply chain is to respond quickly to variations with available resources (resource flexibility) and feasible strategies (operational flexibility; Duclos et al., 2003).

To be more detailed, flexibility can be expected in six aspects: Operational system: able to react to emerging customer trends and changes in functions, volume and so on at each node of the supply chain; Market: able to customize and estimate a close relationship with stakeholders; Logistics: able to receive and deliver when changes occur in location or postponement of ordering; Supply: able to reconfigure the supply chain or alter product supply in line with customer demand; Organizational: able to align labour force skills to the requirements of the supply chain; Information system: able to provide necessary information for the organization by aligning the information system with updated data to meet customer demand. Moreover, it is said that the multidimensional nature (Kumar and Malegeant, 2006) of manufacturing industry implies the requirement for a systematic network like collaborative partnering (Le et al., 2013) to better perform in various strategic objectives in the supply chain.

(4) Sustainability

Sustainability is a benefit that can be expected from collaboration (Chakraborty et al., 2014). Furthermore, it has been stated that collaboration can bring about many competitive advantages for the supply network with a significant overall cost reduction to enhance or boost performance (Beske and Seuring, 2014). However, if the goal is to obtain sustainability, the point of continuing should be emphasized. Any uncertainty

that can potentially provide a threat to the business should be well managed, and it has been confirmed that collaboration can help to reduce financial risks (G. Wang et al., 2015), environmental risks (Chin et al., 2015) and operational risks (Chakraborty et al., 2014), and facilitate improvement of supply chain performance in the long term (Chin et al., 2015).

Once again, the importance of partner selection has been highlighted (Schaltegger and Burritt, 2014): choosing the right partners to work jointly on key concepts, design, commercial exploitation and delivery is crucial to maintaining a sustainable supply chain. Moreover, stakeholders' increasing concerns about sustainability have put a great deal of pressure on the relevant participants (Blome et al., 2014). Achieving partnerships and joint initiatives with members in the supply chain in order to innovate and develop strategies to gain improvements in overall performance has become a life-saver (Kohl et al., 2015).

(5) Opportunity

Opportunity is said to have arisen in situations of new resources for goods or services, markets and management techniques, and it can be introduced through the formation of new relationships (Korsgaard, 2011). An increasing number of firms have recognized that it can be one of the core issues to concentrate on (Renko et al., 2012), as opportunity in business is meant potentially to bring about more benefits (Hansen and Hills, 2004).

Like sustainability, which has been discussed above, opportunity is associated with challenges, problems and risks. If the tough issues can be settled well, opportunities can be expected (Hansen and Hills, 2004). Renko, Shrader and Simon (2012) describe opportunity as a favourable juncture of good chances for progress or advancement. When referring to Hansen and Hills' (2004) research, opportunity is said to be clearly related to creativity, which means that innovation is a significant aspect to be further discovered if organizations would like to have more opportunities. Effective collaboration can solve problems (Van Hoof and Thiell, 2014) and align broader resources (Kohl et al., 2015) for innovation, which is encouraged. The process of joint innovation could help to figure out the true needs of the supply chain and enable

organizations to take out more free capital to encourage further innovations (Magdaleno et al., 2014), and thus lead to a positive cycle.

Above all, collaboration can be motivated by factors from different perspectives and reasons. To make progress and obtain benefits are the main purposes and final objectives of collaboration. With different motivations, organizations tend to build different types of collaboration with various supply chain participants. Therefore, getting to know the motivations for collaboration should be the starting point of research in supply chain collaboration, which needs to be explored further.

2.4 Factors Affecting Supply Chain Collaboration

When organizations have decided to build collaborations in a supply chain, diverse factors may influence the formation of those collaborations. Supply chain collaboration involves a system of people, organizations, activities and resources in production or service delivery in channels from tier suppliers to end customers (Sepehri, 2011). To operate such complicated processes successfully, it is important to get to know more about the factors that may affect collaboration in the supply chain.

2.4.1 Relevant concepts

There are some key concepts frequently discussed in research, which may be said to have an impact on estimating (DiMasi et al., 2016) and maintaining (Song et al., 2012) collaboration in a supply chain. The details are summarized in Table 2-4.

Table 1-5 Key words mentioned in research on factors affecting collaboration

No.	Key Words	Interpretation	Reference
1	<i>Firm size</i>	The scale of a firm, which may be associated with the number of employees, length of time established, assets and capital etc.	Teirlinck and Spithoven, 2013; Ho and Lu, 2014; McKelvey, Zaring and Ljungberg, 2014; Li et al., 2015
2	<i>Equal partners</i>	The participants in partnership	Adenso-Díaz et al., 2014;

		are in an equal position in business trading.	Grudinschi, Sintonen and Hallikas, 2014
3	<i>Switching cost</i>	The cost generated as the result of changing current trading partners, or the loss of breaking up an existing collaboration and cost to construct a new network relationship.	Cao and Zhang, 2011; Boehm and Hogan, 2013; Sun and Debo, 2014
4	<i>Trust</i>	A positive attitude or belief that the collaborating parties are able to generate a satisfactory outcome or, in other words, that they are reliable and dependable.	Hudnurkar, Jakhar and Rathod, 2014; Ming, Grabot and Houé, 2014; Arsenyan, Büyüközkan and Feyzioğlu, 2015; Narayanan, Narasimhan and Schoenherr, 2015; Li et al., 2015; Kohl et al., 2015
5	<i>Capability</i>	The ability or value of a firm to contribute to collaborative relationships; costs can be spent on collaboration.	Ming, Grabot and Houé, 2014; Wang and Ma, 2015; McKelvey, Zaring and Ljungberg, 2014; Shyam Kumar, 2008
6	<i>Commitment</i>	The willingness of partners on behalf of the collaborative network to exert efforts to maintain a sustained relationship and to face certain unanticipated problems together.	Hudnurkar, Jakhar and Rathod, 2014; Ming, Grabot and Houé, 2014
7	<i>Goal congruence Incentive alliance</i>	Shared beliefs/common understanding; network partners and the supply chain system have unified viewpoints and, when necessary, would like to share the risks, costs and benefits.	Chakraborty, Bhattacharya and Dobrzykowski, 2014; Ming, Grabot and Houé, 2014; Arsenyan, Büyüközkan and Feyzioğlu, 2015
8	<i>Dependence Interdependence</i>	A need of a firm that has to maintain a collaborative or exchange relationship to approach desired goals.	Bantham, Celuch and Kasouf, 2003; He, Ghobadian and Gallear, 2013; Hudnurkar, Jakhar and Rathod, 2014; Ming, Grabot and Houé, 2014
9	<i>Power</i>	The ability of one side of a collaborative relationship to affect another in a manner contrary to his/her interest.	Sepehri, 2011; He, Ghobadian and Gallear, 2013; Chicksand, 2015
10	<i>Culture Organizational culture</i>	Beliefs and shared values that help to understand organizational functioning with certain set behavioural norms.	Ming, Grabot and Houé, 2014; Qu and Yang, 2015
11	<i>Policy Legal factors</i>	A course of action or plan generated by government and related agencies or related regulatory institutions, which have the power to directly and	Grudinschi, Sintonen and Hallikas, 2014; Hudnurkar, Jakhar and Rathod, 2014; Zhao et al., 2015; Kafouros et al., 2015

		effectively control certain activities.	
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Most research tends to regard firm size as a very important factor (Cao and Zhang, 2011; Van Hoof and Thiell, 2014). It is believed that dedicated resources that can be shared in collaborations are significantly related to the scale of a business (Ho and Lu, 2014). To set up a collaboration, large firms are likely to put more resources into both financial and technical aspects, and thus to have a comparatively higher propensity to sign agreements to safeguard the desired benefits (McKelvey et al., 2014). For SMEs, collaboration is an excellent possibility to create opportunities in exploiting their own resources (Kohl et al., 2015). To SMEs, costs can be a very high proportion of their consideration when compared to large firms. They tend to think more about the possibility of the relevant risks of loss (Teirlinck and Spithoven, 2013), which in a way limits the scope and nature of the collaboration estimated. Moreover, large firms usually enjoy more channels than SMEs (McKelvey et al., 2014), which means that they would have more choices and bargaining power; SMEs can be placed in a disadvantageous position.

Equal partnership is emphasized in the discussion of a partnering/alliance collaborative relationship, which refers to equal positions in business trading and negotiations (Adenso-Díaz et al., 2014; Grudinschi et al., 2014b). It is somehow associated with the factor of firm size, as being devoted to resource asymmetry may cause different attitudes and unequal positions in network relationships. However, it does not mean that a large firm always has priority. For some rare resources, if there is a high dependence (Hudnurkar et al., 2014a), in order to get a long-term stable relationship large firms would be willing to make a short-term sacrifice (Yang et al., 2008). In this situation, the impact of firm size has been weakened, and the position of partners in a collaborative relationship is much more dependent on the level of willingness to collaborate when they refer to goals and strategies.

Switching cost (Boehm and Hogan, 2013) is a concept introduced in discussion of the loss/cost occurred when existing collaborative networks have been dissolved and a new partnership is to be launched (Cao and Zhang, 2011; Sun and Debo, 2014). Boehm and Hogan (2013) argue that the level of switching cost can influence the loyalty and the length of the collaboration. It is said that if switching cost is low when the costs for

retaining and maintaining the relationship are comparatively high, acquiring a new partner with low relationship costs would be preferred.

Trust based on shared beliefs (Ming et al., 2014) is often considered as one of the relevant factors that contribute to a successfully operated network (Kohl et al., 2015). Fynes, Voss and de Búrca (2005) propose three types of trust: (1) contractual trust: a belief in promise keeping; (2) competence trust: confidence in a partner's ability to fulfil certain tasks; and (3) goodwill trust: a belief in promise keeping and maintaining a collaborative relationship at a moral level. Tracing trust, satisfaction in outcomes or action evaluated by the participants may help to measure it. An approach of result verification has been proposed to test whether partners are able to meet relevant expectations in business. However, it is still an ambiguous concept that there is no way to check (Ming et al., 2014).

Capability is regarded as a critical factor for collaboration (G. Wang et al., 2015) and refers to the ability to dedicate resources. Usually it depends on firm size (Ho and Lu, 2014) and the willingness to share (Ming et al., 2014). McKelvey, Zaring and Ljungberg (2014) have put forward the idea of absorptive capacity in transferring or applying mutual outcomes, especially in R&D. This is a significant ability to get more benefit from profitability and sustainability.

Absorptive capability in a sense enhances and even promotes capability. Shyam Kumar (2008) argues that if there is a high differential among partners in a collaboration, it can lead to asymmetry in benefits. The one who has a lower capability would obtain more private benefit from increased opportunities and the overall common benefits.

The commitment required by supply chain collaboration is usually based on the willingness of participants to maintain such relationships with effort and to face certain difficulties when needed (Hudnurkar et al., 2014a). To safeguard the desired benefits, in accordance with their dedication, stakeholders are usually asked to sign agreements/contracts (McKelvey et al., 2014; Sun and Debo, 2014). To a certain extent, commitment can help to reduce conflicts within collaborative networks, as the interests and related responsibilities should have been negotiated, agreed and then clarified.

Goal congruence or incentive alliance is one of the premises of collaboration, which is put forward based on the shared beliefs and common understanding of responsibility and the expected outcome of networking (Ming et al., 2014). Only when the goals of

different parties are compatible (Hudnurkar et al., 2014a) is there a possibility of further collaboration. Goal congruence or incentive alliance can be practised referring to the strategies of the relevant parties (Hudnurkar et al., 2014a). Prior goals (Gallear et al., 2012) can be selected and used in deciding the level of collaboration.

Dependence and independence refer to the extent to which one party in the relationship influences others or to the exchange relationships of interaction in achieving valued outcomes (Bantham et al., 2003). Such relationships are considered negative to supply chain performance by some researchers (He et al., 2013). An arm's-length approach is suggested to avoid dependence on suppliers and is applied to maximize bargaining power (Sepehri, 2011). He, Ghobadian and Gallear (2013) point out that dependence or interdependence may lead to unproductive partnerships, which can be a barrier to win-win integration. Switching cost is comparatively high in this situation, and the power of the one who is on the disadvantaged side can be weakened in negotiations.

Power is a complicated factor that dynamically influences partnerships in a supply chain (He et al., 2013). As a general concept, it is described as the ability of one party to affect another in a way that goes against the second one's interests (Chicksand, 2015). Power is often associated and discussed with the factor of dependence or interdependence (Bantham et al., 2003; He et al., 2013; Ming et al., 2014). It is said that dependence or power is fundamental to collaboration and decides the development and maintenance of long-term relationships (Ming et al., 2014). The balance of power or dependence has become a crucial issue that must be carefully considered before the estimation of any collaboration.

Culture or organizational culture and the legal factor of policy are usually characterized with specificity and territoriality. Conflicts or differences of opinions can occur due to the distinction of culture at social and organizational levels (Hudnurkar et al., 2014b). Motivations, objectives and preferences in different regions tend to be distinct (Kafouros et al., 2015). When compared to the factor of culture, policy is more important to any organization, as government intervention can be directly embedded in the supply chain process (Zhao et al., 2015) with regulatory power, and can have a significant impact on certain core businesses.

From the discussions above, the factors that affect supply chain collaboration can be further crystallized as (1) trust, (2) commitment, (3) dependence/interdependence, and (4) power (Ming et al., 2014). Firm size, equal partnership, switching cost, capability and policy can be regarded as expressive forms or measures of power, while goals or incentives and culture are relevant to the factor of commitment. Trust and commitment have decided the level of closeness of participants that would like to form collaborations. Dependence or the power balance can have an impact on the distribution of benefits and duties (Hudnurkar et al., 2014b; Ming et al., 2014).

2.4.2 Trust and commitment matrix

The presence of commitment and trust are the central issues in estimating a successful relationship (Morgan and Hunt, 1994). Trust is the focal point that is fundamental (Coote et al., 2003) and exists when an organization is confident in or has faith in the reliability and integrity of its partners (De Cannière et al., 2009; Leuthesser, 1997). Commitment can be defined as a belief in an ongoing relationship that is exchanged between partners (Ming et al., 2014). With relationship commitment, the committed parties believe that it is worth working on the partnership with maximum effort to build, maintain and develop it (Morgan and Hunt, 1994). Confidence in partners and willingness to work together (Coote et al., 2003; Liu et al., 2010b; Ming et al., 2014; Morgan and Hunt, 1994) are emphasized in the exploration of relationship quality (RQ). Both trust and commitment are regarded as the factors that cannot be ignored in achieving cooperation.

In a collaboration, relationship commitment and trust are to be developed when partners are providing benefits like resources and opportunities that are superior to the offerings of alternative ones (Morgan and Hunt, 1994). Maintaining a high standard of corporate values to align with others with similar values, commitment and trust can help enhance the effectiveness, productivity and efficiency of relational exchanges (Coote et al., 2003) and avoid taking advantage of exchange partners (Morgan and Hunt, 1994). Based on theory, Liu, Li and Zhang (2010) and Ming, Grabot and Houé (2014) developed a matrix (see Figure 2-2) to investigate how the factors of commitment and

trust affect supplier–buyer relationships.

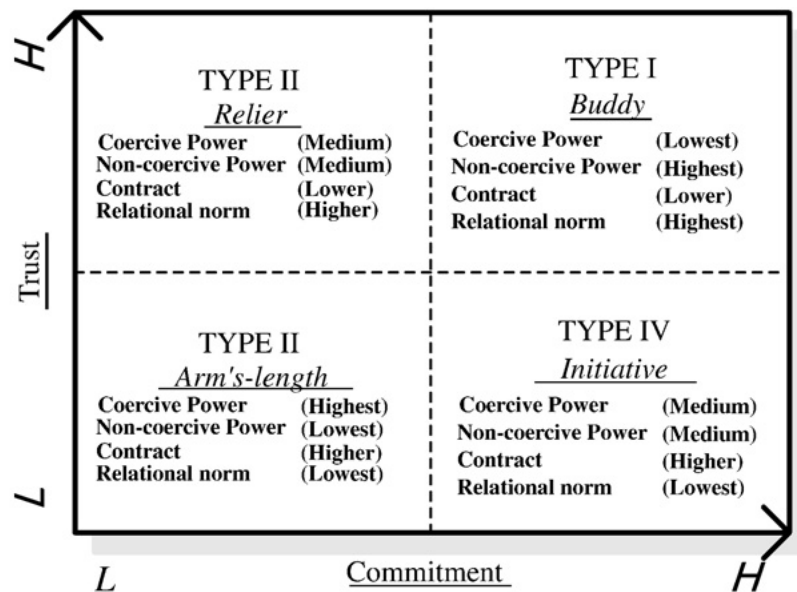


Figure 1-2 A theoretical model of relationship quality and control mechanisms coupled in buyer–supplier dyadic relationship (Liu, Li and Zhang, 2010)

The model illustrated in Figure 2-2 identifies the possible relational modes estimated between buyers and suppliers in the supply chain. To complete the analysis, power is confirmed as the central conceptual factor and can be influencing others (Morgan and Hunt, 1994), which should also be taken into consideration.

This research adopts this model as part of the theoretical basis for pattern identification. The factors of power, contract and relational norm will be applied as the indicators to differentiate the patterns.

2.4.3 Power–dependence matrix

Power and dependence are considered to be very important concepts for understanding the relationships among suppliers and buyers (Caniëls and Gelderman, 2007). An organization always depends on its trading partners to varying extents. Power that results from dependence in a way implies the extent of that dependence (Morgan and Hunt, 1994). Any activity between two organizations is anticipated for certain

respective goals or objectives to be realized, and power is fundamental to understanding such interorganizational behaviour (Cook, 1977).

The availability of alternative sources can determine one party's power and autonomy by decreasing its dependence on others (Cook, 1977; Cook et al., 2011; Ming et al., 2014). The imbalance of power in a supply chain can be caused by the difference in value that suppliers and buyers have attached to their relationship (Buchanan, 1992). Balanced power can refer to the fact that there is no difference between the two parties' levels of dependence (Caniëls and Gelderman, 2007).

El-Ansary and Stern (1972) propose that power is a function of dependence and sources of power. A *power matrix* (see Figure 2-3) was developed by Cox (2000, cited by Chicksand, 2015) to identify resource dependence in order to investigate asymmetrical interdependence further. The degree of power/dependence plays a significant role in a supply chain and can have a great impact on interfirm relationship formation (Benton and Maloni, 2005).

		<u>BUYER DOMINANCE</u>		<u>INDEPENDENCE</u>	
		>	0		
Attributes of Buyer Power Relative to Supplier	HIGH				
	LOW	<u>INTERDEPENDENCE</u>		<u>SUPPLIER DOMINANCE</u>	
		=	<		
		LOW		HIGH	
		Attributes of Supplier Power Relative to Buyer			

Figure 1-3 Power matrix (Cox, 2000, cited by Chicksand, 2015)

The power-dependence matrix can be treated as the foundation of pattern transformation. This research intends to explore it further and then adopt it to better

explain the estimation of collaboration in a dynamic view.

2.5 Collaborative Relationship – Dyadic Perspective

A supply chain is composed of individual participants who may be disjointed originally. When individuals start working on common projects together and connect to each other, the linkage is the relationship of collaboration (Wang and Ma, 2015).

In dyadic relationships, only one pair of firms will be involved (Choi and Wu, 2009). The supply chain or network is constructed by a series of dyads (Borgatti and Li, 2009). Thus, as a fundamental element of the chain, it is necessary to discover it from the simplest view – the dyadic relationship.

A supply chain is a dynamic process (Hudnurkar et al., 2014b). It has been argued that collaborative relationships can vary based on different strategies, and the dyads formed can refer to two situations of discrete one-off transactions (exchanges) and long-term relationship development issues (Miemczyk et al., 2012).

In the exploration of relationship estimation, how two firms get along can be classified into three categories – competition, cooperation and co-opetition (Bunger et al., 2014; Choi and Hong, 2002; Choi and Wu, 2009; Kim et al., 2013; Wu and Choi, 2005). Competition usually refers to the interactions between firms that are in the same industry or that strive for the same resources; cooperation is described as the process of firms working together in approaching common goals; co-opetition is regarded as a collaborative relationship, as discussed at the beginning of the literature review.

Competition can have a negative impact on win–win strategy execution to co-create value, which is treated as a threat that may undermine collaboration (Bunger et al., 2014). However, in some situations, a strategic alliance formed with those who are always in a competitive relationship is said to be acceptable, as it may help to improve operational efficiency and market expansion (Zhang and Frazier, 2011). Co-opetition is known as an advanced business strategy, which is tolerant of both cooperation and competition. It enables competitors to join in collaborative networking to create value that is more efficient (Bunger et al., 2014).

In the supply chain, materials, information and capital flow across multiple

functional areas (Hudnurkar et al., 2014b). The participants in a supply chain are actors who respond by accepting the tasks that have been given, or accepting them with further processing, and then passing to those in the next stage. Basically, the chain is made up of suppliers/providers of materials/information/capital and receivers/buyers/customers. A great deal of research has been generated on supply chain collaboration from the perspective of dyads (refer to Appendix One, samples of dyadic relationship exploration). Certain modes of collaboration have been delineated with discussions of their impacts on performance and the development of the supply chain.

Referring to Appendix One, supplier–buyer dyads are in the mainstream of relationship studies. Both supplier and buyer are regarded as stakeholders in the supply chain who are directly associated with each other in core business activities (Holweg, 2005; Squire et al., 2009). However, as the two parties represent different interests, suppliers and buyers can be not only partners but also competitors (Aleo, 1992), and cooperation and competition always exist (Kim et al., 2013) in business trading.

In fact, supplier and buyer are only generalized concepts, which can be in different forms. If not at the end of a chain, any participant can have a dual attribute and can act as a supplier or a buyer when referring to the business activities in which they have been involved. Mills, Schmitz and Frizelle (2004) argue that the supplier–buyer relationships in a supply chain should be viewed from different perspectives (Figure 2-4): relationships in the upstream structure tend to take the buyers’ perspective and considers more the selection of suppliers and the development of the alliance; downstream, the channel network is highlighted and the perspectives of suppliers are focused on.

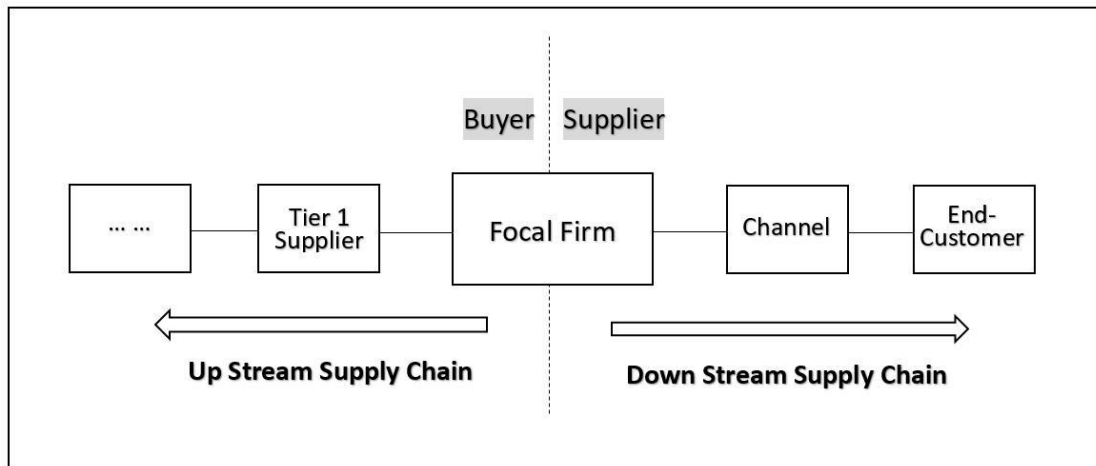


Figure 1-4 Dual attributes of focal firm in the supply chain

2.5.1 Collaborative relationships in the upstream supply chain

In Appendix One, it is presented that activities in the supply chain upstream are mainly about procurement, innovation and manufacturing. Issues of logistics are involved, but most of the time they are only regarded as one of the important references in the process of supplier selection (Aleo, 1992; Qureshi et al., 2007; Sandberg, 2007; Tawfik Mady et al., 2014). A relationship usually starts with contracts (Charterina and Landeta, 2010). In different business activities, contracts have to be signed by the focal firm (referred to as the manufacturer in this research) and other stakeholders. A valid contract can help to make clear relevant issues like prices and obligations under legal protection, and commitments are exchanged based on contractual trust (Ming et al., 2014). Then, an early collaborative relationship is estimated at the initial level.

It is not appropriate to express dyadic collaboration in a general way as supplier–buyer. The commitment, trust, source of power and dependence level (Cook et al., 2011; Liu et al., 2010a; Ming et al., 2014), which can have a significant impact on relationship development, cannot easily be clearly identified and justified in this situation. To make it more detailed and specific, modes with clear expressions of participants in accordance with activities can be summarized, and are expected to better reveal the collaborative relationship from a dyadic view (see Table 2-5).

Table 1-5 Collaborative modes in the upstream supply chain (based on dyads review)

Main Activities in Upstream Supply Chain	Possible Collaborative Mode	Paper Code (refer to Appendix 1)
Innovation	<i>Manufacturer–Supplier</i>	P2, P9, P15, P27, P43, P54
Procurement (Sourcing/Purchasing)	<i>Manufacturer–Supplier</i>	P5, P6, P15, P18, P20, P24, P27, P32, P33, P34, P35, P37, P39, P46, P47, P48, P49, P50, P53, P54, P55, P57
Manufacturing	<i>Manufacturer–Joint Venture</i>	P3, P15, P20

Based on the review provided, there are mainly two types of modes. The dyadic relationship mode of manufacturer–supplier is approved and discussed in previous research. Suppliers can be further identified as service provider/supplier and goods provider/supplier (Morgan and Hunt, 1994; Peng et al., 2013; Wolf and Seuring, 2010). Collaborations widely exist in the activities of innovation and procurement.

In the upstream dyadic mode of supplier–buyer, it is assumed that the buyer is always the manufacturer (focal firm). The supplier can be any appropriate candidate who can provide the required raw materials, components, products or services. Such a relationship can be further divided into two types – discrete one-off exchanges and long-term relationships (Miemczyk et al., 2012). It has been suggested that manufacturers should pay more attention to the selection of suppliers (Tawfik Mady et al., 2014; Walters, 1975), and in all estimated collaborative relationships, only some of them should progress to a higher level (Squire et al., 2009). In addition to this, suppliers can be distinguished as independent suppliers (organizations legally and administratively independent, not controlled/owned/combined by the buyer); cooperative association suppliers (organizations legally and administratively independent, but committed with the buyer in a long-term business relationship); and affiliated companies (organizations that can be controlled by the buyer to a certain degree, or organizations owned/controlled/combined by the buyer). Therefore, when trading with different types of suppliers, the relationship of manufacturer–supplier can be formed at different collaborative levels, and the attitude of buyer to supplier would be different as well.

The power/dependence matrix is proposed in the situation where buyer–supplier collaborations are formed at different levels (Co and Barro, 2009; Gomes and Dahab, 2010; Sambasivan et al., 2013; Song et al., 2012). The belief is that the

complementariness of the two parties somehow exists in a supplier–buyer dyad. A good understanding of power and dependence (interdependence) can also help the focal companies to see opportunities in business (Co and Barro, 2009; Gomes and Dahab, 2010; Magdaleno et al., 2014). Interdependence always lives with power in the game of balance in supply chain management. Interdependence refers to the dependence between two parties in goal determination, task fulfilment and benefit sharing, which represents the degree of relationship strength (Sambasivan et al., 2013). Power is the ability of an advocate to influence process outcomes, business behaviours and objectives/directions (Magdaleno et al., 2014). If there is a single supplier for a buyer, the dependence of that buyer on the resources/products/services of that supplier is comparatively high, and the power of the supplier is greater than that of the buyer. More advantages of bargaining in negotiations can be given to the supplier.

However, when there are several suppliers and even more alternatives can be chosen, the buyer usually tends to rank higher in the supplier–buyer relationship. At that time, those with a closer relationship with the buyer are more likely to emerge as successful (Song et al., 2012). It is said that higher interdependence can lead to greater commitment and trust (Gomes and Dahab, 2010). Buyers would even be prepared to make a short-term sacrifice (Yang et al., 2008) to maintain the existing supplier–buyer collaboration if they can see a sustainable future. Otherwise, the powerful buyer will choose to deal with those who can bring more benefits, which pushes the suppliers into a passive situation.

2.5.2 Collaborative relationships in the downstream supply chain

In the downstream supply chain, the business activities are mainly about inventory management and product distribution, logistics, marketing and sales. The manufacturer as the focal firm acts as a supplier downstream. Buyers expect manufacturers to produce products of the right quality, and then deliver them to buyers on time (Harrison et al., 2014). The performance of the chain or a company is largely associated with the performance of the channel (distribution; Forslund, 2014; Forslund and Jonsson, 2007; Hua et al., 2009), which can be affected by customer satisfaction (Lado et al., 2011). Downstream, the role of the focal firm has been changed from a buyer that has the right

to choose appropriate and capable suppliers to a supplier that has to satisfy its end customers as much as it can. From the focal firm’s point of view, the statement of supplier–customer would be a more appropriate expression.

To satisfy customers, various channels are invited to help in the downstream supply chain. Usually, the focal firm is not directly connected with the end customers. In the situations of third parties that are involved, like third-party logistics (3PLs; Wolf and Seuring, 2010) and resellers (Glynn et al., 2007) or any other distribution and sales agents in the channel (Zemanek and Pride, 1996), the focal firm has a double identity of supplier and buyer. The manufacturer has to buy the service of distribution to supply to customers.

In the investigations in previous research, it has been found that the power of the focal firm as the buyer downstream is not strong. Forslund (2014) obtained the result that only little collaboration existed in such dyadic relationships. Forslund and Jonsson (2007) argue that supplier–customer dyads are only estimated based on order to delivery, where partners in business tend to stick to contracts and focus on interpreting clauses and issues related to what happens if there is a failure (Halldórsson and Skjøtt-Larsen, 2006). In a dyad, the side that is stronger in its willingness to collaborate would have less power in negotiation, and the other side would have more opportunities to take advantage from the collaboration (Golicic, 2007).

After screening Appendix One, topics and discussions related to dyadic collaborations in the downstream supply chain can be coded as in Table 2-6. Six modes can be determined.

Table 1-6 Collaborative modes in the downstream supply chain (based on dyads review)

Main Activities in Downstream Supply Chain	Possible Collaborative Mode	Paper Code
Logistics	<i>Manufacturer–3PL</i>	P1, P11, P13, P15, P17, P18, P20, P21, P25, P26, P28, P36, P41, P42, P45
Marketing and Sales	<i>Manufacturer–Customer</i>	P4, P9, P28, P34, P37, P40, P57
	<i>Manufacturer–Joint Venture</i>	P2
	<i>Manufacturer–</i>	P44

	<i>Wholesaler</i>	
	<i>Manufacturer–Retailer</i>	P1, P16, P18, P22, P56, P58
	<i>Manufacturer–Reseller</i>	P51

In a manufacturing industry, manufacturers are the focal firms that are specialists in production. To satisfy customer requirements, their core business is to produce in reference to customer orientation (Hofer et al., 2014). Thus, as a supplier, the supplier–customer (manufacturer–customer) dyad is one of the most important relationships that have to be carefully managed. In Gomes and Dahab's (2010) research, products and services provided by suppliers need to be well designed. With investigations of the market, improvements to satisfy customers need to be embedded in new products or services (Hofer et al., 2014). To gain sustainable development and to maintain or boost market share, long-term relationships are desired and pursued by the focal firm. A strategy of cooperation is more likely to be created (Co and Barro, 2009), which puts the manufacturer on the comparatively less powerful side. However, a special case was pointed out by Glynn, Motion and Brodie (2007), in that a strong brand of the focal firm can enhance its power in business. When products from manufacturers are required by customers, a higher interdependence in the dyad of focal firm and another stakeholder can be made. A balanced power pattern may be able to be formed.

Wholesalers, retailers and resellers are part of the marketing channel (Kim et al., 2013). To achieve good operational performance (Hinkka, 2013), the mode of manufacturer–channel is formed not only to sell more products for profits, but also to help in the problem solving of market expansion (Walters, 1975).

A joint venture is a special partner of the focal firm; it is an organization jointly controlled by the focal firm (Gattai and Natale, 2013), which share the roles of project fulfilment and profit distribution. The focal firm tends to invest in another group to acquire a certain power in intervention. Although the joint venture can be the competitor of the focal firm in the same area (Shyam Kumar, 2008), the manufacturer can always have a comparatively stronger bargaining power over the surplus benefits; any parties desiring direct contact in business that may bring about benefits (Gattai and Natale, 2013) have to inform the focal firm, and the focal firm has the right to deny their requirements.

The dyad of manufacturer–3PL is formed when the focal firm tends to outsource its

logistics function. As a buyer purchasing services from third parties, the main purpose of the activity is to improve the efficiency of the supply chain (Harrison, 2014), and thus further progress a firm's performance (Sandberg, 2007) by concentrating more on its core businesses (Soinio et al., 2012; Tayles and Drury, 2001). It is said that 3PLs in the alliance of processor and distributor are expected to help in achieving more benefits with comparatively low costs (Bhaskaran and Jenkins, 2009). In practice, the service buyer will easily compare prices among different 3PLs to get the best purchase (Halldórsson and Skjøtt-Larsen, 2006) and the switching cost is not high. It is very common to see that both parties do not care much about their relationships (Forslund, 2014). Compared to other dyads, trust, collaborative culture and common value are missing. However, such an opinion can be biased due to the scale of collaborations that have been investigated or the ignorance of regional culture and environment. Thus, further research on this point is needed to better understand the dyadic relationship.

2.6 Outsourcing – the Pinch Point from Dyads to Triads

2.6.1 Association with dyads

Outsourcing is regarded as a role transformation of a firm from a performer to a purchaser of a certain activity in the form of a service (Yakhlef, 2009). In a manufacturing industry, support services like logistics are treated as a non-core business and tend to be outsourced to make extra resources for the core businesses (Martínez-Noya Andrea and García-Canal Esteban, 2011; Tayles and Drury, 2001). Sartorius and Kirsten (2005) argue that the non-core businesses that are less relevant to manufacturing can be costly and are in a way time-wasting due to the duplication of support facilities, the increasing requirement of excessive training and the inflexibility of production. From a financial or cost perspective, outsourcing can save money; and from a strategic perspective, the outsourcing firm can use the saved money and effort to concentrate on its core competencies (Tayles and Drury, 2001) to solve problems associated with efficiency and effectiveness (Ross et al., 2005). However, to make the final decision on outsourcing, usually the firm has to probe and scrutinize its needs and evaluate the worth of the activity to the firm's overall performance (Yakhlef, 2009).

The situation has changed in recent years, and outsourcing is applied not only in the so-called non-core businesses in the supply chain, but also in the core businesses relevant to manufacturing. A large percentage of activities across the multifunctional process tend to be outsourced to gain related competitive advantages like resource leverage and cost saving (Boulaksil and Fransoo, 2010). Referring to Table 2-7, the strategy of outsourcing has encouraged many dyads to be formed by the manufacturer (focal firm) and the contractors. More participants are invited to work jointly in a network, and in this situation information exchange and risk sharing are required (Cao and Zhang, 2011).

According to the definition of outsourcing, organizational activities are moved to outside vendors (Scherrer-Rathje et al., 2014) who can be fully involved, but also partly, and can combine managing with external parties (Ross et al., 2005). Thus, it is argued that, after the business relationship has been settled, if certain activities within the focal firm can be jointly fulfilled by one or more external parties, such activities have the potential to be outsourced.

Table 1-7 Activities tending to be outsourced and possible collaborative mode

Activities Tending to Be Outsourced	Reference	Possible Collaborative Mode
Innovation (R&D)	Scarlett, 1996; Møller, Johansen and Boer, 2003; Pedroso and Nakano, 2009; Charterina and Landeta, 2010; Soinio, Tanskanen and Finne, 2012; Boulaksil and Fransoo, 2010	<i>Manufacturer–Supplier</i> <i>Manufacturer–University</i> <i>Manufacturer–Institution</i> <i>Manufacturer–Competitor</i>
Planning	Danese, 2006; Møller et al., 2003; Shyam Kumar, 2008; Soinio et al., 2012; Wiley et al., 2006	<i>Manufacturer–3PL</i> <i>Manufacturer–Consultancy</i>
Sourcing	Holweg, 2005; Petison and Johri, 2008; Tantoush et al., 2009; Theodorakioglou et al., 2006; Wasti et al., 2006	<i>Manufacturer–Supplier</i>
Manufacturing	Martínez-Noya Andrea and García-Canal Esteban, 2011; Narayanan et al., 2015; Pedroso and Nakano, 2009; Petison and Johri, 2008	<i>Manufacturer–Joint Venture</i> <i>Manufacturer–Subcontractor</i>
Delivery	Azzi et al., 2013; Forslund, 2014; Hua et al., 2009; Rodríguez-Díaz and Espino-Rodríguez, 2006	<i>Manufacturer–3PL</i> <i>Manufacturer–Joint Venture</i>
Marketing and Sales	Forslund and Jonsson, 2009; Harrison, Van Hoek and Skipworth, n.d.; Thomas and Esper, 2010; Zemanek and Pride, 1996	<i>Manufacturer–Joint Venture</i> <i>Manufacturer–Wholesaler</i> <i>Manufacturer–Retailer</i>

		<i>Manufacturer–Agency</i>
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Uncertainties always exist in the business environment, in line with firms’ particular strategies, and “to outsource or not to outsource” is questioned all the time (Choi, 2007). The activities regarded as core are usually those that directly support the values expected and desired to be created by the end customers; these are “what they do best” in certain areas (Narayanan et al., 2015). It is not only about manufacturing, but also can be about R&D, which contributes to the continuing improvement of products in satisfying customers’ changing requirements (Rees, 2011). In a core business, companies usually partly outsource in reference to the research results. Focal firms tend to control the timing to a great extent and share the benefits in particular markets (Sepehri, 2011). When collaborative relationships with certain outsourcing partners become frequent or in a long-term perspective, mergers and acquisitions may result in the motivation to make the third parties into joint ventures, and thus to get stable control and sustainable benefits (Hertz, 2006).

That activities are regarded as non-core does not mean that they are not important. So-called non-core businesses can be important components of a successful operation. One of the driving forces for outsourcing is that the focal firm would like to find partners that are more competent (Hertz, 2006). Delivery is the most widely outsourced activity in manufacturing industry. Although costs can rise when a third party is involved (Halldórsson and Skjøtt-Larsen, 2006), overall savings in facilities (like vehicles and refrigeration equipment) and training (like drivers and stock management) can be obtained (Sartorius and Kirsten, 2005). Professional facilities and services can be provided to make sure that finished products can be delivered whenever and wherever they have been ordered. In addition to this, the risks can be shared with third parties, as a outsourcing contract would list issues and compensation related to service failures (Halldórsson and Skjøtt-Larsen, 2006). The new technologies and techniques applied by 3PLs can progress chain efficiency and effectiveness to a remarkable degree (Harrison et al., 2014).

Planning is usually referred to as demand planning and sales and operational planning associated with activities in marketing and sales. Although this activity is not directly associated with production, it can have a great impact on the volume, quality and design

of manufacturing (Gomes and Dahab, 2010; Ross et al., 2005). It is not easy to identify the activities that are core or non-core. In marketing and sales, outsourcing is feasible. The external sales force can help gather information from customers to assist a focal firm in better understanding the market, which can be described as windows to the real business (Ross et al., 2005). Outsourcing does involve more participants in the marketing channel and brings about a broader view for the focal firm, which it is suggested should be applied. However, having one's own sales force in marketing and sales is strongly recommended by Ross, Dalsace and Anderson (2005) as well. It is said that the most appropriate system is to combine a direct sales force and representative agencies that refer to product class, territory and tasks or rights and interest.

2.6.2 Contribution to triads

In manufacturing industry, collaboration is indispensable (Baloh et al., 2008). Outsourcing introduces more external organizations into the supply chain to work jointly in approaching competitive advantages (Boulaksil and Fransoo, 2010) for sustainable development (Miemczyk et al., 2012). The increasingly complicated structure makes the supply chain more like one that is made up of linearly structured interconnected dyads (Miemczyk et al., 2012). A brief illustration of the formation of triads can be seen in Figure 2-5.

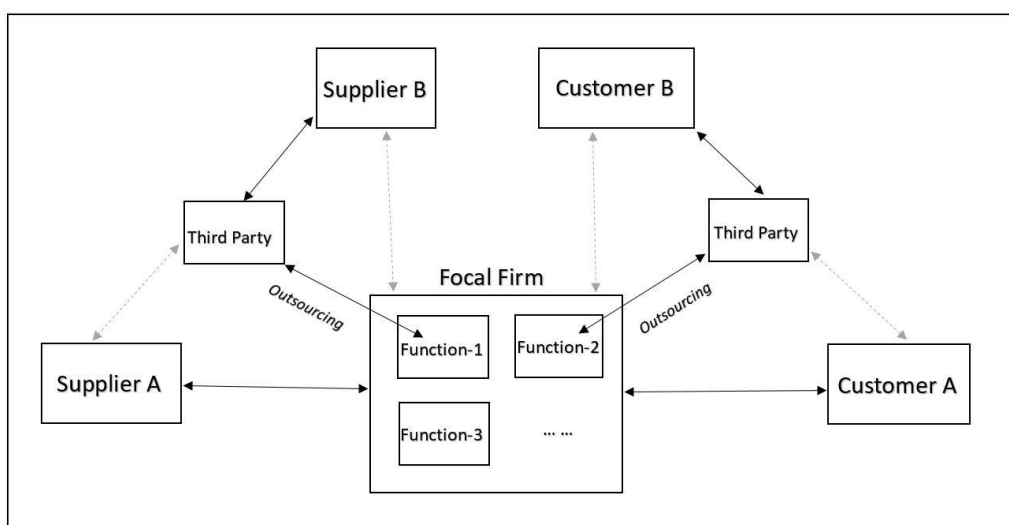


Figure 1-5 Illustration of outsourcing in forming triads based on dyads

When part of the function is outsourced to a third party, a direct interconnection can be built between the focal firm and the contractor. The existing collaborative relationships with partners in business are persistent, and will last until the parties have announced the ending of such relationships. The third party involved will only need to take the responsibility for providing services to make the operation run well. In fact, the contractors do not have to collaborate further with the focal firm's partners. However, Yin, Liu and Kaku (2011) have even proposed that the neighbouring players in a common system can possibly collaborate in dyads. A triad can be formed when three parties are involved in the same case. Peng et al. (2013) argue that when there is a common goal or a project that requires joint working by stakeholders, a group is able to be formed of parties that were originally separate. Any two of them can have a comparatively closer relationship, and ideally three of them would collaborate with each other tightly. Li and Choi (2009) once pointed out that if such a triad is formed due to outsourcing, the greatest benefit of information and control will go to the focal firm.

Thus, this research argues that dyadic collaborative relationships are the foundation of a triadic relationship. The driver of the triad's formation is associated with the focal firm. Outsourcing, as the action of putting out certain internal processes based on a make-or-buy decision (Theodorakioglou et al., 2006), involves more participants in the supply chain to approach desired goals jointly with various tasks. The intervention of third parties is in a way preparing for the dyads to progress towards triads. The focal firm as the buyer can expect advanced benefits in the early stage of triads; however, it will have to face the risks of decay that come from the alliance between the other two parties (Li and Choi, 2009).

2.7 Collaborative Relationships – in a Triadic Perspective

Dyadic relationships can be formed among suppliers and buyers, which do not exist in isolation (Ritter, 2000). It has been suggested that more attention will need to be paid to the impact of one relationship on another, as some phenomena in the business world can be understood only when the comprehensive analysis of interconnections is taken into consideration. Dyads are encouraged to be embedded in the supply chain (Guillot

and Lincoln, 2015). The triad, as the simplest view of a network progressed from dyads, is said to be able to provide a comparatively more realistic perspective among supply chain participants (Wu and Choi, 2005; Li and Choi, 2009).

In dyads, the degree of collaboration varies. Thus, when bringing one party into a triad, there is a great possibility of there being an unbalanced situation, where some dyadic relationships are closer than others. In real business practice, manufacturing industry can be regarded as a system that involves a number of enterprises across different sectors (Montoya-Torres and Ortiz-Vargas, 2014). A basic triadic supply chain structure can be mapped based on previous studies (Li and Choi, 2009; van der Valk and van Iwaarden, 2011). (See Figures 2-6 and 2-7 for the basic triadic structure and the systematic structure of triads.)

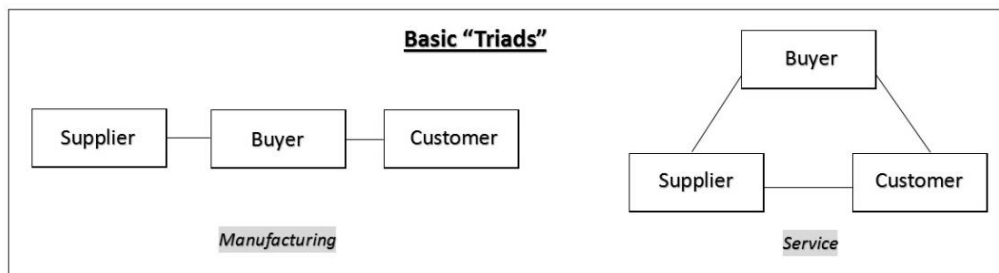


Figure 1-6 Traditional basic triadic view in the manufacturing and service sectors

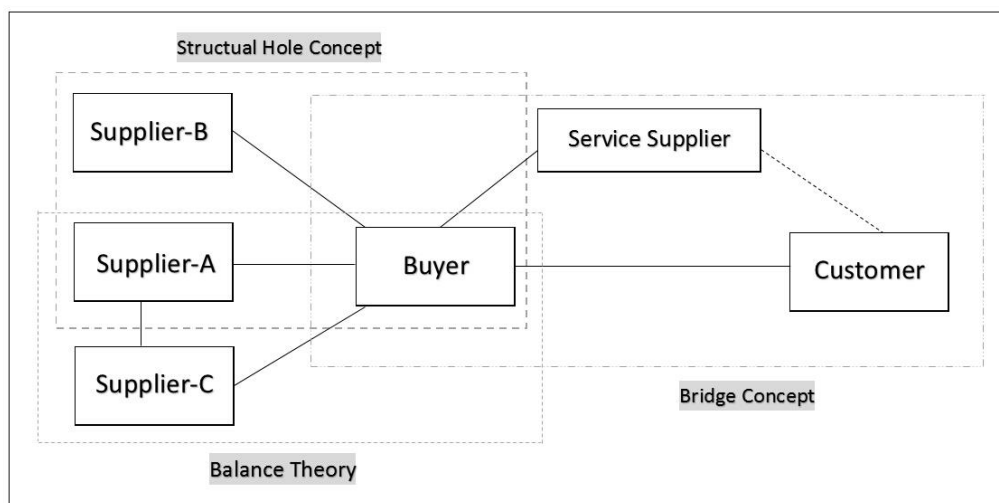


Figure 1-7 Systematic view of basic triads in the supply chain (theory/concept review)

With the existing knowledge to address the issues of triadic relationships, three important theories and concepts have been suggested for review – *balance theory*, the *structural hole concept* and the *bridge concept* (Li and Choi, 2009; Wu and Choi, 2005; Choi and Wu, 2009).

2.7.1 Balance theory

Balance theory is a concept of attitude change in business that was first proposed by Fritz Heider (1958). In balance theory, the triadic relationship can be presented in six modes and allocated to two patterns – balanced state and unbalanced state. It has been argued that psychological balance is important in one’s beliefs and values over time. Choi and Wu (2009) gave the signs of [+] and [-] the meaning of cooperative, voice-based relationship and adversarial, exit-based relationship. When a dyadic relationship combination is represented as [+] [+] [+] or [-] [-] [+] it is regarded as balanced; and when presented as [-] [-] [-] or [+] [+] [-] it is regarded as unbalanced. Details can be referred to in Table 2-8.

Table 1-8 Illustration of balance theory

Pattern	State 1	State 2	State 3
Balanced			
Unbalanced			

Source: Choi and Wu, 2009.

Balanced state 1 is a *three-way collaboration*, where all participants are in good collaborative relationships. Balanced state 2 represents a supplier–supplier alliance, while their relationship with the buyer is adversarial. Balanced state 3 shows the favouring of one of the suppliers by the buyer, while the supplier–supplier relationship

is not that close.

Unbalanced state 1 illustrates the positive collaborative relationship of buyer–supplier, while the supplier–supplier relationship is adversarial. Unbalanced state 2 shows the good position of one of the suppliers, which has a good relationship with both the buyer and another supplier, while the buyer only favours one of the suppliers, which is described by Carson et al. (1997) as “a friend of my friend is my friend”. Unbalanced state 3 refers to when all the relationships in the triad are adversarial.

In the previous section, research on the dyadic relationship focused on the supplier–buyer mode. When referring to the balance theory illustrated above, supplier–supplier is regarded as another possible collaborative relationship. Due to the factors of competitive pressures, time and cost (Choi et al., 2002), a close relationship among suppliers can be built. The conditions of near locations or an existing history of collaborations may further enhance such a relationship (Wu and Choi, 2005; Choi and Wu, 2009). In triads, such a close dyadic mode is able to bring about opportunities for the supplier alliance in better support for the buyer; however, the risk of power being weakened for the buyer also cannot be ignored (Simatupang et al., 2002). How the relationships in triads can be balanced is indeed a serious question that needs to be carefully considered.

Triads were discussed as early as the 1950s by Caplow (1956b, 1959) and six situations of possible triads were illustrated based on power comparisons. However, scholars (Carson et al., 1997; Choi and Wu, 2009) tend to consider the balance theory that was initially generated by Heider in 1958. Carson et al. (1997) applied the theory to a triad of organization–provider–customer in the service industry. At that time only four states could be investigated in their analysis. Although their results indicated the efforts of participants in trying to keep the balance in getting benefits, not much empirical evidence could be provided. Choi and Wu (2009) applied the theory to a triad of buyer–supplier–supplier. Again, based on the theoretical reviews and analysis, six modes can be built and seem possible, but only theoretically. Their analysis did not give any consideration to the factors of industry and the particularity of cases. Thus, to get better knowledge of triads, this research will suggest investigating this within industries based on identified dyadic modes.

2.7.2 Structural hole in triadic modes

The structural hole can be described as a relationship of non-redundancy between two contacts (Burt, 2009). In triads, if the focal firm (manufacturer) acts as the buyer, the structural hole refers to the relationship between the suppliers directly associated with the buyer, which it is said should be in a disconnected relationship or one with very weak ties (Burt, 2009). Wu and Choi (2005) and Choi and Wu (2009) describe the triadic relationship with a structural hole: when there is no relationship between the suppliers, the buyer would take the position of maintaining the relationships with suppliers, regardless of the nature of those relationships.

Referring to Table 2-9, the buyer tends to treat the suppliers with a distinct attitude. If there is no obvious close relationship between supplier and supplier, the network in a way takes a step back to chain management. The buyer only has to consider how to maintain the relationship with its directly linked partners, and the illustration shown exactly proves that not all collaborative relationships should progress to higher levels (Squire et al., 2009).

Table 1-9 Illustration of structural hole concepts in triads

Concept	State 1	State 2	State 3
Structural Hole	<p>Diagram illustrating State 1: A Buyer is connected to Supplier-1 and Supplier-2 with positive (+) relationships.</p>	<p>Diagram illustrating State 2: A Buyer is connected to Supplier-1 with a positive (+) relationship and to Supplier-2 with a negative (-) relationship.</p>	<p>Diagram illustrating State 3: A Buyer is connected to both Supplier-1 and Supplier-2 with negative (-) relationships.</p>

Source: Choi and Wu, 2009.

Scholars have argued that such relationship structures are dynamic (Burt, 1992; Burt, 2009; Squire et al., 2009) and that the relationship between supplier and supplier can be tied up under certain circumstances. In Wilhelm's (2011) research, when the buyer–supplier relationship in a triad remains cooperative, the relationship of supplier–supplier can have three statuses: (purely) competitive, co-opetitive and no ties. In effect, suppliers in the same industry can be competitors. However, if they are satisfied with

their existing status or there is not much overlap in their interest level, they may live in their own space with each other but with weak ties (Burt, 2009) or no tie (Wilhelm, 2011), where there is a structural hole. In reality, suppliers that are directly linked with the buyer are pooled in the supply chain, and the buying firm is said to be able to bridge the hole between supplier and supplier (Choi and Wu, 2009; Wilhelm, 2011; Wu and Choi, 2005); a common project initiated by the buyer makes it possible for the suppliers involved to have a point of connection.

2.7.3 Bridge concept in dyads

The bridge concept has been developed as a theory that responds to the structural hole concept. In dyadic relationships, the bridge can refer to the party who connects the other two parties in pursuing common goals (Wilhelm, 2011), and the metaphor of a bridge is said to span the structural hole between organizations (Burt, 2000, 2004, 2009). The firm in the position of the bridge is said to be able to obtain the critical advantages (Burt, 2004; Choi and Wu, 2009) of information benefits and control benefits. The bridge firm connects two suppliers, which can get relatively more information. At the beginning of the triad's estimation, there is no connection or a very weak connection between the suppliers, and information exchange is almost impossible; the buyer who is able to acknowledge more can have greater power in business.

However, the competitive advantages in information and control will not last (Li and Choi, 2009). The relationship is dynamic, as the bridge will decay at a quick rate (Burt, 2000, 2004). Moreover, the bridge position is able to be transferred to either of the remaining two parties (Li and Choi, 2009). When two separated suppliers have been connected due to the bridging of the buyer, their communications can be more frequent (Burt, 2004). Although suppliers usually are in competitive situations, when driven by benefits or rights guarding they may become an alliance (Choi and Wu, 2009; Wilhelm, 2011) and the bridge position of the supplier will decay. A new bridge will be transferred to the one who has greater power in group control with the most information resources.

The structural hole and bridge concepts contribute to explaining how basic triads can be formed, and the possible relationship of interactions among them. The existence of

a bridge in this sense indicates the information asymmetries and distinctiveness of the power of control. To the firm acting as the bridge in a triad, benefits are always desired, and if possible they would like to keep the position forever. Strategies like short-term contracting and multiple sourcing (Wilhelm, 2011) may be applied to guarantee the buyer's power.

Referring to Figure 2-7, theoretically the possible modes of triads can be buyer–supplier–supplier and buyer–supplier–customer, which can describe most of the possible combinations. As it has been discussed that outsourcing can provide a unique context for networks (Choi and Wu, 2009), and that there is a tendency for outsourcing in a supply chain, it is believed that triads should widely exist in reality. In Zhao et al.'s (2015) research, a triadic-like structure was constructed due to the intervention of the authorities (government and related regulatory system) and favourable policies and funding attracted and motivated joint collaborations in certain areas; the power of the authorities put them in a position of absolute advantage. Hence, it can be argued that the authorities can be a specific bridge that can always last.

2.8 Research Gap

Referring to the literature review, several research questions can be put forward based on the gaps identified. To make it clear why and how this research will further develop, the details can be highlighted as follows.

2.8.1 Gap in identification of collaboration

Collaboration has been widely discussed in most research on supply chain management. In the definitions of collaboration, the characteristics of joint working (Guan et al., 2016), common goals (Rahman et al., 2014) and information sharing (Traavik, 2011) have been highlighted. The synonyms for collaboration like coordination, cooperation, alliance and partnerships appear frequently in these discussions (Gallear et al., 2012; Grudinschi et al., 2014b; Magdaleno et al., 2014; Montoya-Torres and Ortiz-Vargas, 2014) and are usually applied interchangeably.

However, when referring to Lu et al. (2013), Grudinschi, Sintonen and Hallikas (2014b) and Hisjam et al. (2015), the different extent of trust, commitment, power and dependence/interdependence will affect the level of collaboration. Furthermore, the synonyms for collaboration are represented as a distinct level of collaborative relationships.

In previous research, collaboration has been interpreted and discussed with various expressions like cooperation, alliance and partnership. Referring to different studies, the way of joint working described in those concepts is distinct regarding the different levels of closeness among supply chain participants (Guan et al., 2016) and the willingness to share information (Montoya-Torres and Ortiz-Vargas, 2014). There is no theory to conceptualize supply chain collaboration in a systematic view. The existing definitions are quite general, which limits them in explaining a collaborative phenomenon. Relevant investigations in supply chain management are mostly focused on exploring the general advantages that can be expected through collaboration (Ho and Lu, 2014; Lu et al., 2013; Mishra et al., 2015; Tsou, 2013). This is insufficient to guide organizations in collaborating for more benefits.

Although predecessors (Cahill, 1996; Grudinschi et al., 2014b; Ming et al., 2014; Montoya-Torres and Ortiz-Vargas, 2014) have built a collaboration pyramid to describe levels of collaboration and differentiate the concepts, there is a lack of evidence to support this and it is difficult for a business practitioner to practise without systematic guidance. Thus, a clearer framework to show distinct collaborative relationships in a systematic view is necessary. To make the findings more valuable and applicable, this research intends to improve the collaboration pyramid and adopt it in the following data collection and data analysis. As the foundation of pattern identification, making the concept of collaboration clear is essential to this research.

2.8.2 Gap in identification of collaboration's motivation

Motivation is at the centre of why stakeholders want to collaborate in the supply chain. It has been frequently discussed in terms of motivations like innovation, efficiency, stability, reciprocity and legitimacy from the perspective of goal directedness; and cost reduction, effectiveness, flexibility, sustainability and opportunity from the perspective

of potential advantages (refer to Table 2-3). In most of the studies, when they talk about motivations authors tend to express the concept with general ideas. Goal directedness stresses business on a strategic level (Sandberg, 2007) and the potential advantages tend to provide guidance on the operational level (Hinkka, 2013).

Many researchers have discussed relevant motivations in their individual works and have highlighted their significant impact on driving firms to collaborate (Cao and Zhang, 2011; Ramanathan et al., 2014; Van Hoof and Thiell, 2014).

However, the empirical evidence is insufficient to further differentiate the motives for collaboration. Most of the discussions are only on the surface without strategic highlights, which means that they have limited usability to guide collaborative activities.

The goals of different organizations are not constant in line with their strategic considerations and are always changing. Referring to the review in section 2.3, there are many overlaps in the perspective of goal directedness and potential advantages, where the potential advantages can be regarded as the essential conditions to achieving the goals. This research will only apply the theories of sustainability, opportunity, cost efficiency, effectiveness and flexibility to explore collaboration patterns.

In fact, collaborations with different motivations can be identified at strategic and operational levels (Xu et al., 2015; Youn et al., 2013). In some cases, collaborations can be formed at a political level, due to the special existence of governmental institutions in the market and their increasing importance to business development (Grudinschi et al., 2014b; Sodhi and Son, 2009; Zhao et al., 2015). This research will adopt the theory of legitimacy to get to know how participants in the supply chain can be motivated to collaborate in achieving potential advantages financially and politically.

Above all, part of the conceptual framework can be illustrated as in Figure 2-8.

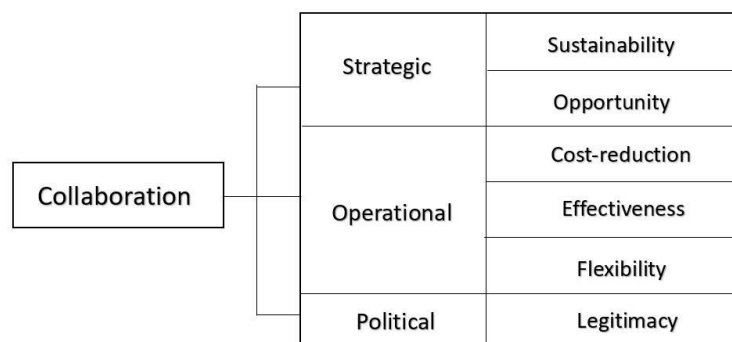


Figure 1-8 Part of the research framework for collaboration patterns

2.8.3 Gap in discovering the factors that influence collaboration

Scholars have done much to discover the factors that may have an impact on collaboration, and the key points are referred to in Table 2-4. The key points are listed as firm size, equal partners, switching cost, trust, capability, commitment, goal congruence, incentive for alliance, dependence, power, organizational culture and legal factors. It has been discussed in section 2.4 that firm size, equal partners, switching cost, capability and policy are associated with power and dependence/interdependence, while the goal or incentive and culture are the foundations of commitment.

As there are many overlaps in the discussions, the factors can be finally crystallized into trust and commitment, power and dependence. Trust/commitment decides the level or closeness of the collaborative relationship that firms would like to form (Hudnurkar et al., 2014b; Ming et al., 2014) and power/dependence can have an impact on the distribution of benefits and duties.

In previous research, several frameworks based on these four factors have been proposed (Hallikas et al., 2005; Liu et al., 2010a; Marcotte et al., 2008; Ming et al., 2014) to explore how collaborations can be influenced by these factors, and how to balance dependence and power in order to get an optimized structure in pursuing mutual benefits. However, due to lack of empirical evidence to support this, it is limited in its application to the real business world. Moreover, the case studies that have been done did not consider industry differentiation (Siew-Phaik et al., 2013) and the roles played by participants (Peng et al., 2013) in the various processes. Relevant principles of collaboration building can be challenged. This research will use both the trust/commitment matrix and the power/dependence matrix to re-identify the principles in both dyadic and triadic contexts.

2.8.4 Gap in the research on dyads and triads

The dyadic relationships widely discussed in supply chain management are supplier–buyer and supplier–supplier. In the vertical supply chain, supplier–buyer is a quite

common mode. Collaborations between supplier and buyer are mostly accepted to achieve mutual benefits (Jia and Lamming, 2013b; Simatupang et al., 2002; Zaheer and Bell, 2005) from a long-term perspective. The collaborative relationship in supplier–buyer dyads is expected to get win–win benefits (Lee, 2011). Collaboration is regarded as a type of investment, which will cost the participants. Resources are required to be pooled and shared. It is suggested that participants select only a few of their business partners to collaborate with at a comparatively higher level (Squire et al., 2009).

Although scholars have noticed the significance of supplier selection, not many of them have tried to apply it in their investigation when doing relevant research. When referring to the research of Guillot and Lincoln (2015), suppliers can be classified into three types: independent, cooperative and affiliated. The attitude of the focal firm to distinct suppliers is different, and the closeness of the relationship is different as well. The role played by the focal firm changes with reference to the various strategic considerations in different processes. Even though some of the researchers have tried to discuss supplier–buyer dyads from the perspective of upstream and downstream separately (Lado et al., 2011; Tantoush et al., 2009), due to the failure to distinguish the types of suppliers, the results are weak in explaining the collaborative relationships from a deeper perspective.

Supplier–supplier dyads have been discussed in a horizontal view and applied in a triadic structure. Compared to supplier–buyer dyads, not many studies have been done in this area (Choi and Wu, 2009). Three types of collaborative relationships have been identified: competitive, co-opetitive and no ties (Wilhelm, 2011). When referring to collaboration concepts, this usually refers to competitive relationships, where two suppliers collaborate due to the pressures on various projects, and yet can compete any time when projects have been fulfilled (Wu and Choi, 2005). However, again, most of the suppliers fail to clearly identify the type of supplier and the roles played by participants. The forming of a triadic collaboration can only be explained at a surface level.

Triads are constructed by dyads, as relationships between organizations do not exist in isolation (Ritter, 2000). To explore collaboration in a triadic view is the first step towards networks from a dyadic view (Choi and Wu, 2009). To take the critical first step to get to know the supply chain, it is crucial to think about the following:

Question One: *What are the patterns of supply chain collaboration from a triadic view?*

Question Two: *How do dyads come together into triads in supply chain collaboration?*

Scholars (Wu and Choi, 2005; Choi and Wu, 2009; Wilhelm, 2011; Burt, 2000, 2004, 2009; Li and Choi, 2009) have tried to figure out certain patterns of triads in supply chain collaboration at the theoretical level. Great progress has been made, but there is still a lack of empirical evidence to support it.

Stakeholders interested in this topic do not know where the starting point of triadic collaboration forming is, and they do not know about the exact patterns that are applicable in practice from the proposed framework as well. Many advantages like cost reduction and effectiveness (Kohl et al., 2015; Liao and Kuo, 2014) have been mentioned in the exploration of supply chain collaboration and are confirmed in real business from the perspective of dyads. However, there is no evidence to show that triadic collaborations can bring about similar impacts. Hence, in this research, the following question can be addressed, which aims to interpret supply chain collaboration in a more systematic view.

Question Three: *How does triadic collaboration impact on supply chain performance?*

What is more, in the review of collaboration in the supply chain from dyads to triads, this research has noted that outsourcing has become a concern for more and more people, and is treated as an important action that prepares and helps to provide the conditions for dyads to be transformed into triads (Cao and Zhang, 2011; Choi and Wu, 2009; Martínez-Noya Andrea and García-Canal Esteban, 2011; Ross et al., 2005; Yakhlef, 2009). However, this research cannot find any existing studies that discuss how outsourcing may contribute to the shift from dyads to triads in detail, or to explain how this activity can impact on network building. Outsourcing has been applied in many activities of the supply chain. In the future, more third parties across various sectors certainly will be invited to work together and play a role in the triad. We cannot just be

satisfied with knowing the immediate interests that are brought about by outsourcing.

To get sustainable benefit, this research will figure out: *How does outsourcing contribute to the formation of triadic collaborations? What is the role played by outsourcing in forming triadic collaborations? How do the roles that are played by relevant participants have an impact on supply chain collaborations?* It is believed that outsourcing is very important to motivate research on collaboration from dyads to triads (Bhaskaran and Jenkins, 2009), which is also significant to answer proposed research question two.

2.9 Conceptual Framework

To summarize the research gaps identified based on the literature review and to organize the intention of this research, a conceptual framework is built as Figure 2-9. The consistent concepts involved are the key factors that may motivate and affect supply chain collaboration. Applied as an analytical tool, the conceptual framework can bring about several advantages, as follows:

- Providing a clear and complete template for researchers in practice.
- Assisting the researchers to stick to the research topic and prepare or develop relevant consistent concepts.
- Assisting to better explain the results.
- Assisting other researchers to understand this research.

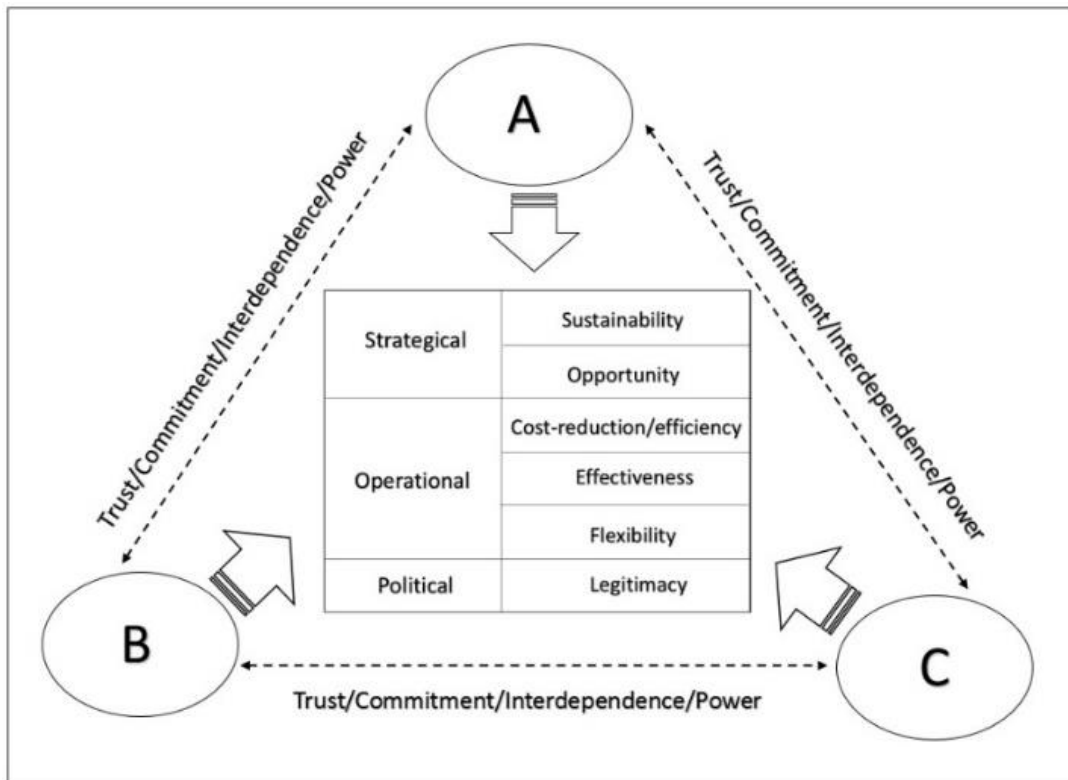


Figure 1-9 Conceptual framework

Basically, there should be three participants in any triadic construction. Any two of them can be linked through business connections (Tuomela and Salonen, 2005). Referring to collaboration theories, which have been reviewed in section 2.2, the involvement is at the bottom level of collaboration. Therefore, it is argued that only when three of them are interconnected with each other can it be called a triadic collaboration. Any missing links would destroy the collaboration; it can be regarded as a triadic construction, but not collaboration.

Since it has been affirmed that collaborations can be motivated by the factors of sustainability, opportunity, cost efficiency, effectiveness, flexibility and legitimacy (refer to section 2.3), the achievement of a collaborative alliance in both dyadic and triadic perspectives is set as the measurement of supply chain performance in this research. According to Figure 2-9, a triadic collaboration is composed of a series of dyadic collaborations. Thus, to carry out a systematic analysis, it is necessary to investigate how both dyadic and triadic collaborations impact on supply chain performance.

When referring to trust and commitment theory and power–dependence theory (Chicksand, 2015; Liu et al., 2010b), factors of trust, commitment, power and dependence have a significant impact on the degree of collaborative relationship of participants who would like to practise and maintain a business. Different levels of collaboration should be considered in pattern identification.

Above all, all relevant concepts have been involved in building the conceptual framework and in further guiding the research.

2.10 Summary

Collaboration has been studied by researchers as a hot topic. How to maintain relationships among suppliers and buyers to obtain sustained and maximum benefits is the concern of every participant in the supply chain or network. This chapter not only provided a review of supply chain collaboration from the dyadic perspective and shifting to a triadic perspective, it also tried to re-identify several key concepts that are crucial to future research work. In the context of the review, this study is trying to develop a practical framework to investigate the existing triads and their impact on the supply chain. The following questions are expected to be addressed: How do dyads come together into triads in supply chain collaboration? What are the patterns of supply chain collaboration from a triadic view? And how does triadic collaboration impact on supply chain performance?

The key concepts and the factors that may have an impact on collaboration have been re-identified; it has been argued that to better interpret collaborative relationships, it is the factors of trust, commitment, power and dependence that have to be considered in line with the motivation for collaboration in the supply chain. A conceptual framework has been developed to facilitate the study.

Due to the insufficiency of empirical data in previous relevant research, and the ignorance of industry distinctions, the methodology of the case study will be applied in this research to get more data from real businesses for further analysis, and thus progress the proposed theories from a theoretical to a practical level. It is hoped that this research will make original contributions both to the literature and to industry.

In the next chapter, the research methodology adopted will be introduced. The details of data collection and techniques applied to the analysis will be illustrated.

Chapter Three : Research Methodology

3.1 Introduction

This research aims to explore the patterns of relationships and their impact on supply chain collaboration from a triadic perspective. This chapter explains the methodology adopted for the research, and illustrates how the study has been designed and processed in a rigorous way. The case study has been decided as the main research method. To ensure the quality of the study, the issues of generalization, validity, reliability and triangulation are considered. To guard against observer bias, a multiple-case study is introduced. The multiple data collection method of a semi-structured interview and a follow-up survey has been applied and is explained in the data collection section. Moreover, the approach to data analysis can be expected to incorporate a review of the trustworthiness of the case study at the end.

3.2 Research Approach

Research is finding out something in a systematic way and thus further increasing people's knowledge (Gao et al., 2008). Knowledge is usually referred to as a set of organized statements of ideas or facts, which represent a reasoned judgement or a tested result that can be transmitted to others (Kamuriwo and Baden-Fuller, 2016). When statements are composed of variables and concepts, and one is able to identify and verify their nature and causality with logical reasoning, the statements are likely to constitute a theory (Amaratunga and Baldry, 2001a). The contributions of research can be to build a new theory (Caplow, 1956; Voss et al., 2002), to extend existing theory (Choi and Wu, 2009) and to falsify theory (to prove that a theory is not true).

Referring to the literature reviews in Chapter Two, there are many studies in operations management, systems management, supply chain management and networking that have made great contributions to the area of study of this thesis. Collaboration (Liu et al., 2010b; Van Hoof and Thiell, 2014), balance theory, structural hole and bridge theory (Burt, 2004, 2009; Li and Choi, 2009) have proposed a way to set a good foundation for the future work of this research. Although many scholars have already done some research that is expected to determine the way in which collaborative relationships are formed based on the existing theories (Choi and Hong, 2002; Choi and Wu, 2009; Wu and Choi, 2005), the empirical data is still insufficient to support it; some of the models can be challenged in particular situations.

There are some gaps, which have been identified by this research in the previous chapter and which have challenged several existing theories, for example ignoring distinctness in different collaborative relationships, which leads to inaccuracies in the relevant research. To fill the gap, this research has put forward a new framework referring to previous research, which details the levels of collaborative relationships and embeds this in a new conceptual framework. With the conceptual framework, it aims to explore something new that can further explain collaboration.

This research does not propose any hypothesis based on the academic literature, and does not set out to test any theory. It proposes a conceptual framework (refer to section 2.8, Figure 2-9) and would like to explore certain phenomena of supply chain collaboration in an industry area. This research is going to figure out new patterns with a modified theoretical background. It is exploratory research, which is designed to close the gap (Soinio et al., 2012) identified in the literature.

3.3 Rationale of the Case Study

This research aims to increase knowledge in supply chain management via exploratory research approaches based on existing theories. It is said that for most research activities, in the early stages, ideas have to be developed (Voss et al., 2002), and it is important to turn these ideas into a research project (Guan et al., 2016; Jarratt

and Ceric, 2015). Research questions and objectives are significant in deciding a research approach, and are also important to the method that is chosen to collect and process the data required by any approach. The purpose of the research is to fill the literature gap to contribute to theory building in the research topic area, and to progress relevant theories from an academic to a practical level. With reference to Rowley (2002), in the preliminary and exploratory stages of research projects, a case study (or case research) is viewed as a useful tool or as a means of research exploration (Voss et al., 2002) and theory building (Amaratunga and Baldry, 2001a).

The proposed research questions mainly start with how and what. In effect, the methods of survey, archival analysis and case study are the potential options. Yin (2014) pointed out that when the questions are exploratory, the case study method is usually preferred. Voss, Tsikriktsis and Frohlich (2002) highlighted that a case study is not only good at answering questions of how and why through investigations of certain phenomena, but also can be used for theory refinement, which requires a response to detailed questions like what, who, where, how many and how much.

Case study research is more than just a method to investigate contemporary phenomena, it is also a comprehensive and all-encompassing method that covers the logic of design, techniques of data collection and particular approaches to data analysis (Yin, 2014). Moreover, as Mile and Huberman (1994) mention, to apply the case study method a conceptual framework that underlies the research is suggested. Referring to Figure 2-9, a conceptual framework for collaborative relationship exploration has been provided, which in a way has created an essential condition for applying the case study. Therefore, this research will argue that the case study is the most suitable method that should be applied to this investigation.

3.3.1 A need for a case study in supply chain collaboration

As the fundamental building block of the supply chain, a “perspective beyond dyads and to the next level of triads” (Choi and Wu, 2009) is required. Comparisons of dyadic research have been done in the topic areas, and supply chain collaboration from the perspective of a triadic view is still in the early stages of exploration. The structure of a dyadic relationship has been constructed theoretically (Burt, 2000; Choi and Wu, 2009;

Wu and Choi, 2005), but the lack of empirical evidence has limited the development of the relevant theory. Wu and Choi (2005) have tried to build theories from case studies; five archetypal supplier–supplier dyadic relationships embedded in triads are identified and contribute to the understanding of triad building.

Wu and Choi's research has confirmed that a case study is powerful in the development of a new theory (Eisenhardt, 1989; Voss et al., 2002) and in the availability of a combination of research-applied case study and network theory (Gummesson, 2007). The results they have obtained have both theoretical and practical implications, as the empirical evidence is regarded as valuable. It is noteworthy that although the eight cases involved investigate contemporary events that do not refer to any time series issues, they are still able to provide the rational dynamics between different participants from an inductive approach.

However, the cases are in limited types of industries, and the rational dynamics of a triad are not investigated. It was suggested to apply more case studies to further research to get empirical evidence of rational dynamics in a triadic view. Van der Valk and van Iwaarden (2011), Yang et al. (2013) and Chin, Tat and Sulaiman (2015) have tried to collect data in the service sector, but the empirical evidence is far from enough. When moving to triadic studies, the service sector has been over-highlighted rather than studies in manufacturing industry. Hence, the case study is appropriate to apply in research on supply chain collaboration, and there is a great need for case studies to collect empirical data and develop relevant theories.

3.3.2 Favourable conditions for a case study in supply chain collaboration

To complete a good case study, challenges are inevitable, which includes the facts that they are time consuming, that there are high requirements for skilled interviewers, that care needs to be paid in drawing generalizable conclusions from limited cases and that a rigorous research design is needed (Voss et al., 2002). For this research, favourable conditions have been prepared for it:

- (1) As a full-time PhD student, the project and more than 40 hours for research could be guaranteed.

- (2) The main researcher is supervised by two experienced scholars who have published several influential works. Guidance and training on interviewing were offered by the supervisors. Regular meetings enabled the researcher to identify the problems and modify the research plan.
- (3) Pilot studies were done at the beginning of the project to select cases and to get in touch with important contacts, who were junior enough to assist the researcher to organize relevant interviews in the target industry. Although the number of cases is limited, all cases involved were carefully selected to be of comparatively high quality.
- (4) The research design is well managed and follows the four tests of being rigorous (see the criteria for judging the quality of research designs in Voss, Tsikriktsis and Frohlich, 2002 and Yin, 2014). The details can be referred to in section 3.3.

3.4 Research Strategy

A research strategy is a plan of how the research questions will be answered by the researcher (Simsek et al., 2015). For exploratory research, which aims to build or verify a theory, a conceptualized research strategy of research processes has been proposed and practised by Pacitti (1998) and then adopted by Amaratunga and Baldry (2001). It is said that research exploration is formed by a series of descriptive and prescriptive activities, from the literature review to theory building. Descriptive activities refer to phenomena and data introducing (Fayezi et al., 2012; Sandberg, 2007), which aim to get to know the nature and features of certain issues. Prescriptive activities go beyond the descriptive and can refer to activities of pattern and principle identification based on data and relevant theories (Vesalainen and Kohtamäki, 2015).

The research strategy for this thesis can be illustrated as in Figure 3-1.

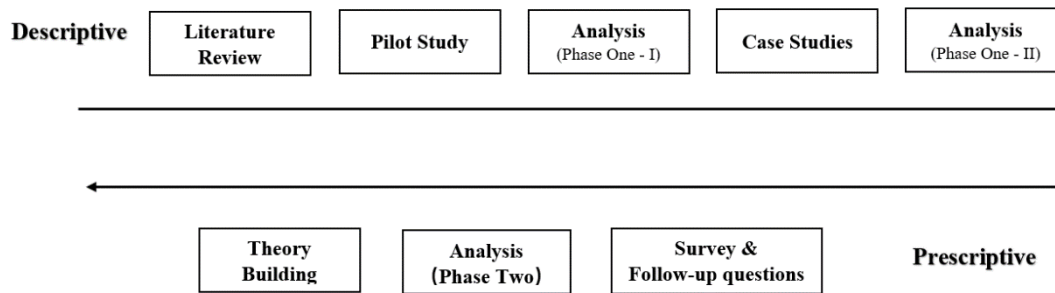


Figure 1-10 Research strategy

At the beginning of the research, it is suggested that a literature review be conducted to identify potential research questions. At this stage it has been emphasized that the literature review should be a continuous process (Amaratunga and Baldry, 2001a) throughout the study, as the literature search can always help to “gather effective and useful materials and insights” (Howard and Peters, 1990).

To uncover the operability of a designed research construct, a pilot study is conducted to redefine the plan for data collection (Tuomela and Salonen, 2005) as a confirmatory focus. Significant insights for future research can be provided in this process. Together with the literature review, research questioning and strategy have been further developed.

In this research, a pilot study was generated in the early stage of the data collection process, and the results contributed to the final decisions related to the target industry and case criteria. Some significant issues were noticed, like the fact that it is difficult to measure the impact of the factors of trust, commitment, power and dependence on collaboration. As most of the case companies refused to be tape-recorded, to ensure the quality of data collection a set of measures were implemented; the details can be referred to in the following sections.

The formal case studies can be generated after the pilot study. With the analysis of the pilot study, a target industry (industries) can be decided on; relevant case companies in the pilot study can be involved with other possible cases. Interviews and observations are suggested (Yin, 2014) for data collection.

It has been highlighted that surveys and other relevant follow-up questions that relate to target cases are required (Amaratunga and Baldry, 2001b). Answering the research

questions will thus further develop the relevant theory. The degree of closeness, power and trustworthiness of participants in a supply chain in collaboration needs to be measured. Moreover, there are some issues that may have been ignored during the interviews that need to be further confirmed. A questionnaire or survey has been suggested to be adopted for this research (Amaratunga and Baldry, 2001a; Voss et al., 2002), which is regarded as a supporting technique to providing the relevant quantitative findings and further uncover relationship issues.

The proposed strategy in a way has embraced both descriptive and prescriptive research and practised an investigation of qualitative data (Amaratunga and Baldry, 2001a), which is able to make the case study more comprehensive. Hence, this research is able to collect the necessary data to be analysed and then to answer the research questions.

3.5 Rigorous Case Study Design

In case study design, rigorous consideration is emphasized throughout the study (Näslund et al., 2010; Rowley, 2002; Slater and Atuahene-Gima, 2015; Wolf and Seuring, 2010). Quality research can be regarded as knowledge that can be assimilated into the knowledge base of the field of study (Rowley, 2002). Four concepts are frequently discussed and are established as the basis of a quality piece of work: generalization, validity, reliability and triangulation (Rowley, 2002; Voss et al., 2002; Wolf and Seuring, 2010).

3.5.1 Generalization

Generalization usually refers to whether the case study design has been appropriately informed by theory and is therefore able to contribute to established knowledge (Rowley, 2002). It is said that in a case study, generalization is analytical and is based on advancing theoretical concepts that have been referenced in research or new concepts that are generated on doing the case study. The existing theory can be used as a template and be compared with the empirical results of the case study. This is known

as “the role of theory development, prior to the conduct of any data collection” (Yin, 2014). Generalization as part of a research design is highly desired.

In this research, the research questions have arisen from the literature review and the study aims to close the gap identified. Theories and ideas have been illustrated in a proposed conceptual framework. The details of how relevant theory was developed and how the conceptual framework was generated can be referred to in Chapter Two, especially sections 2.2 (theories and concepts relevant to collaborations in supply chain management), 2.7 (research gap) and 2.8 (conceptual framework). The availability of data collection based on the framework has been discussed a little in section 3.2.3 and is to be further explained in the following sections. Multiple case studies were adopted to make the research more robust (Amaratunga and Baldry, 2001a). As in analytical generalization, each case can be viewed as an experiment and the involvement of more cases can increase the rigour of the investigation (Rowley, 2002).

3.5.2 Validity and reliability

It has been stressed that as a research design is supposed to represent a logical use of statements, logical tests are needed to judge the quality of any given design (Yin, 2014). There are four tests relevant to case study research that are strongly recommended (Wolf and Seuring, 2010; Voss, Tsikriktsis and Frohlich, 2002; Yin, 2014): construct validity, internal validity, external validity and reliability. The test of construct validity is to identify correct operational measures; Yin (2014) suggests multiple sources of evidence be applied in data collection, and a chain of evidence generated with key informant review. For explanatory studies, the test of internal validity is to seek the rule of relationship establishment, where the techniques of pattern matching and explanation building are needed. To define the domain of which study’s finding can be generalized (Yin, 2014) and demonstrate research repeatability, the tests of external validity and reliability are recommended.

Referring to Table 3-1, the details are shown of how the required validity and reliability can be attained. It should be noted that, in this stage of the research design, this research will mainly focus on approaches to ensure external validity, as more approaches will be further discussed in the stage of data collection and data analysis.

Table 1-6 Research Quality Test

Tests	Tactics Adopted in This Research
Construct Validity	(1) Multiple sources of evidence have been used, including relevant documentation, archival records, observations, photographs, interviews and surveys. (2) All case data has been filed in Word and catalogued, and is capable of being checked when convenient by project researchers. (3) Key informants' files have been confirmed and generated after a pilot study, and relevant reports of each case study have been made.
Internal Validity	This research is mainly exploratory and does not need to consider this test. In the data analysis, the techniques that have been applied in this research are "pattern matching", "explanation building", "logic models" and "cross-case synthesis"(the details can be referred to in the following sections).
External Validity	The case study method adopted in this research is a "multiple-case study". Interviews and surveys have been undertaken in grouped cases based on the same protocols and designed questionnaires.
Reliability	(1) A study protocol has been generated in the early stage of data collection. (2) All case data has been filed in Word and catalogued, and is capable of being checked when convenient by project researchers.

3.5.3 Single-case study vs multiple-case study

A single-case study is said to be appropriate for application when the case being investigated is critical, unusual, common, revelatory or longitudinal (Yin, 2014). A multiple-case study is considered as a different method and has distinct advantages and disadvantages when compared to the design of a single-case study. In any research, the risks of misjudging certain events and exaggerating easily obtained data exist; however, they can be somehow mitigated when the events and data can be compared across cases (Voss et al., 2002).

To minimize the possibilities of misrepresentation and to maximize the access needed to collect relevant data, a very careful investigation is required. The single-case study has a great possibility of generating an in-depth study; however, it could limit the potential of the research to be generalized to more valuable findings (Bhaskaran and Jenkins, 2009). A multiple-case study is regarded as an appropriate method that enables researchers to consider more widely (Yin, 2014) and to focus on data collection to extend theory building (Jia and Lamming, 2013b). Although the involvement of multiple cases might reduce the depth of the study, it is also said that it can “both augment external validity and help to guard against observer bias” (Voss et al., 2002). Thus, in this research a multiple-case study has been adopted.

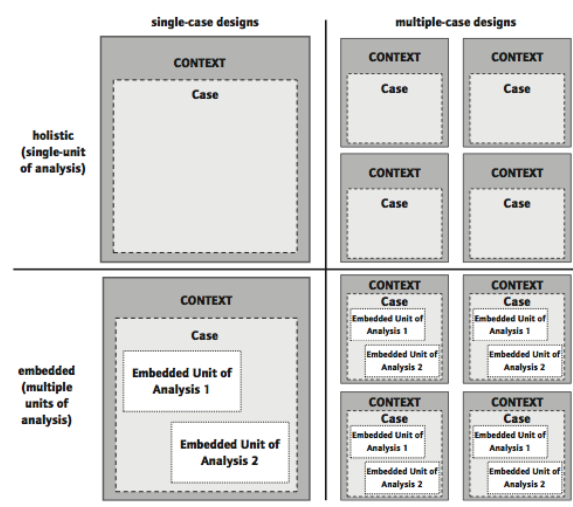


Figure 1-11 Basic types of designs for case studies

Source: Yin, 2014.

There are two types of design in multiple-case studies (see Figure 3-2): holistic and embedded (Yin, 2014). The holistic design is said to be more advantageous when there are no logical subunits or relevant theory underlying the case itself. However, holistic research may lead to problems like when the results are unduly abstract and the measures or data are insufficient. The embedded design in a way adds opportunities for extensive analysis and can enhance the insights of relevant studies.

In this research, the case study is designed to be an embedded multiple-case study.

3.5.4 Triangulation

Triangulation is required for ethical reasons to confirm process validity (Amaratunga and Baldry, 2001a), which was originally found by Campbell and Fiske in 1959 (Campbell and Fiske, n.d.; Jick, 1979). The idea of multiple operationalism has been developed, and it has been argued that more than one method should be applied to ensure that relevant knowledge can be variance reflected. This research applied data source triangulation (Denzin, 1984, cited by Amaratunga and Baldry, 2001), which can be achieved by using multiple sources of data (Yin, 2014). In this research, multiple sources of data refer to relevant documentation, archival records, observations, photographs, interviews and surveys tending to be applied in case studies.

The use of multiple sources of evidence allows this research to better address a broader range of behavioural issues (Yin, 2014), which could make the case findings more accurate and convincing. Moreover, due to the involvement of interviews and surveys, process validity is enhanced as well. In Amaratunga and Baldry's (2001) case study, via multiple methods of data collection, triangulation was applied for two purposes: qualitative research can be supported by quantitative findings; relationships between constructs (which were based on qualitative research) can be measured and uncovered by quantitative findings. Extra impetus can be provided to the answering of research questions and the qualitative analysis can be more robust.

3.6 Data Collection

Data collection is the execution of case studies, which calls for a competent researcher (Rowley, 2002). Multiple methods of data collection with different sources of evidence are suggested by predecessors (Eisenhardt, 1989; Rowley, 2002; Voss et al., 2002), which is said to allow the researcher to access a broader range of data and be able to enhance process validity and research reliability. In this research, the main data collection methods of interview and follow-up survey will be applied; other sources of evidence (Yin, 2014) are considered and relevant ethical issues are well addressed.

3.6.1 Division of multiple cases

This research applies the methodology of an embedded multiple-case study, where there is more than one case study. Many case companies within the supply chain from upstream to downstream can be involved. Within one case, the product manufacturer is the focal company, and other organizations in a business connection with the focal company are the non-focal companies (or organizations). The focal companies are regarded as the main part of the single cases, but that does not mean that the non-focal companies (or organizations) are not important. Together with the focal company, the single cases are analysed as a supply chain/network. The division of a multiple-case study can be illustrated as in Figure 3-3.

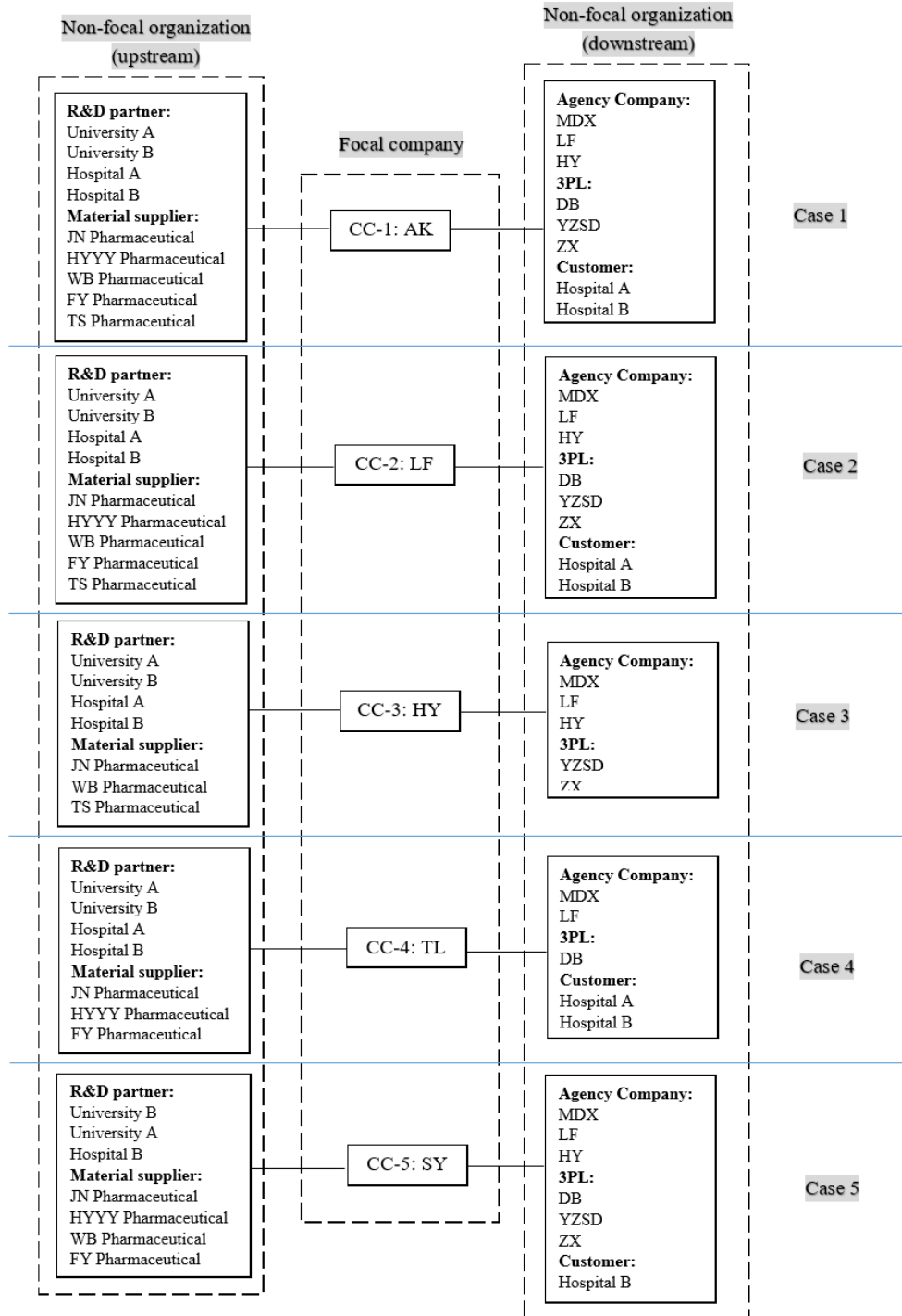


Figure 1-12 Division of a multiple-case study

3.6.2 Company selection criteria

Case company selection is a very important aspect of case study theory development (Eisenhardt, 1989). Theoretically, a good sampling method is to choose case companies

that are likely to replicate or extend the emergent theory. Different from the sampling discussed in previous studies of population, case selection usually refers to selecting cases that are typical or representative, or able to highlight the differences being studied, or are negative or disconfirming for some reason (Voss et al., 2002). To be specific, Rowley (2002) explained that case company selection must be determined by the research purpose, questions and theoretical context. However, the process can be affected by some other factors like accessibility, resources and time available.

This research aims to explore the patterns and their impact on supply chain collaboration from the perspective of a triad. The research questions have been proposed on that basis. Referring to previous literature, the cases selected are mainly in the manufacturing and service industries. Referring to our review, the cases that come from the service industry mostly act as supporters of manufacturers or their relevant participants in the supply chain. A great majority of theories are developed based on those case studies; thus, as research based on existing theories, this research intends to select case companies from manufacturing industry as well.

In this research, a pilot study was designed at the beginning of the project to select the case companies and to get in touch with important contacts, who were junior enough to assist the researcher in organizing relevant interviews in the target industry. The details can be referred to in the next chapter. When considering the accessibility of a case company, the resource availability of whether there are enough collaborative partners to be interviewed or involved in the follow-up survey, and the time available in terms of whether the case could be completed within a limited research period (the researcher's PhD programme), were all considered. In line with the research purpose and questions, cases were chosen from the perspectives of (1) industry, (2) firm size and (3) location.

(1) Industry

As this research intends to explore the possible existing collaborative patterns in a supply chain (network), the structure of the supply chain is expected to contain most of

the identified nodes. The pharmaceutical industry has been selected; the details of why to focus on the pharmaceutical industry are further explained in the following sections and the findings of the pilot study are outlined in the next chapter.

Pharmaceuticals is an innovative industry (Rees, 2011) that supports the development of the health service, which requires plenty of resources to focus on R&D, quality control in all processes and product distribution. To focus on the core business, outsourcing tends to be applied at various stages (PwC, 2012). Compared to traditional manufacturing industries and other innovative industries related to high-tech, the pharmaceutical industry is even more complicated (Rees, 2011), especially in the downstream supply chain (Azzi et al., 2013; Laínez et al., 2012). It is said that opportunities and challenges have been encountered by business practitioners and that it is necessary to fully discover the collaborative relationships in this industry (Montoya-Torres and Ortiz-Vargas, 2014). What is more, as an industry closely associated with people's livelihood, the government has tended to pay more attention to it; the increasing intervention of governmental agencies and regulatory institutions (Shah, 2004) makes it possible for this research to further investigate the motivations for such possible collaborations, which are mentioned but not discussed by other researchers in previous studies from the perspectives of patterns.

(2) Firm size

Empirical data is usually collected from organizations of different sizes. The size or scale of a firm as a factor that could have an impact on collaborative relationship forming in a supply chain has been approved by many scholars (Cao and Zhang, 2011; Ho and Lu, 2014). This research aims to figure out patterns and impacts with consideration of the degree of collaboration. Thus, to get more accurate results, it is necessary to distinguish firm size.

In this research, case companies are SMEs. The reasons for such a size selection is because when compared to large enterprises, which are estimated to have comparatively mature supply and manufacturing systems, there are more challenges for SMEs in the process of development. To seek sustainable development, a certain number of SMEs

have realized that collaborations may help them to gain more competitive advantages (Rees, 2011). However, due to a lack of references in patterns or strategies, the collaborations are often formed in a conservative way. When competing with large firms, SMEs are inferior.

In the real business world, there is a very large percentage of SMEs. Although learning from the successful experiences of large firms may help to light the way for the future, getting to know their own business and the environment should be the first step. When considering the factor of power, large companies tend to take the dominant positions (Chicksand, 2015), which in a sense has limited the possibility and level of collaboration. SMEs can collaborate with parties of various sizes and degrees of power, and investigations in this type of organization should be able to get richer answers.

(3) Location

The target cases are SMEs in mainland China. As the biggest developing country in the world with stable, fast GDP growth and a large population base, the target industry (manufacturing industry) is eagerly demanded by local people, encouraged by the government (State Council of the People's Republic of China, 2012). Compared with developed countries like the USA and the UK, there are more SMEs in China. In 2001, China entered the WTO (World Trade Organization). For organizations in China, the business market is more competitive. Faced with opportunities and challenges that come from other countries, alliances should be in existence and follow various patterns.

What is more, when considering the distinction of regional policies (Van Hoof and Thiell, 2014), all the case companies are selected from the same district in China. In this way, the motives, objectives and performance of governmental agencies and related institutions that may have an impact on possible collaborative patterns should be identical. In a formal case study, all the selected focal case companies are the representatives advised by the local administrative committee, which agreed to take interviews and other relevant research activities. The non-focal companies (or organizations) are advised and introduced by relevant focal companies.

3.6.3 Research protocol

To ensure the reliability (Yin, 2014) of the case study research, a research protocol was designed to guide data collection and was applied as an interview tool for the semi-structured interviews. The protocol does not only contain the instrument or questionnaire, it also introduces the general rules and procedures to be followed. This is important and essential in multiple-case studies (Yin, 2014). It could force researchers to anticipate possible problems within interviews and thus to fully prepare; moreover, it keeps the research targeted on the topic. Following Yin's (2014) instructions, the research protocol contains four parts – overview, data collection procedures, questionnaire and a guide for the report.

This section was generated based on the gap in the literature review and research purpose and questions. A few key relevant readings have been provided, which contribute to sketching out the brief structure of the research; possible questions have been proposed in the questionnaire section to guide the investigators involved in collecting the targeted information; reporting frameworks have been provided to assist data collection systematically in an orderly way, which prepares for the following analysis. As the principle of the case study, this part has been reviewed regularly, to remind the researchers involved to stay on the right track of the research. Details can be referred to in Appendix Two.

3.6.4 Semi-structured interview

For data collection, the interview approach has been recommended (Yin, 2014), and when compared to unstructured and well-structured interviews, many researchers tend to apply semi-structured ones (Tantoush et al., 2009). Such a type of interview is able to provide certain guidance/schedules to help interviewers in better controlling the processing of interviews; moreover, it tends to be more flexible and conversational, and is able to identify many more interesting points that might have been ignored in previous research (Rowley, 2002).

A protocol (Appendix Two) was designed to guide the interviews. A framework was prepared to remind the interviewer to stick to the proposed research and this was

prepared in advance. The protocol was applied in both the pilot study and the formal case studies.

Extra questionnaires (Appendix Three) were designed as supplements to the protocol. Referring to the relevant literature, points often discussed or argued by other researchers in discovering supply chain collaborations were designed to be questions. The general questions focus on discovering how important collaboration is in a particular industry (Blome et al., 2014; Rahman et al., 2014; Song et al., 2012) from the case companies' perspective and their willingness (Frödell, 2011) to build collaborations. By asking their criteria for partner selection (Frödell, 2011) and the collaboration projects they currently have, it was possible to get an overview of a certain business. The general questions were applied in the pilot study.

After the pilot study, research in the pharmaceutical industry could be further explored (the reasons can be referred to in the pilot study section). The general questionnaire could be polished and more questionnaires could be designed (Appendix Three) in reference to the industry and relevant literature. According to the main activities that could be identified in the literature, questions were proposed to figure out the formation of collaborations in R&D (Guo et al., 2016; Montoya-Torres and Ortiz-Vargas, 2014; Zhao et al., 2015), procurement and production (Grudinschi et al., 2014b; Tanskanen, 2015; Tawfik Mady et al., 2014) and distribution and logistics (Azzi et al., 2013; Forslund, 2014; Johnson et al., 1990; Murray and Fu, 2016).

Face-to-face interviews were undertaken at case companies to guarantee that the interviews could be conducted in a comparatively stable environment (Yin, 2014). Moreover, observations of relevant evidence could be made easily. Online interviews and telephone interviews were undertaken as a support method to collect and confirm further data.

The face-to-face interviews were generated in two rounds. Round one was a pilot study, and round two was the formal interview. In the pilot study, only 1–2 interviewees at a senior level in each company were invited to participate. In the formal round, 3–6 members of staff were interviewed in each company. Referring to Morgan and Hunt (1994) and Lu et al. (2013), the selection of members to be interviewed should follow the three guidelines of “homogeneity, heterogeneity, and representativeness”, which means the interviewees should be those able to process similar understanding about the

topics of the interview.

In the case studies for this research, all of the interviewees were in the position of manager or above (general manager/department manager/CEO/member of board/...), and the position they are currently in or the experience they had made it possible for them to respond to the topic. Interview time per person was no less than 30 minutes (this could be guaranteed, as the appointments had been confirmed in advanced). The time for each interview was limited and the arrangement of interviews should fit the interviewees' available time. If there were problems getting the required information, there was the possibility of arranging subsequent telephone interviews and online interviews. Any approach accepted by the interviewees would be used in data collection.

(1) Pilot study

Referring to our criteria mentioned above, eight companies in manufacturing industries or related industries that agreed to be interviewed were selected, and they were in the same region. The details of participants can be referred to in Table 3-2.

Table 1-7 Participants of pilot study

Pilot study (Field visit period: June–August 2014)	
Company Visited	Position of Interviewee
H Electronic Equipment (manufacturer, buyer)	President (2 hours) Manufacturing manager (1 hour) Sales manager (1.5 hours)
AK Pharmaceutical (manufacturer, buyer)	President (1.5 hours) General manager (2 hours)
J LED Screen (manufacturer, buyer)	General manager (1 hour) Marketing manager (1 hour)
JC Industrial Material (manufacturer, supplier, buyer)	General manager (1 hour) Operations manager (2.5 hours)
JH Auto Making (manufacturer, buyer)	R&D manager (1 hour) Manufacturing manager (1 hour)
CH Engine Making (manufacturer, supplier, buyer)	General manager (1.5 hours) Manufacturing manager (1 hour)
G Machine (supplier, retailer)	General manager (1 hour)
H Sales Agency (third party, sales channel)	Regional manager (1 hour) Sales representative (1 hour)

With the pilot study, specific information relevant to this research was acknowledged,

and the questionnaire – part of *general questions* (refer to Appendix Three) – that was designed was not that specific compared to those provided in the protocol. Due to the time limit, it was impossible for us to do investigations in all manufacturing industries. The selected pilot cases are representative SMEs in the target region (all of them hold the certificates of a key project granted by the local authority). The eight companies that were interviewed are in very different industries. Participant observations were conducted during the visit. According to the results of the pilot study (details can be referred to in the next chapter), this research decided to focus on the pharmaceutical industry, due to the time limit and with the considerations of available accessibility and resources.

Compared to other manufacturing industries, the pharmaceutical industry is special (a typical innovative industry requires comparatively huge continuing input in R&D and, compared to other industries visited, the pharmaceutical industry is much more focused on manufacturing, which provides this study with a good possibility of investigating outsourcing activities) and is increasingly an area of concern for people. Although auto-making partially qualifies, the size of the case is arguable – in the interviews the company regarded itself as a mature medium-level auto-maker when compared to its competitors in the industry, but referring to comments given online and the introduction of the industrial parts committee, it is not a typical SME. Moreover, as automation is a big industry, this has meant that cases have been conducted by many researchers from almost every perspective; but in the pharmaceutical industry, case studies are scarce. Thus, this research believes that it is more meaningful to undertake case studies in the pharmaceutical industry.

(2) Formal case study

Five companies were invited to take part in the formal case study. AK was one of the participants in the pilot study; the other four participants were introduced by the administration commission of the local economic development zone. All the case companies have developed significantly in recent years and have certain market recognition. In this research the intention is to identify the patterns of collaborative relationships among participants in the supply chain, and referring to section 3.3.2 it is

an embedded design case study that can enhance relevant studies and provide further evidence for a more comprehensive analysis. Therefore, besides the five cases, participants in the upstream and downstream supply chain in the pharmaceutical industry were also invited to contribute. University A and University B are two famous universities that have at some time worked with the case companies; in particular, they have good relationships with CC-1, CC-2 and CC-4. The material suppliers were recommended by the case companies that have worked with them. The agency companies involved were those that currently worked with the case companies. The 3PLs were introduced by CC-1, CC-2 and CC-5. The details of participants can be referred to in Table 3-3. According to the research protocol (Appendix One) and the full version of the questionnaire (Appendix Two), interviews were undertaken to collect relevant information.

Table 1-8 Participants in formal study

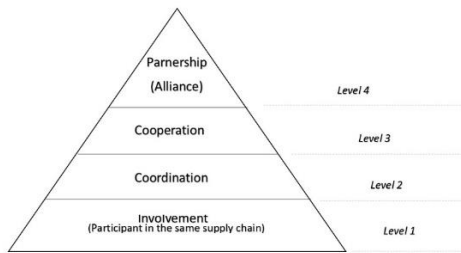
Formal Interview (Field visit period: July–December 2015)	
Case Company Visited	Position of Interviewee
AK Pharmaceutical (CC-1) (manufacturer, buyer, seller)	President (1 hour) General manager (3 hours, 3 times) Manufacturing manager (1.5 hours, 2 times)
LF Pharmaceutical (CC-2) (manufacturer, buyer, seller)	Manufacturing manager (2 hours, 2 times) Distribution manager (5 hours, 6 times) R&D director (2 hours, 2 times)
HY Pharmaceutical (CC-3) (manufacturer, buyer, seller)	President (2.5 hours, 2 times) R&D director (3 hours, 3 times)
TL Pharmaceutical (CC-4) (manufacturer, buyer, seller)	General manager (1.5 hours) Marketing manager (2.5 hours, 3 times) Manufacturing manager (1.5 hours)
SY Pharmaceutical (CC-5) (manufacturer, buyer, seller)	President (3.5 hours, 3 times) R&D director (1.5 hours, 2 times)
R&D Institutions visited	Position of Interviewee
University A (Research institution, educational institution)	Leader of pharmacy department (2 hours) Professor in pharmacy department (1.5 hours)
University B (Research institution, educational institution)	Leader of pharmacy department (2.5 hours)
Pharmaceutical Material Supplier	Position of Interviewee
JN Pharmaceutical (manufacturer, buyer, seller)	CEO (1 hour) General manager (1 hour)
FY Pharmaceutical (manufacturer, buyer, seller)	General manager (1 hour)
TS Pharmaceutical (manufacturer, buyer, seller)	General manager (1 hour)
Agency Company Visited	Position of Interviewee
MDX (buyer, seller, service provider)	Marketing executive (2.5 hours, 2 times) Regional sales representative (1 hour)

LF (buyer, seller, service provider)	Regional sales representative (2.5 hours, 2 times)
HY (buyer, seller, service provider)	Regional sales representative (1 hour)
3PL	Position of Interviewee
DB	Business manager (40 minutes)
YZSD	Manager (30 minutes)
ZX	Business manager (1 hour)

At the beginning of all the interviews this research intended to spend 5 to 15 minutes (this did not count in the length of interview) to introduce our research purpose and research questions. The research protocol had been printed out, but was not allowed to be skimmed over in advance by the interviewee, to ensure that the person would not be influenced and would be able to respond to questions fairly. The way of asking questions would not be the same as the questions listed. The questions were translated from an English version; this research intended to keep the meaning or the main ideas of the questionnaires and the expressions in Chinese could vary according to the conditions. In this way, the interviewees could catch the key points in which this research was more interested, and the answers that were given were expected to be more targeted.

A definition of key words/key concepts had been provided in order to ensure that when referring to the key words, what the research would like to express would have the exact same meaning as those offered by the interviewees, to maintain consistency and thus enhance the accuracy of communication in questioning and answering. The protocol was printed out and could be referred to by both interviewer and interviewee.

Table 1-9 Key words and key concepts

No.	Key Concept	Key Point to Be Highlighted						
1	Collaborative Relationship	Based on the literature review: 						
2	Alliance/Partnership							
3	Cooperation							
		<table border="1"> <thead> <tr> <th>Level</th> <th>Characteristics</th> </tr> </thead> <tbody> <tr> <td><i>Level-1</i></td> <td>(1) Direct business connection; (2) Goal congruence.</td> </tr> <tr> <td><i>Level-</i></td> <td>(1) Direct business connection;</td> </tr> </tbody> </table>	Level	Characteristics	<i>Level-1</i>	(1) Direct business connection; (2) Goal congruence.	<i>Level-</i>	(1) Direct business connection;
Level	Characteristics							
<i>Level-1</i>	(1) Direct business connection; (2) Goal congruence.							
<i>Level-</i>	(1) Direct business connection;							

		2	(2) Goal congruence; (3) Information/source sharing at minimum level.
		<i>Level-3</i>	(1) Direct business connection; (2) Goal congruence; (3) Information/source sharing at certain high level; (4) Decision synchronization in mutual projects.
		<i>Level-4</i>	(1) Direct business connection; (2) Goal congruence; (3) Information/source sharing at maximum level; (4) Decision synchronization in mutual projects; (5) Incentive alignment.
4	Supplier	Materials/service supplier Long-term (strategic) supplier Regular supplier	
5	Third Party	Third party and outsourcer (3PL, joint venture, research institution...)	

Moreover, before the interviews got started, the interviewer would negotiate with the interviewee about the form of the interview – “Do they mind to be recorded?” “Do they mind the note-taking?” In previous research (Lu et al., 2013), it has been mentioned that companies in China have a tendency to refuse the request to record, and in this data collection the same problem was met, as well as in all the case companies. However, the note taking was accepted. Moreover, it was promised that the follow-up emails/online chat/texts related to the questions that had been asked for in advance or other additional questions would be responded to if permitted by the company.

During the interviews, the questionnaire and frameworks designed in advance (protocol) were applied. All the questions are open-ended, which enabled the interviewees to express their ideas in a more comfortable way and with freedom. There was no fixed wording (Choi and Hong, 2002) in questioning; moreover, the conversations were allowed to proceed at the pace of the interviewee’s preference. Basically, the interviewer just needed to make sure that all the related questions listed on the protocol had been fully addressed.

At the end of the interviews, the researcher would ask if it were possible to have a visit to the manufacturing plants/distribution centres/warehouses. It was possible for this request to be rejected. However, if possible, videos and pictures were requested to show the researcher the related area with a brief introduction, which in a way helped the researcher have a better understanding of the business.

All the notes that were taken during the interviews were reorganized and summarized according to the questionnaire, and then sent back to the interviewees via email. The interviewees were asked to proofread the notes and the data confirmed with the respondents was applied in the research.

The listed framework (sample framework of data collection in the protocol) could be used during the interviews to facilitate data collection. Based on the uniformly applied tables, the data could be collected in a more distinct and knowable format (Yin, 2014). However, it was also said that it should be flexibly adhered to, which meant it should be involved when needed, and was changeable if done in a proper way.

The main interviews were conducted in the five case companies; the other interviews with relevant participants were undertaken to support our understanding and further data analysis. Although the researcher was not able to interview all participants in the supply chain of the five case companies, it was possible to get certain hints referring to the interviews with the key parties suggested.

3.6.5 Follow-up survey

The follow-up survey was designed to confirm the accuracy, validity and reliability of the data we had collected through the interviews. The purpose of the survey was not to collect new data.

The semi-structured interview is the typical prime source of data; moreover, when needed, surveys administered within the case can be set to back it up (Voss et al., 2002). After the formal interviews, the researcher could summarize the key points that contributed more to the research topic and figure out the shortages of data during the collection process. A well-designed survey can be applied to collect qualitative data to support qualitative research (Amaratunga and Baldry, 2001a). And in other research, trust, commitment, power and dependence are set to measure the closeness of collaborative relationships; a quantitative method of data collection can provide an accurate view and make the results more reliable. Moreover, it is an opportunity for the researcher to collect further relevant information and confirm the key points that have been summarized.

This research aims to explore the configuration patterns of dyads and triads in a supply chain. The interviews with focal companies were able to give this research an overview of possible existing partnerships in light of the evaluations of manufacturers. To get more comprehensive insights from a chain or network perspective, the survey was applied to collect data on selected groups.

The pharmaceutical industry is special compared to other manufacturing industries (Rees, 2011). Quality inspection is emphasized at every stage, from material purchasing, manufacturing and storage to distribution. In the pharmaceutical industry supply chain/network, there are plenty of suppliers (active pharmaceutical ingredient producers, excipient producers, herb suppliers and so on) assigned to particular product lines. It would be unrealistic to follow every line in all cases. As all case companies are in the same region, this research determined to pool them in the same group.

During the visits, a list of main suppliers could be referred to in their office documentation and the researcher was allowed to take relevant notes. After the formal interviews, the notes on the supplier were compared and it was noticed that there are several suppliers who are either currently in business with or previously had business with the case companies. The researcher was able to get connected with five of them with help from the key contact persons, and pooled them into another group. Moreover, as mentioned in this research study, outsourcing is an important aspect that may have a significant impact on the forming of triads. In the interviews, it was confirmed that the activities of R&D and distribution have a tendency to be outsourced, and their relationships are the most fitting for the identified collaborations. Thus, this research decided to collect some relevant data to verify the information obtained in the formal interviews with more valuable insights.

The research estimated two investigation groups of R&D institutions and sales force, and surveys were designed and sent to the relevant organizations. Moreover, the research set 3PLs as an individual group to be investigated as well. Due to the informal interviews, no specific group was suggested by any of the case companies with which they have a strong willingness to work from a strategic perspective, and the switching cost is very low. It can be confirmed that currently the 3PLs are only contracted for “delivery” and are not in strategic collaborations with the case companies. Therefore, to do research on this group, the researcher sent the designed survey to the 3PLs that

were mentioned the most by the case companies (including the 3PLs that were interviewed).

Above all, the sampling of the survey was not random. As a support method for the case study, all follow-up survey participants were selected based on the results of the formal interviews and were suggested by the key contact persons in the case firms. The overview of case groups is illustrated in Figure 3-4, and the details of surveys designed for each group can be referred to in Appendix Three. (As the suppliers involved belong to pharmaceutical manufacturers as well, they shared the same survey with the focal firm; the other three surveys were designed to help the researcher better understand the data collected relevant to the case companies and further interpret the possible results.)

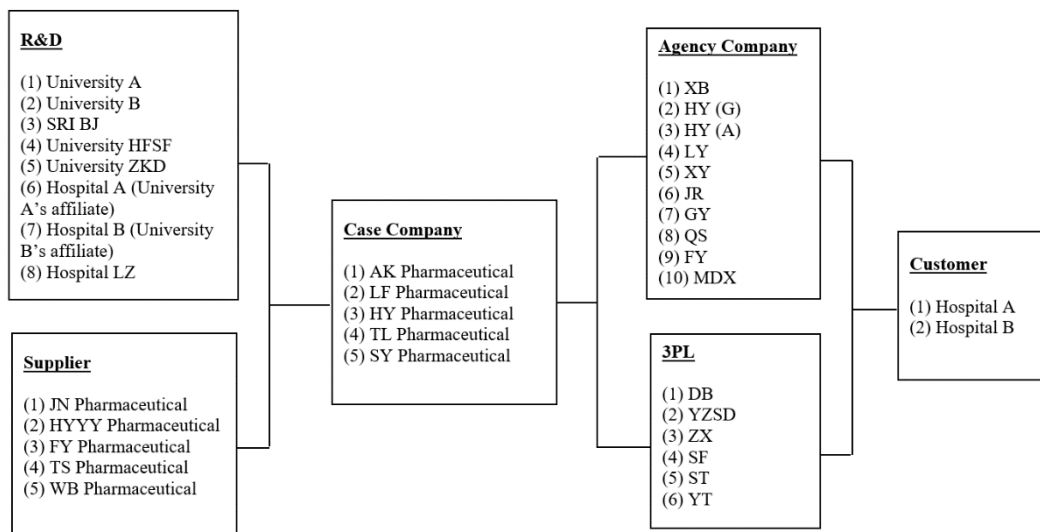


Figure 1-13 Participants in follow-up survey

All surveys were sent by email to the relevant participants. The researcher informed the available groups by our contact persons. All the surveys sent out were responded to. All the survey replies were well documented. Hard copies were printed out and well preserved.

3.6.6 Other sources of evidence

In this research, many sources of evidence were involved in the research design and case studies (Table 3-5). The requirement for multiple sources of evidence is one of the key principles of data collection in Yin's (2014) instructions, which in a way helps to reduce the bias that may be caused by applying an individual source of evidence.

Table 1-10 Sources of evidence applied

Source of Evidence	Details of Evidence
<u>Documentation</u>	Emails; notes; annual reports published online (listed company only); official website studies of each case; information from main mass media
<u>Archival Records</u>	Published files by local government online; published data by National Bureau of Statistics of the People's Republic of China; historical meeting notes
<u>Videos and Photographs</u>	Shown on website and provided by companies
<u>Interviews</u>	Response to questions listed on protocol; response to other relevant conversational questions
<u>Direct Observations</u>	General meeting; manufacturing department; distribution department (distribution centres)

The status of documentation and archival records is comparatively stable, and the sources of evidence enabled this research to review the relevant information repeatedly. They were not the result of the case studies, but relevant information could be applied for checking. The records documented cover a long span of time; significant issues could be traced when needed, although this could make it difficult to conduct useful information filtering, and the feature of "selectivity" (Yin, 2014) may cause a certain bias. They are still sources of evidence to apply in the research design and the following analysis, however, and the existing bias in application could be reduced when there are other sources of evidence involved.

Through the interviews with people in the target companies, information directly related to the case topics could be obtained. The implication of certain practical measures in the real business world could be known and further applied to explain the concepts. The response bias could be a weakness of the source; however, the introductions made at the beginning of the interviews and the action of note confirmation in a way helped to improve the quality of the interviews with a comparatively higher accuracy. Moreover, in a company with direct observations, the data that was collected in the interview could be further confirmed in a certain context.

3.6.7 Other relevant issues

In case of any omissions or further information that may be required in the research, the researcher intended to maintain regular contact with the case companies. Relevant questions to request information for the case study would be proposed when needed.

As the interviews and surveys were undertaken in China and proceeded in Chinese, all the research documents (including the protocol) were translated into Chinese, and proofreading was done by secondary researchers. The confirmed notes taken in Chinese were translated into English, and all the files in both Chinese and English were double checked by secondary researchers as well.

The files, notes and processed data have been well preserved – paper documents have been categorized in file packets; the electronic data has been preserved on the relevant researchers' personal computers/laptops (with antivirus software) with backups. Only the relevant researchers are able to access the data.

3.7 Data Analysis

Regarding the research of Yin (2014), to generate high-quality data analysis there are several principles: the researcher should be able to attend to all relevant sources of evidence; focus on the most significant issues in the case studies; preserve sufficient prior and expert knowledge related to the case studies; and be convincing with their reliable findings.

This research applied the techniques of pattern matching, explanation building, logic models and cross-case synthesis.

(1) Pattern matching

In previous research, when more than one case has been involved with plenty of data, pattern/relation searching among the business process integration of a supply chain is recommended to apply the technique of pattern matching (Forslund and Jonsson, 2007). The basic idea of this technique can be described as locating the data that has been collected into the target conditions. When the research comes across the problem of pattern matching, the researchers need to decide, for any of the given patterns and the data held, whether or not certain groups of data match the pattern (Fernau and Schmid, 2015). When referring to Fernau and Schmid's words, the given patterns should be one of the key issues to be settled prior to the application of the technique. Nature centralizing is regarded as an equipment of individual network points, and helps to predict the patterns of outcomes (Yin, 2014); theoretical replications are required in the process to ensure the validity of the matching.

In this research, a protocol and a set of interview questions were designed in the early stage of the research (Appendices One and Two). The same questions were asked of interviewees in the case companies and the results were allocated to prepared templates. To make sure the data was collected into the target conditions, a follow-up survey was conducted to confirm the answers to relevant key issues referring to the conceptual framework proposed. Matching was then guaranteed in every possibility.

(2) Explanation building

Explanation building is said to be a special type of pattern matching (Yin, 2014), which deserves more attention due to its more complicated process. This technique is quite relevant to apply to some explanatory issues within case studies. When issues of how and why emerge, causal links are required to explain the related phenomena, and usually they can be complex and difficult to measure. In processing, with the initial conceptual framework and purposes, a series of iterations are needed – findings always have to be compared with the frameworks or proposition; the protocol needs to be revised again and again; other relevant sources of evidence should be involved and compared against the revisions; and single cases need to be compared in pairs and groups. To get reliable eventual explanations, evidence should be examined repeatedly; accordingly, revisions are required every time (Yin, 2014).

A pilot study was set up before the formal study with the original design protocol. The data collected was analysed in the first phase, and the protocol was redesigned based on the results. Besides the general questions, which should be asked of all case companies, a questionnaire relevant to the non-focal company (or organizations) in line with its activities was designed to collect more data. A continuing relationship was maintained with all case companies and interviewees in order to revise the template and update the data collected. In addition to this, with the follow-up surveys, evidence was examined repeatedly, so that the eventual explanation of this research should be reliable.

(3) Logic models

The technique of logic models is said to be increasingly significant and applied in theories of change (Yin, 2014). Observed events can be matched to theoretically predicted events by using such a technique (Yin, 2014).

Multiple sources of evidence are involved; the logic models can help to better analyse the data and enhance the research rationality. The details of how to practise this technique can be found in Table 3-6.

Table 1-11 Practice of logic model

Inputs	Activities	Outputs	Outcomes/Impacts
What resources have been input/tend to be pooled by participants? (Money, information, human resources...)	<ul style="list-style-type: none"> • R&D • Procurement • Sales (distribution) • Logistics 	<ul style="list-style-type: none"> • Activities • Collaboration patterns • Role played by different parties involved 	<ul style="list-style-type: none"> • Short term (dynamically) • Long term (fixed)

(4) Cross-case synthesis

The cross-case synthesis is said to be applicable only to multiple-case studies (Jia and Lamming, 2013; Yin, 2014). In this research, multiple-case studies are adopted to explore the collaborative relationships in a supply chain. It is suitable to apply this technique to give a systematic view on the topic area.

Referring to Figure 3-3, there are five cases in this research, and it can be seen that some of the partners are the same ones. However, in the same activity with the same partner, the collaborations that are built could be at different levels and the associated impact on supply chain performance could vary. The same questions were asked of interviewees in the same group, and their answers were compared to sum up the patterns. This technique contributes to this research in levelling out the collaborative relationships. It can help to identify the characteristics of collaborations in different activities and catch the attitude of participants in those features identified in the pilot study, thus improving the questionnaires for the formal study. Most importantly, it gives a systematic view of all the data collected to ensure that the pattern that this research obtained was theoretically coherent (Yin, 2014).

In Figure 3-5, the numbers “1” to “13” represent the participants in the pharmaceutical supply chain in this case, including university, scientific research institution, other pharmaceutical companies, hospital, authority, conventional supplier, project supplier, appointed supplier, agency company, pharmacy, clinic, OTC (over-the-counter) buyer and 3PL. The details will be further illustrated in the following chapters.

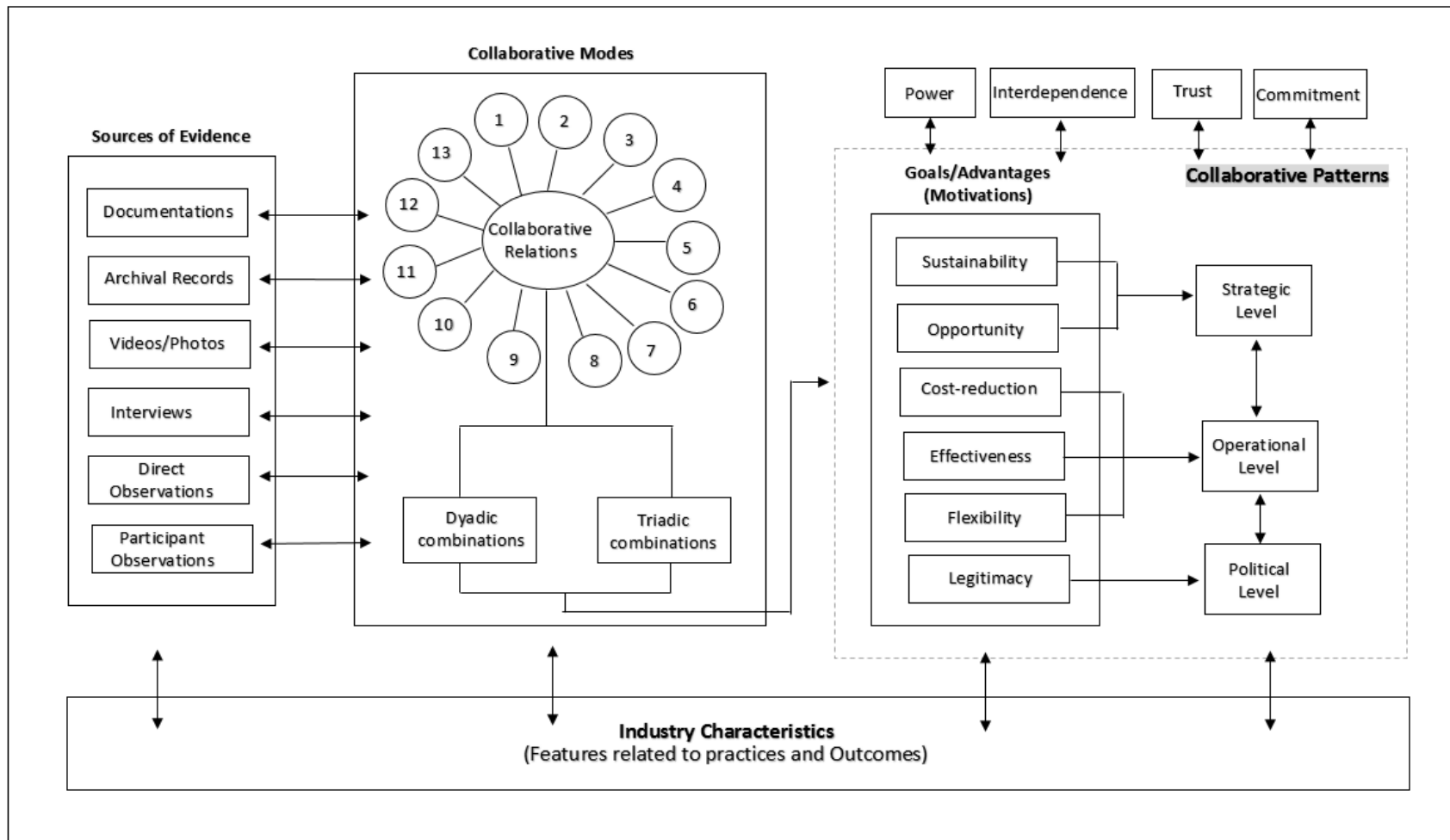


Figure 1-14 Methodology – data analysis framework

3.8 Trustworthiness of Case Study

Nine criteria have been suggested by Shenton (2004) and Lin and Zhou (2011) for doing qualitative research: dependability or reliability (Yin, 2014), confirmability, transferability, integrity, credibility, fit, generality, control and understanding. As in the phases of research design, data collection and data analysis, bias/ethical issues or mistakes could exist that may have negative impacts on the rigour of the research.

Dependability refers to the issue of reliability (Shenton, 2004) and the objective is to ensure that similar results could be obtained by other researchers with the same methods (Yin, 2014). Confirmability refers to the comparable concern with objectives (Shenton, 2004), as opposed to the biases of investigators/researchers (Lin and Zhou, 2011). Transferability refers to the extent to which one's findings in case studies can be applied to other situations (Shenton, 2004; Lin and Zhou, 2011; Yin, 2012). Integrity refers to the extent of data confidentiality (Yin, 2014) and the degree to which interpretation is influenced by mistaken information or evasions by participants in the data collection (Lin and Zhou, 2011). Credibility refers to the extent to which the results can be accepted (Shenton, 2004), with "threats" having been identified (Yin, 2014). Fit refers to whether the findings could fit with the substantive area under investigation (Lin and Zhou, 2011). Generality refers to the extent to which the findings generated are able to explain certain phenomena from multiple aspects (Lin and Zhou, 2011; Yin, 2014). Control refers to how far the theories can be influenced by organizations (Lin and Zhou, 2011). Understanding refers to whether participants are able to get into the meaning of the representations (Lin and Zhou, 2011) and develop a valid response (De Vaus, 2002).

In the previous illustrations, the relevant issues were settled to ensure the quality of the research. Details of the trustworthiness of this study with certain complementary issues can be referred to in Table 3-7.

Table 1-12 Trustworthiness of case study

No.	Criteria	Approaches Applied in Addressing Criteria
1	<u>Dependability</u> <u>("reliability")</u>	<p><u>Approaches:</u></p> <p>(1) The research has been designed in advance, with a clear illustration of planning and implementation (protocol).</p> <p>(2) Multiple sources of evidence have been involved, categorized and reorganized by more than one key investigator.</p> <p>(3) Data collected (notes taken) have been double checked by the interviewees.</p> <p>(4) Data analysis techniques ("pattern matching", "explanation building", "logic models" and "cross-case synthesis") have been applied to ensure the quality of data processing.</p> <p>(5) The interviewees are all in a position of manager (or above) with rich experience in the target industries, and served in more than one department before; they are able to respond to supply chain questions from a comparatively wider view.</p> <p><u>Outcome:</u></p> <p>The consistency and accuracy of explanations have been enhanced.</p>
2	<u>Confirmability</u> <u>("objectivity")</u>	<p><u>Approaches:</u></p> <p>(1) Multiple sources of evidence (including documents, notes, archival records and interview reports) are reviewed repeatedly by key investigators.</p> <p>(2) The summaries of notes taken have been reviewed by the interviewees.</p> <p>(3) Contact with case companies is maintained, and any further questions are sent to request answers at a later time.</p> <p><u>Outcome:</u></p> <p>The interpretations of findings can be more objective and able to respond to the topic area to a larger degree with comparatively less bias.</p>
3	<u>Transferability</u> <u>("external validity")</u>	<p><u>Approaches:</u></p>

		<p>(1) Multiple sources of evidence are used.</p> <p>(2) Replication logic in a multiple-case study has been applied.</p> <p>(3) Key concepts and research frameworks (theoretical concept, research design, data collection and data analysis) are defined, designed and provided with clear illustrations.</p> <p><u>Outcome:</u></p> <p>Similar study findings can be generalized and can be traced to certain theories accordingly.</p>
4	<u>Integrity</u>	<p><u>Approaches:</u></p> <p>(1) Interviews and reporting are anonymous, and the participants are able to express their ideas freely with “open-ended” questioning.</p> <p>(2) The instigators (interviewers) are well trained and have had similar experiences before.</p> <p>(3) The communications are not recorded by electronic facilities but by “note taking”; participants are encouraged to explain more with relevant issues.</p> <p><u>Outcome:</u></p> <p>Trust has been estimated and the information given by participants is believed to be true and fair.</p>
5	<u>Credibility (“internal validity”)</u>	<p><u>Approaches:</u></p> <p>(1) The case study report outline (protocol) has been designed.</p> <p>(2) On-hand sources of evidence (background information on all case companies and industries) have been well studied.</p> <p>(3) Appointments are made to ensure the interviews can be processed prior to formal interviews; issues that need attention for field visits have been noted in advance by the contact persons.</p> <p>(4) Triangulation: multiple sources of evidence, a multiple-case study, more than one investigator and several techniques of data collection analysis.</p> <p>(5) Participants in interviews are mainly required to respond to the specific areas they are masters in; if more information is</p>

		<p>needed, which cannot be responded to by the participants confidentially, another more appropriate candidate would be nominated and introduced.</p> <p>(6) Iterative questioning. For some very important issues, it will be confirmed repeatedly. (Questioning would not be in fixed words, which enables the meanings to be expressed in the best way.)</p> <p>(7) Frequent debriefing sessions with other researchers. These regular meetings would enable investigators to get feedback from professional researchers, in order to avoid individual bias or preferences.</p> <p>(8) Initial interpretations of findings would be verified at the end of the interviews, and the verbal summaries will be sent to respondents to further confirm them.</p> <p>(9) All related works are reviewed and double checked by peers.</p> <p><u>Outcome:</u></p> <p>The model is able to be altered and expanded to best respond to the research purpose.</p>
6	<u>Fit</u>	<p><u>Approach:</u></p> <p>Refer to the methods that have been applied in “dependability”, “confirmability” and “credibility” in the research.</p> <p><u>Outcome:</u></p> <p>The concepts are defined with more detail to a comprehensive degree; the research procedures have been improved to be more fluid and distinct; able to access a large amount of evidence for pattern discovery.</p>
7	<u>Generality</u>	<p><u>Approaches:</u></p> <p>(1) Interviews have been generated in multiple case companies with interviewees at manager level.</p> <p>(2) Protocol has been prepared (semi-structured interview with questionnaire) to ensure the target questions are able to be responded to.</p> <p>Open-ended questioning with anonymous reporting encouraged interviewees to respond positively with more in-depth insights.</p> <p>(3) Questionnaire has been designed for different parties, which enables a more comprehensive view to explore the</p>

		<p>relationship mode.</p> <p><u>Outcome:</u></p> <p>Multiple perspectives are able to be captured.</p>
8	<u>Control</u>	<p><u>Approach:</u></p> <p>Interviewees work in the target department and are currently in charge of related tasks, or the leader of the group who frequently communicates with all departments (top managers at operational and management level).</p> <p><u>Outcome:</u></p> <p>The data collected is able to fully reflect and explain the research topics.</p>
9	<u>Understanding</u>	<p><u>Approaches:</u></p> <p>(1) The introduction at the beginning of interviews enables interviewees to have an overview of the research and encourages them to give more targeted information.</p> <p>(2) During the interviews, all information is verified with interviewees on the spot, and the reorganized notes are sent back via email for double checking.</p> <p><u>Outcome:</u></p> <p>The efficiency and accuracy of communications in interviews are enhanced, which reduces the bias of anything being misleading or misunderstood.</p>

3.9 Summary

The illustration of the research methodology designed in this chapter is to help understand how the research questions and objectives were operationalized in practice. The research philosophies and methods adopted have been introduced. As exploratory research, multiple-case studies have been proposed to further develop the relevant theories (Voss et al., 2002).

With a pilot study, the chosen case companies in a selected industry could be confirmed. Primary sources of data were collected mainly through semi-structured interviews and follow-up surveys.

In the 47 interviews (including the pilot study), all participants were interviewed face to face at least once; methods of online interview and telephone interview were applied to complete the data collection as well. Due to not being allowed to record the interviews, all relevant organized notes were sent to interviewees to double check them. The follow-up surveys were designed on the one hand to further confirm the data collected that had been summarized from the interviews, and on the other hand to collect more information on the relevant findings to support the qualitative research when needed (Amaratunga and Baldry, 2001a).

Moreover, to help with a better interpretation of the results of the case studies in a systematic view, three types of surveys for outsourcing contractors were designed – R&D outsourcing, logistics outsourcing and sales outsourcing. Due to the fact that all the case companies are in the same region, this research was able to figure out the overlaps in their lists of suppliers. The theory to be developed is mainly based on the results of the focal cases. The surveys collected from third parties were only applied to help this research better understand and interpret the results.

Chapter Four : Case Study Profile

4.1 Introduction

In this chapter, the results of the case studies will be illustrated. The exploratory research was conducted to identify dyadic/triadic collaborative patterns in the supply chain and to ask how these collaborations may influence performance.

To get empirical evidence and further explore supply chain collaborations, there were two main phases of data collection in the case study. In *Phase One*, five focal case companies and their relevant business partners were interviewed; in *Phase Two*, follow-up surveys for the purpose of data confirmation were sent to selected parties (including the interviewed case companies). When applied with other resources like documentation, arrival records, videos/photographs and direct observations, this research is able to map out the general supply chain (network) of the different cases.

4.2 Case Company Description

According to Chapter Three, the five focal companies come from the same region, and all of them are pharmaceutical SMEs. Large-scale outsourcing activities widely exist (Lowman et al., 2012) and none of them is a single business that does not collaborate with other parties in the supply chain.

When referring to the *standards of enterprise division* established by the National Bureau of Statistics of the People's Republic of China (2011), the enterprises in China can be divided into large, medium, small and mini. They conform to the classifications and focuses stressed by previous research (Kohl et al., 2015; Van Hoof and Thiell, 2014); those that are medium, small and mini will be regarded as the components of SMEs. In the standards, there is a particular item for manufacturing industry; however, only a general division has been made and some of manufacturing (i.e. pharmaceutical manufacturing) as an industry may contain many cross-functional sectors, so it is difficult to allocate a company to any group. Basically, when referring to the standards,

the number of staff in a typical SME should be no more than 1000.

The central part (particularly the area close to the eastern coast) of China has been regarded as a “back-land region”, which enjoys a better geographical position (Yu et al., 2012), and it has become the new economic centre due to transportation construction in China and the good investment environment. A great number of SMEs that are fast growing can be tracked to this area. Therefore, all the cases invited come from this area.

The details of the case companies (focal companies) can be referred to in Table 4-1.

Also in Table 4-1, most of the case companies are typical SMEs referring to the standards, except CC-1, which has 1210 employees, so more than 1000. Here, it is still treated as an SME and CC-1 is still involved in the investigation. The reasons are: (1) the number of staff changed to more than 1000 in the last two years, and due to the dynamic of the employee turnover rate this historical figure could be changeable (and the current figure is quite close to 1000); (2) prior to the interview, in the contact with managers in CC-1, they still described themselves as a medium-sized firm; (3) compared to some large pharmaceutical companies (with a number of staff usually more than 2000 in China), there is still a long way for the “1210” to go. Thus, it was decided to put CC-1 into the SME group.

Table 1-13 Focal companies

Case Company	Employees	Business Overview
<i>CC-1</i>	1210	<ul style="list-style-type: none"> ▪ Started as bio-pharmaceutical manufacturer (was a local R&D institution) ▪ Currently 3 subsidiaries (producing pharmaceutical materials and also drug products; medical equipment sales; R&D support) ▪ Professional R&D team ▪ No distribution centre (plan to establish), but has its own sales team ▪ > 70% delivery count on 3PLs ▪ Main products: bio-pharmaceutical drugs, chemical drugs, traditional Chinese medicine and synthetic drugs.
<i>CC-2</i>	505	<ul style="list-style-type: none"> ▪ Started as small pharmaceutical manufacturer (focus on marketing development rather than R&D at the beginning of its business) ▪ Currently 2 subsidiaries (pharmaceutical sales agency, retail pharmacy chain) ▪ Online sales platform ▪ > 98% delivery count on 3PLs

		<ul style="list-style-type: none"> ▪ R&D centre in progress ▪ Main products: chemical drugs, traditional Chinese medicine and synthetic drugs
<i>CC-3</i>	105	<ul style="list-style-type: none"> ▪ Small pharmaceutical manufacturer (focus on pharmaceutical innovation) ▪ No subsidiary ▪ No sales team ▪ ≈ 100% delivery count on 3PLs ▪ Main products: chemical drugs (limited range of products) ▪ Able to provide R&D services to other pharmaceutical companies (including transfer of technology)
<i>CC-4</i>	260	<ul style="list-style-type: none"> ▪ Bio-pharmaceutical manufacturer (designated to provide blood plasma products for clinical treatment by government) ▪ Currently no subsidiary ▪ Professional R&D team ▪ Able to delivery most of its products with its own force (< 30% delivery count on 3PLs) ▪ Main products: blood plasma products like blood protein
<i>CC-5</i>	205	<ul style="list-style-type: none"> ▪ Started as a pharmaceutical company co-funded by a university ▪ Currently has no subsidiary ▪ Has its own R&D employees ▪ Has its own sales team ▪ > 90% delivery count on 3PLs ▪ Main products: traditional Chinese medicine and synthetic drugs

4.2.1 Supply chain mapping of cases

(1) Case Company 1 (CC-1)

CC-1 is a famous bio-pharmaceutical manufacturer in China; it is seeking to be a big pharmaceutical company engaged in more areas in pharmaceutical manufacturing. In the last decade CC-1 launched a series of projects to take over relevant production lines and cultivate potential scientific and technical talent. Its remarkable achievements in innovation and the noticeable contributions to the progress of people's livelihoods enabled it to obtain more support from local government.

CC-1 was developed from a local research institution and is currently a large company in bio-pharmaceutical manufacturing; however, it is a medium-sized pharmaceutical manufacturer in the industry. The products provided by CC-1 are more than bio-pharmaceuticals nowadays, also covering a collection of chemical drugs, traditional Chinese medicine and synthetic drugs. The main materials required in

manufacturing are biomaterials, APIs, excipients and Chinese herbs. Its suppliers can be divided into two categories – *conventional suppliers (CS)*, traditional order-to-supply partners; and *project suppliers (PS)*, suppliers partly or fully controlled by CC-1, or suppliers invited to participate in certain projects.

The CC-1 group has three subsidiaries that support the business, from sourcing, R&D and production to distribution. The operation of CC-1 strictly follows the guidance of China’s new “Good Manufacturing Practice” (GMP) and “Good Supply Practice” (GSP). The sales force is cultivated; the department of sales and marketing is estimated to be committed to market networking. To further capture the market, CC-1’s products are able to be provided to relevant qualified sales companies (agent companies). The end customers of prescription medicine buyers and OTC medicine buyers can obtain the necessary pharmaceutical products from hospitals, pharmacies and clinics. A brief structure of CC-1’s supply chain is mapped in Figure 4-1.

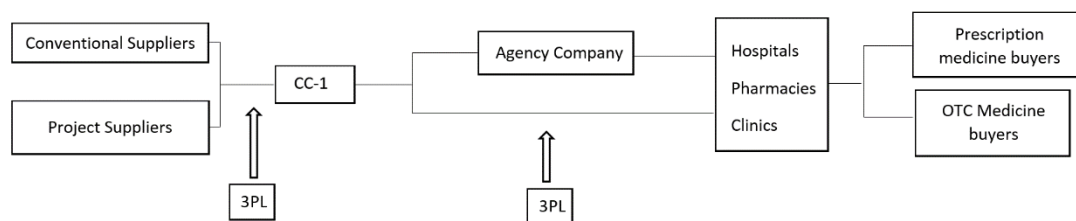


Figure 1-15 CC-1 supply chain

CC-1 values R&D as a top priority and has invested a large amount in building a talent pool, researching new drugs and obtaining pharmaceutical patents. To make sure its products respond to market demand and are able to meet the related requirements proposed by local government and regulatory institutions, a collection of activities including drug discovery, preclinical trails, clinical trials and FDA (Food and Drug Administration) review are undertaken, which require the participation of organizations like universities and scientific research institutions (SRIs), data support from the market and favourable policies launched by the authorities. The R&D network in the pharmaceutical industry can be illustrated as in Figure 4-2.

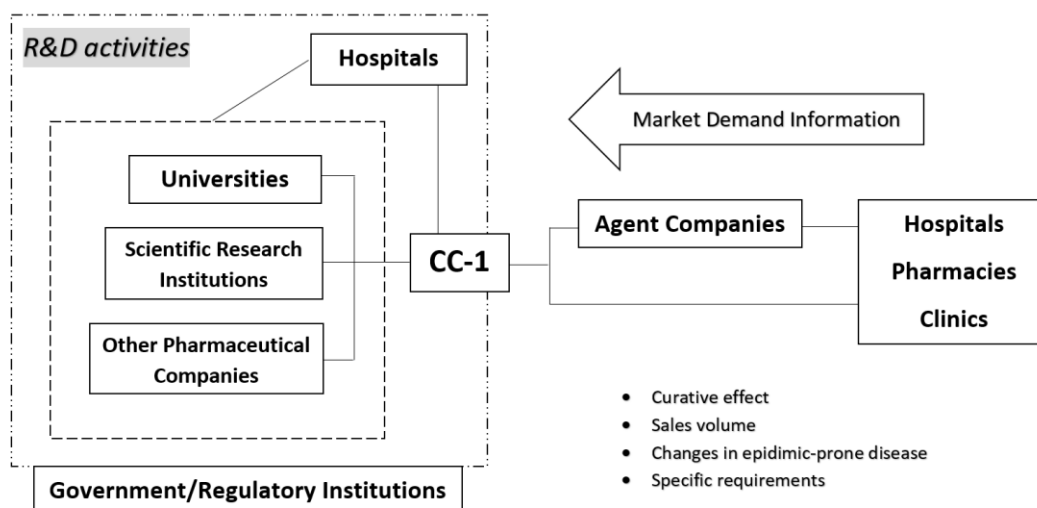


Figure 1-16 CC-1 R&D network

(2) Case Company 2 (CC-2)

CC-2 is a pharmaceutical manufacturer that mainly produces chemical drugs, as well as traditional Chinese medicine and synthetic drugs. Since 2002, CC-2 has facilitated nine production lines and two technical platforms according to the updating requirements of China’s GMP. As a fast-developing enterprise, it has been granted the status of regional “Professional, Elaborate, Specific, and Innovative Small-to-Medium Sized Enterprise” by local government.

CC-2 is a small pharmaceutical manufacturer working on the production of generic drugs and APIs. It sticks to the principle of “market prior”; CC-2 applies most of its investment to obtaining agent authorization of new drugs from peers and building market channels in the early stages, rather than R&D on new drugs under its own brand. Its sales networks cover most of the key cities or regions in China. In 2014, CC-2 was approved to trade on China’s medical B2B platform (an online pharmacy retailing platform).

The CC-2 group consists of five subsidiaries – three pharmaceutical industrial enterprises, one agency company and one retail chain. Two of the industrial enterprises were purchased by CC-2 in recent years; the acquisitions aimed to enhance its capability in R&D and production of bio-pharmaceuticals and modern Chinese herbal medicines.

It mainly relies on its own agency company and the networks that it has built. CC-2 has a professional sales team to push its products into the market, and a logistics centre is operational to handle nationwide distribution. Most of CC-2's products are OTCs that can be sold directly to consumers. The group-owned pharmacies and online trading platform enable it to connect to end customers in a more convenient way.

The details of the supply chain structure can be referred to in Figure 4-3.

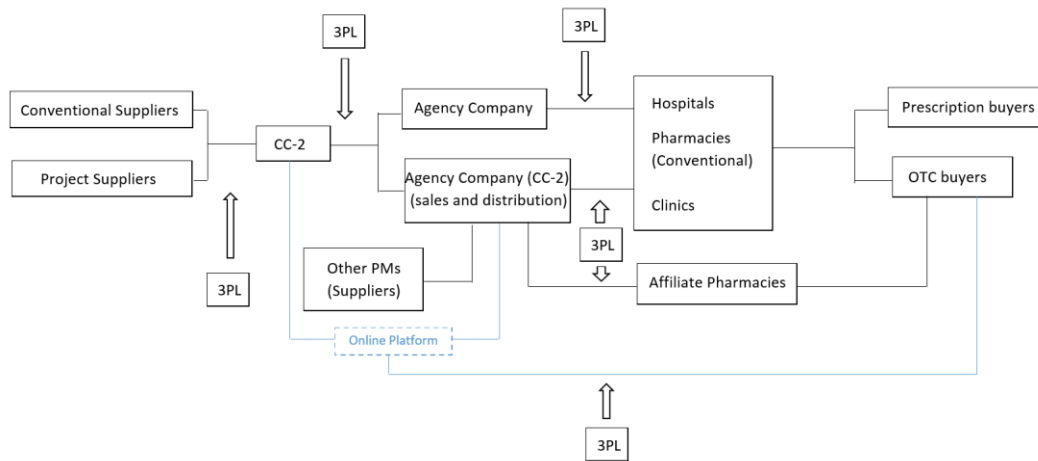


Figure 1-17 CC-2 supply chain

To ensure sustainable development, CC-2 decided to introduce a range of domestic and overseas talent to join its new drug R&D. Experts in the relevant academic areas are invited to participate and supervise production. Like CC-1, CC-2 intends to maintain good relationships with the R&D institutions as well, to ensure that its products can be launched onto the market successfully. All the activities that are relevant are strictly controlled for quality and follow the associated regulations issued by the authorities. Referring to the market demand information, CC-2 is mainly seeking to satisfy customers' common requirements of health and medical care, and to give assistance with therapy for serious diseases to a certain degree (Figure 4-4).

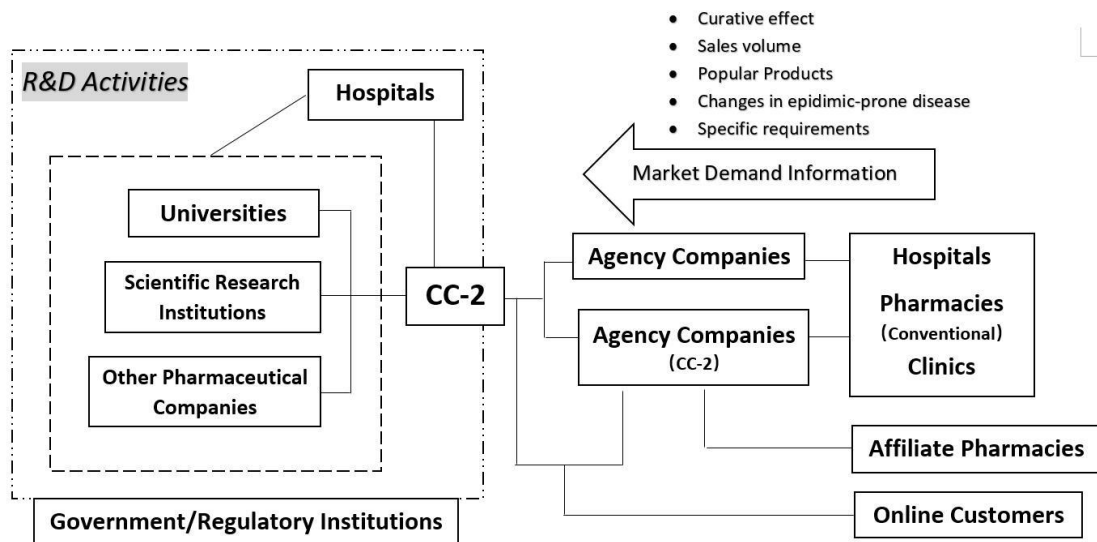


Figure 1-18 CC-2 R&D network

(3) Case Company 3 (CC-3)

CC-3 is a pharmaceutical manufacturing company working on innovative drug R&D and production. It positions itself as a new drug discoverer, innovative drug R&D organizer, key executor in R&D and innovative drug provider. Different from CC-1 and CC-2, CC-3 is a rather small pharmaceutical manufacturer that is still in the early stage of development.

As a pharmaceutical manufacturer, it has two GMP production lines, which enable it to guarantee the supply of several varieties of chemical drugs to the market. However, there is a certain number of pharmaceutical products and production is dependent on outsourcing or technology transfer.

CC-3 does not have its own sales team and it does not have direct contact with any medicine consumer. Referring to Figure 4-5, networks developed by agency companies are the only channels for CC-3 to distribute its products.

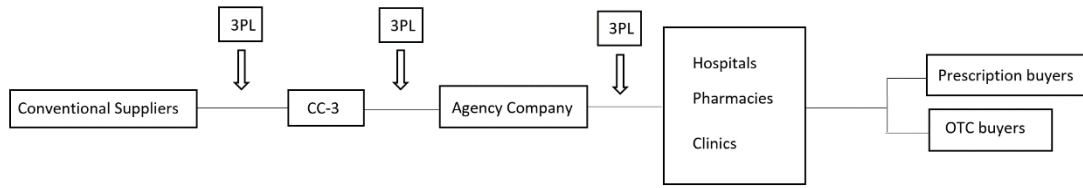


Figure 1-19 CC-3 supply chain

CC-3's operating principles are to seek collaborative innovation and to share mutual benefits. It built a new drug development platform to involve a series of R&D and medical institutions to work jointly on the process of candidate compound selection, process development, preclinical safety evaluation, quality and stability study, clinical trials, application for registration and pilot production. As CC-3 does not connect with the market directly, relevant information about demand and the sales status of certain drugs usually comes from resources such as industrial or academic conferences, government documents and information provided by partners (Figure 4-6).

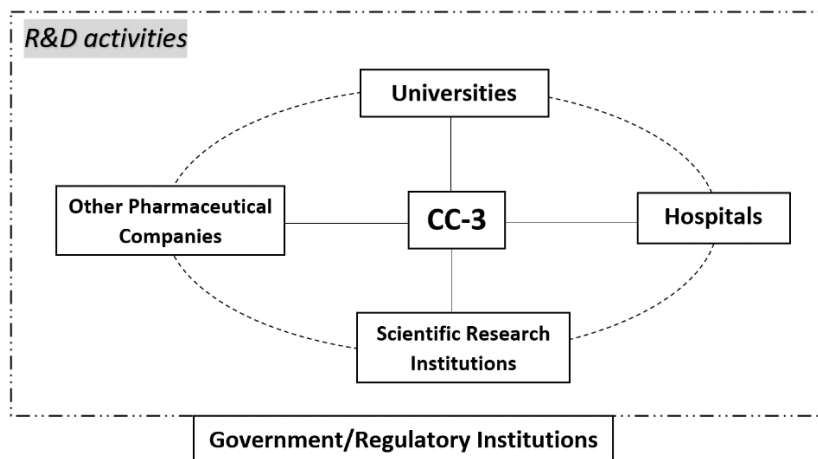


Figure 1-20 CC-3 R&D network

(4) Case Company 4 (CC-4)

CC-4 is a bio-pharmaceutical enterprise with GMP authentication, which is

designated to provide blood plasma products for clinical treatment. Different from other case companies, all CC-4's products have to be produced and stored under a strict temperature control system, and the products cannot be purchased and applied without professional medical assistance. The suppliers of materials required for CC-4's production are appointed suppliers of plasma and conventional suppliers of API and other materials. Its products are usually reserved directly by the relevant medical institutions. It has its own sales team for marketing and third-party agencies are only involved in support. It mainly produces for regional supply, and it has its own logistics for distribution (Figure 4-7).

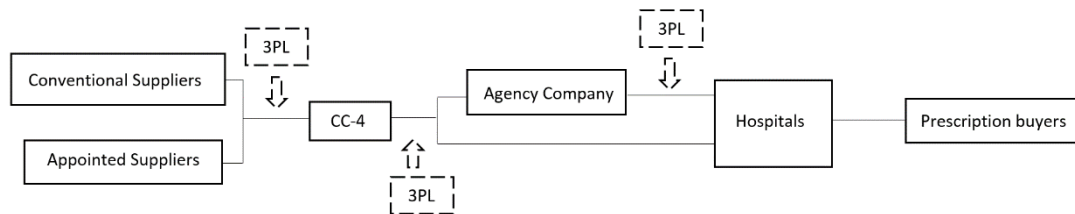


Figure 1-21 CC-4 supply chain

To maintain sustainable development, CC-4 built its own experimental centre and quality inspection centre. 78% of its employees are specialists in pharmacy and clinical medicine science. CC-4 believes that innovation can promote the progress of enterprise; it intends to collaborate with R&D institutions to develop more new products from a long-term perspective (Figure 4-8).

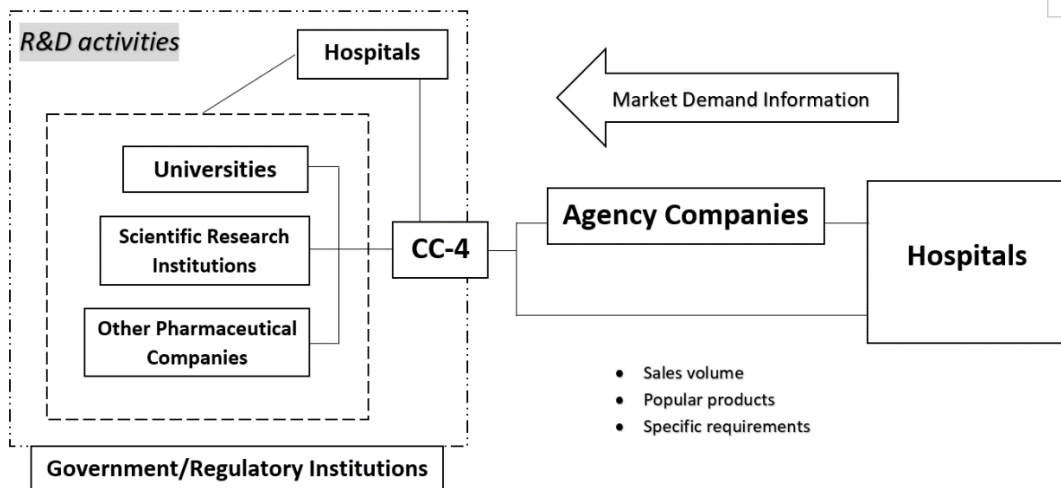


Figure 1-22 CC-4 R&D network

(5) Case Company 5 (CC-5)

CC-5 is a pharmaceutical enterprise that was co-founded with a local college of traditional Chinese medicine in the 1990s. Through a series of restructurings and reforms within the group, CC-5 received GMP authentication for its new production lines in 2014. Its products are Chinese medicine and synthetic drugs, as well as chemical drugs.

All of the pharmaceutical materials required are ordered from CC-5’s conventional suppliers. It has its own sales team; however, it relies on agency companies to do its marketing to a large extent. The third-party logistics are widely involved in every logistical process of CC-5’s business.

The supply chain can be mapped as in Figure 4-9.

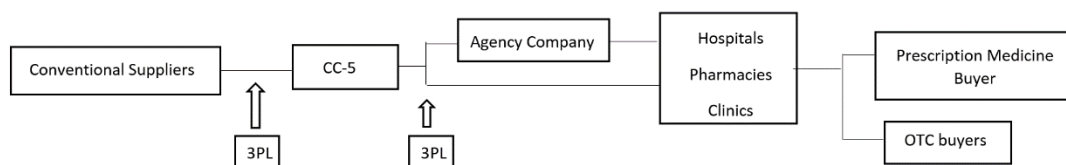


Figure 1-23 CC-5 supply chain

As CC-5 is co-funded by a local medical university, it works closely with many academic institutions. The medical university has an affiliated hospital, which can co-support CC-5's R&D (Figure 4-10).

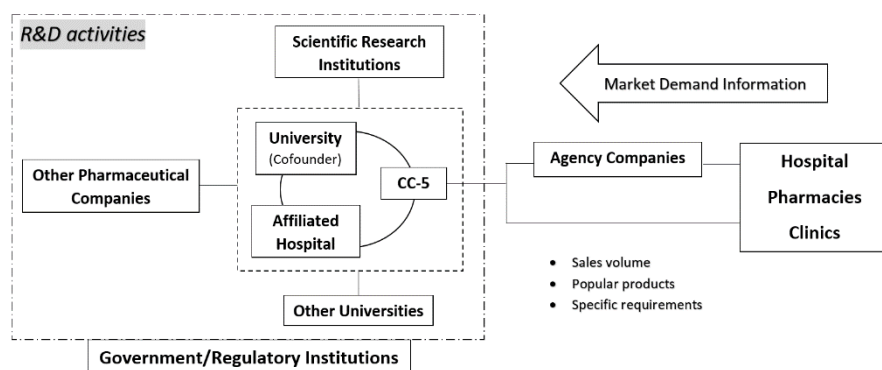


Figure 1-24 CC-5 R&D network

Above all, a general pharmaceutical supply chain of SMEs can be mapped as in Figure 4-11. The basic information on business collaborations in different activities can be summarized as in Table 4-2.

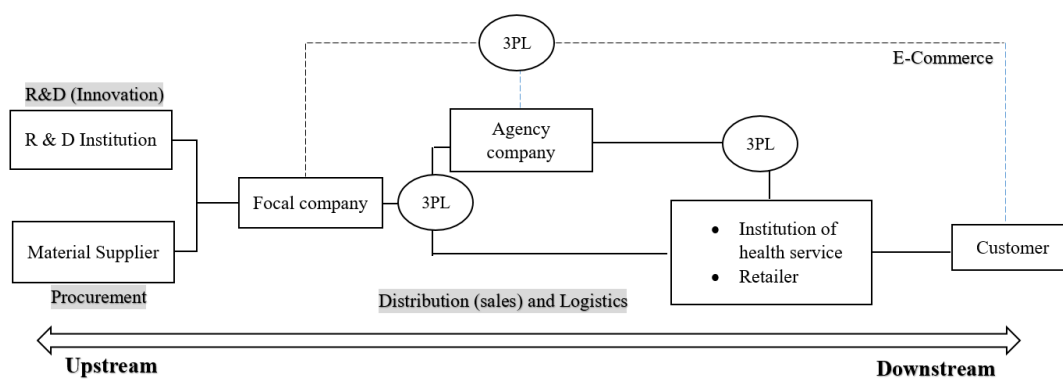


Figure 1-25 Pharmaceutical supply chain mapping (general)

Table 1-14 Case description

Case	Feature of Business Orientation	Relationship (Network) Building in Activities			
		R&D	Procurement	Distribution (Sales)	Logistics
1	R&D oriented	Well developed (continuing investment to make progress)	Stable relationship with locked-in suppliers (usually suppliers are isolated from each other from the perspective of the focal company)	Developing (continuing investment to train professionals; always would like to work with competent partners)	Developing (continuing investment to build logistics centre, and in good relationship with 3PLs)
2	Market oriented	Developing (increasing input of R&D and eager to collaborate with other institutions)	Comparatively stable relationship with locked-in suppliers (no clear evidence to show suppliers tend to work together in providing to the same focal company)	Well developed (completed system of distribution; group of professional sales people; fully owned chain stores; always would like to work with other partners)	Well developed (has its own logistic centre; in good relationship with number of 3PLs)
3	R&D oriented	Well developed (but at a comparatively small scale and a comparatively low level; changing dynamically)	No fixed relationship with suppliers	Fully outsourced (no fixed relationship with any agency company)	Fully outsourced (no fixed relationship with any 3PL)
4	R&D oriented	Well developed (stable relationship with most current partners; no new partners in recent 3 years)	Very stable relationship with project suppliers and stable relationship with locked-in conventional suppliers (no clear evidence to show that suppliers tend to work together in providing to the same focal company)	Mainly dependent on its own sales team (keeping in touch with certain agency companies)	Developed (has its own channel to do transportation; would like to work with 3PLs more in the future, depending on its business development and requirements of customers)
5	R&D oriented	Developing (very stable relationship with current partners; in bottleneck of innovation and seeing opportunities for progress)	Stable relationship with locked-in conventional suppliers (no clear evidence to show suppliers tend to work together in providing to the same focal company)	Bottleneck of development (comparative lack of money to improve its own sales team; no new product to attract more agency companies)	Developed (in good relationship with number of 3PLs)

As illustrated in Table 4-2, collaborations mainly exist in four types of activities from upstream to downstream – R&D (innovation), procurement, distribution (sales) and logistics. With different features of business orientation, the focal companies have different priorities in developing their supply chain system. The R&D-oriented focal companies tend to invest relatively more in their upstream supply chain to make further progress or to maintain the collaborative relationships they have built, and their downstream businesses are more likely to count on third parties. The market-oriented focal company is usually equipped with a comparatively complete system of distribution and logistics, but is somehow weak in R&D.

4.2.2 Common questions in interviews

The interviews generated were semi-structured, and the questions were designed based on the review of relevant literature (Appendix Two). To practise the technique of pattern matching, general questions were asked of interviewees in all cases. Here, this research study would like to highlight some of the questions and answers (Q&As) that are highly relevant to the identification of collaborative patterns. Q1 explores the capability of the focal case company in organizing any collaboration in the supply chain; Q2 is aimed at finding out the motivation of the focal company in building any collaboration; Q3 inspects the attribute of the focal company in collaborative relationships with different partners in various activities; Q4 tries to get to know the impact of collaborations on supply chain performance; Q5 seeks out the stability of collaborations and the reasons for possible changes (emergence or decay of alliance); Q6 looks at the willingness of the focal company to build a complex network, and applies the results to better explain dynamic phenomena in triadic collaborations (Ateş et al., 2015); Q7 examines the attitude of the focal companies to outsourcing and how outsourcing may influence the formation of triadic collaborations.

In Table 4-3, the key points of the Q&As have been listed. In the table, P refers to procurement, S to sales and L to logistics. Further complementary explanations will be provided in the following sections. The key points listed are summarized in reference to the interview protocol designed based on the conceptual research framework.

Table 1-15 Key points in Q&As

Case	Q1: (the role your company is playing)	Q2: (when to collaborate and partner selection criteria)	Q3: (degree of collaboration)	Q4: (benefit of collaboration)	Q5: (challenges in collaboration)	Q6: (willingness to build collaboration)	Q7: (work with third party, 3P)
1	R&D: leader (organizer) P: buyer, partner S: supplier, outsourcer L: outsourcer, service buyer	R&D: qualification, reputation, historical record P: qualification, quality, capability S: reputation, scales, marketability L: reputation, capability, price	R&D: high with key partners P: high with particular locked-in suppliers S: medium with most agency companies L: medium high (normally good)	R&D: sustainability, legitimacy P: stability (sustainability) S: opportunity L: effectiveness, cost-efficiency	R&D: return on investment (ROI) P: availability, flexibility S: stock management L: quality control	R&D: yes P: depends (normally one to one) S: depends (refer to requirement of market development) L: yes	Would like to work with 3Ps in R&D, sales and logistics (especially in logistics)
2	R&D: co-projector, initiator P: buyer, partner S: supplier, buyer, partner L: outsourcer, service buyer, partner	R&D: qualification, reputation P: qualification, quality, capability S: marketability L: flexibility, capability	R&D: high with existing partners P: medium high S: depends L: depends (normally, medium or medium low)	R&D: sustainability, legitimacy P: sustainability S: opportunity, cost efficiency L: effectiveness, flexibility	R&D: dependence on partners P: flexibility S: stock management L: quality control	R&D: yes (but seeks to improve its own capability) P: yes (normally one to one) S: depends L: yes	Would like to work with 3Ps in R&D, sales and logistics (especially in R&D)
3	R&D: outsourcer, co-projector, service	R&D: qualification, willingness to collaborate	R&D: prefers high (medium or medium low in reality)	R&D: sustainability, opportunity, cost-efficiency P: sustainability	R&D: sustainability of collaboration, ROI P: scale of	R&D: yes P: yes (but currently not easy) S: yes (but	Prefers to work with 3Ps in R&D, sales and logistics

	<p>provider P: buyer S: service buyer, outsourcer L: service buyer, outsourcer</p>	<p>P: qualification, quality, capability S: willingness to collaborate L: cost-efficiency, flexibility</p>	<p>P: low S: low L: low</p>	<p>S: opportunity L: would like to get cost efficiency, flexibility</p>	<p>manufacturing (small) S: capability of manufacturing L: low supplying to market</p>	<p>currently not easy) L: yes (but currently not easy)</p>	
4	<p>R&D: leader, strategic partner P: strategic partner, buyer S: provider L: service buyer</p>	<p>R&D: qualification, reputation, historical record P: qualification, willingness to collaborate, capability S: reputation, capability L: quality of service, effectiveness, flexibility</p>	<p>R&D: high with particular partners P: very high with project partner S: depends L: medium</p>	<p>R&D: sustainability, legitimacy P: stability, sustainability, effectiveness, flexibility S: opportunity L: flexibility</p>	<p>R&D: sustainability (ownership of intellectual property) P: availability of materials S: not able to guarantee stable supply L: balance of cost and quality control</p>	<p>R&D: yes P: yes S: depends (when it has surplus inventory, yes) L: not really</p>	<p>Would like to work with 3Ps in R&D, sales and logistics (no particular preference)</p>
5	<p>R&D: partner, co-projector P: partner, buyer S: provider, partner L: outsourcer, service buyer</p>	<p>R&D: qualification, capability P: qualification, quality, capability S: willingness to collaborate L: cost-efficiency, flexibility</p>	<p>R&D: high with key partners P: high with particular suppliers S: normally high L: medium high</p>	<p>R&D: sustainability, legitimacy, cost-efficiency, effectiveness P: sustainability, flexibility S: opportunity, cost-efficiency, legitimacy L: cost-efficiency,</p>	<p>R&D: work efficiency, high failure rate P: stable supply of Chinese herbal materials S: bottleneck L: quality control</p>	<p>R&D: yes P: yes S: yes L: yes (but not at high level)</p>	<p>Prefers to work with 3Ps in R&D, sales and logistics</p>

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(1) CC-1

Q1: How do you identify the role your company is playing in the supply chain?

CC-1 wants to be a leader of the bio-pharmaceutical industry in the future, and it is working hard to play a role as a leader in that it owns a supply chain. CC-1 invests much in its R&D, and there are more than 10 projects launched every year. It is the lead organization in those projects and invited a series of relevant R&D institutions (mainly universities and scientific research institutions) to join it in different phases, from project proposal to clinical trials. In recent years, it has purchased several companies and plans to invest in more pharmaceutical companies in its upstream supply chain that are supplying to it. The ambition to take control of its main resources slightly reduced its investment in R&D. Moreover, to enhance its markets, it is building a distribution centre. Half of its total number of employees are sales personnel; besides the collaboration with pharmaceutical agency companies, it has started to recruit and train its own sales force.

Q2: When you decide to collaborate with other parties, are there any criteria for partner selection?

To CC-1, collaborations with other parties are said to be on a regular basis. In R&D, it set up several long-term projects with universities; continuing investment has been made in the study of antibiotics. In procurement, all selected suppliers are sort of locked in and the company tends to work with most of them in a long-term relationship; however, this does not mean that it is not able to make a change. In the process of distribution, CC-1 works with many pharmaceutical agencies, and it is learning from its partners to build its own sales force to make it more professional.

“Let the professional people to do the professional things.” (General manager, CC-1)

To focus on its pharmaceutical business, CC-1 tends to outsource the function of delivery to 3PLs.

When talking about criteria, the general manager of CC-1 pointed out that reliability

is one of the most important factors it will refer to. Moreover, reliability can be reflected in the following aspects: good reputation/records, certain qualifications and willingness to collaborate.

Q3: To what degree do you intend to maintain your relationship with certain partners?

In R&D collaborations, CC-1 intends to maintain a sustainable relationship with most of the educational institutions. It believes that comparatively more researchers are able to work in particular areas that may bring about more opportunities; regular communications can further enhance its relationships and allow it to preserve talent for its future development. Good relationships built with other institutions are mostly initiated by particular projects; CC-1 will only have to share information and resources related to these projects. The materials required by pharmaceutical companies are various, and could be raw materials or base materials like chemicals, sugar and starch for general pharmaceuticals; they could be a nutrient solution and bioplast for biopharmaceuticals; and also they could be herbs for Chinese patent or Chinese herbal pharmaceuticals. These materials could be for BPC/API (bulk pharmaceutical chemical/active pharmaceutical ingredient) production, applied with pharmaceutical auxiliaries and related processing techniques, and to enable the final pharmaceutical products to be completed.

CC-1 intends to fully or partly control the pharmaceutical suppliers of its main products. Downstream of the supply chain, CC-1 would like to share certain sales information with close partners (agency companies) and offer them training regularly; but to other agency companies it will only provide essential assistance in business when required. The relationship with 3PL is “*normally good*” (General manager, CC-1), and it will not promise any 3PL something; but if there is no significant failure in delivery, CC-1 will keep its relationships with certain parties.

Q4: What benefit do you expect from business collaborations?

CC-1 presented the viewpoint that collaboration is a good way for it to improve its efficiency in both R&D and operations. In R&D, collaborations with universities and science research institutions in intensive research enable it to respond effectively to

changes in diseases in a comparatively short time. In procurement, a close relationship with certain suppliers gives CC-1 more flexibility in payment and supply. In distribution (marketing), some agency companies in a collaborative relationship would like to help right from the very beginning at a new product's launch, which on the one hand will save CC-1 more money in marketing, and on the other hand enable it to leverage its resources for other important business. Usually, the company does not deliver by itself, only when this is required, or for those orders that are small scale and when the customers are not far away from its factory. 3PLs are regarded as vital partners in the supply chain to ensure efficiency of delivery.

Q5: What challenges have you met in your business collaborations?

In R&D, the challenges mainly come from issues related to the ownership of intellectual property; it is said that the company has to negotiate before the launch of any collaborative project and to make clear the power and responsibilities involved. What is more relevant in R&D is that some of the projects are for the long term (especially projects with universities) without specific goals or time limits, and sometimes it could take a long time for any achievements to be made; this is not efficient in R&D, but contributes to maintaining the relationship and preserving its talent.

In procurement, the biggest challenge is how to make certain collaborative relationships sustainable. CC-1 in a way worries about the stability of supply due to competition in the markets; the development of a generic drug is very fast in the pharmaceutical industry, with market expansion, and there is a need to make sure that significant BPC/APIs are always available for production. It believes that the safest way is to fully control relevant suppliers or at least be able to strive for the priorities for its business; however, this will challenge its budget and that is why its investment in R&D has not been able to be increased in recent years.

In distribution and logistics, the challenges come from quality control in service delivery. CC-1 states that some agency companies are not very capable in marketing, especially in new drug promotion and market expansion; referring to its financial report, the level of inventory is quite high in some of its products and there is a risk of stockpiling. In collaboration with 3PLs, a comparatively higher cost is the biggest

challenge for CC-1. However, it said that it will not risk its business by outsourcing deliveries to cheap 3PLs, as any failure in delivery could increase the risk of product quality damage, which may have a further negative impact on consumer safety and corporate reputation.

Q6: Do you intend to build collaborative relationships with any particular party or more than one in a certain project/programme/activity...?

To CC-1, in R&D projects there is usually more than one party involved; however, the level of collaboration with various parties in the same projects could be different. Collaborative projects are mostly launched by two parties (including CC-1), and a third party or more could be invited to assist when required, but normally they will only be asked for technology support. In procurement, usually CC-1 is in a one-on-one collaborative mode; only when there are requirements for co-production with one of CC-1's subsidiaries can a triadic mode be established. Downstream of the supply chain, both agency company and 3PL are involved as third parties, which can help in product distribution and delivery; to enhance marketing performance, it is common to see collaborations in triads.

Q7: In what aspects/activities/processes do you prefer to collaborate with a third party?

Although there are challenges in CC-1 collaborating with third parties in any of the activities of the supply chain, it still has to collaborate with them.

“It is a trend to do collaborations in pharmaceutical industry... the required inputs are too much if we do it alone.” (General manager, CC-1)

CC-1 states that when a certain business is able to be controlled or it could bring about significant opportunities, it will always welcome collaborations in any phase of its business.

(2) CC-2

Q1: How do you identify the role your company is playing in the supply chain?

CC-2 identified itself as a leading pharmaceutical company with a complete sales system. Compared to other pharmaceutical companies that have begun with a biopharmaceutical R&D business, CC-2 focuses on developing its distribution system rather than its R&D. Of its 505 employees, its R&D personnel are only about 9.24%, while the sales force is about 53.66%. In most of its joint innovation (R&D) projects, CC-2 can be the initiator, but usually needs help from other parties.

In procurement activities, CC-2 tends to keep a good relationship with most of its suppliers. Its main products are chemical drugs, which require relevant chemical pharmaceutical materials, but only when it is not difficult to find qualified substitutes. Although it will not easily change suppliers, it has the initiative in making decisions about its relationship building.

In its activities of distribution and logistics, CC-2 is in a leading position in the research region of this study, which is of benefit for its existing distribution network. Although it has to count on 3PLs for delivery, due to the frequency of its trading, most 3PLs tend to work with the company and provide it with considerable discounts. Downstream of the supply chain, CC-2 is not only the product supplier, but has also been regarded as a strategic partner by many other parties.

Q2: When you decide to collaborate with other parties, are there any criteria in partner selection?

Innovation is significant to a pharmaceutical company's sustainability, and CC-2 has realized that it should pay more attention to enhancing its R&D capability. However, since its R&D is not at a very high level currently, it has to collaborate with other parties. Downstream, it can count on its own distribution system and its own sales force to enhance the local market; the decision to collaborate is not difficult to make if it can see other possible opportunities to expand the market further.

The criteria for partner selection are on a "trust basis" (General manager, CC-2). It has been pointed out that product/service quality, flexibility and capability are the main factors it will refer to when it decides to upgrade or withdraw from certain relationships.

Q3: To what degree do you intend to maintain your relationship with certain partners?

In the upstream supply chain, CC-2 pays attention to keeping a comparatively good relationship with R&D partners. Certain marketing data and relevant feedback on particular pharmaceutical products will be shared with some of CC-2's R&D partners, even though there is no joint project currently. In procurement activities, collaborative relationships are based on signed contracts, which means that there is not much flexibility in its business trading; the relationship is generally stable without emergencies. In distribution activities, in the local market CC-2 counts on its own staff, but in other regional markets it tends to keep a good relationship with local agency companies. It may send its people to its partners to assist in their work, and in certain sales projects a high-level collaboration can be built. In collaborations with 3PLs, CC-2 is actively associated with many 3PLs at different levels; it is said that there is no preference for any 3PL, and the basic requirement is to ensure that particular products can be delivered.

Q4: What benefit do you expect from business collaborations?

To CC-2, most collaborations that have occurred are in the upstream supply chain in the current stage of its business. The main benefits it expects to have from such collaborations are the improvement of R&D capability, and thus enhancing its business sustainability and cost saving in R&D projects.

“Our distribution centre was supported by 8 3PLs, and we learnt from them. Now we are able to better collaborate with any other 3PL regarding to our needs.” (Distribution manager, CC-2)

In the downstream supply chain, collaborations with a third party are to get opportunities in market expansion and to improve its operational efficiency in distribution and delivery.

Q5: What challenges have you met in your business collaboration?

CC-2 states that the biggest challenges of collaborations in the upstream supply chain are the high dependence on certain R&D institutions; it is difficult for it to attract enough qualified talent to stay, even though it has paid a certain amount of money for relevant joint R&D projects. In the downstream supply chain, collaboration with an agency company in a way increases the risks of stock management; compared to when the focus is on the local market and it relies on its own sales team, business expansion based on collaborations brings more uncertainties of demand in the markets. Moreover, the collaborations with various 3PLs challenge its performance control system; however, if it standardizes the 3PLs at a comparatively high level, this will challenge its budgets and may have a further impact on relevant R&D activities.

Q6: Do you intend to build collaborative relationship with any particular party or more than one in a certain project/programme/activity...?

In R&D activities, there are usually more than two parties in a project. In generic drug R&D, CC-2 may only invite a couple of relevant institutions for formula reviews and related pharmaceutical trials. In new drug R&D, CC-2 tends to collaborate with one of its R&D partners with a comparatively strong capability and certain qualifications, and then it may invite more parties to assist in its work. In the downstream supply chain, collaborations from a triadic view are common.

Q7: In what aspects/activities/processes do you prefer to collaborate with a third party?

CC-2 faces many challenges in collaborations, and in its opinion it is not about what it “prefers”; the general manager pointed it out that collaboration is an inevitable part of its development. In R&D, it has to work with third parties due to its own weak R&D capability. It has to collaborate with agency companies in other regions to expand its markets, as it would like to further increase sales to gain more profits, which can be reinvested in its R&D. To work with 3PLs gives flexibility to its business in cost management, and resources can be leveraged to concentrate on the core businesses in the group.

(3) CC-3

Q1: How do you identify the role your company is playing in the supply chain?

CC-3 is a rather small pharmaceutical company that is still in the early stage of development. Most of the staff in the company are in an R&D group. In pharmaceutical innovation, it is striving to be a leader in the new generation. However, due to limited capital, it is usually in a comparatively passive position. In procurement, it is only one of the buyers for its suppliers, due to the fact that the scale of its production is not large and demand is very not stable. In distribution and logistics, CC-3 depends on agency companies and 3PLs to an incredibly large degree ($\approx 100\%$).

Q2: When you decide to collaborate with other parties, are there any criteria in partner selection?

To survive, CC-3 has to collaborate with other parties throughout the supply chain. That is why it set up an online platform to better communicate with third parties, especially R&D institutions.

Being trustworthy is the basic rule of CC-3, and there are no more specific criteria in partner selection; it tends to pool all available resources and then review the available information for further study. Any parties that are able to provide useful information/resources/services and are willing to collaborate could be welcomed by CC-3.

Q3: To what degree do you intend to maintain your relationship with certain partners?

CC-3 would always like to maintain a sustainable relationship with its partners and to develop a relationship with potential partners. In R&D, CC-3 does like to maintain a collaborative relationship to a high degree; however, due to the fact that it does not have enough money to invest in “*guanxi*”, its relationship with certain R&D partners is at a low level (not sustainable, not very flexible in payment terms, limited sharing of valuable resources). Downstream of the supply chain, CC-3 does not pay much attention to maintaining its relationship with agency companies or 3PLs.

Q4: What benefit do you expect from business collaborations?

CC-3 would like to benefit from its current collaborations in R&D to enhance its capability in innovation and to get more opportunities to access new areas and technologies. The collaboration with third parties downstream is only to ensure the efficiency of operations and leverage its resources (capital) to concentrate on R&D.

Q5: What challenges have you met in your business collaboration?

In the upstream supply chain, the biggest challenges for CC-3 in collaboration are how to maintain a sustainable relationship with existing partners and to increase its cost efficiency in R&D. Innovations require continuing investment, and CC-3 can only meet the requirements by providing service support (pharmaceutical tests) to other pharmaceutical companies; such collaboration is not stable. In the downstream supply chain, business collaborations are at a low level, which is due to the small scale of CC-3's production.

Q6: Do you intend to build collaborative relationships with any particular party or more than one in a certain project/programme/activity...?

CC-3 usually has to collaborate with more than one party in R&D projects. In the downstream supply chain, although third parties like an agency company and 3PL have been involved, due to the fact that CC-3 does not directly have contact with end customers, the collaborative relationships are mostly of a dyadic construction.

Q7: In what aspects/activities/processes do you prefer to collaborate with a third party?

At the current stage of CC-3's business, it has to collaborate with third parties throughout the supply chain.

(4) CC-4

Q1: How do you identify the role your company is playing in the supply chain?

CC-4 is a bio-pharmaceutical company that is designated to provide blood plasma products for clinical treatment. It has a professional R&D department that maintains a sustainable collaborative relationship with a number of local universities; in R&D activities CC-4 plays the role of strategic partner, which contributes to talent training and technology support. In procurement it collaborates with a series of suppliers; long-term contracts for directional supply have been made. Downstream of the supply chain, most of the time CC-4 can complete its distribution and logistics activities by itself. However, it does not refuse agency companies that are interested in its products when they are capable of supplying.

“We do not worry about marketing... the demand always exceeds supply...”
(Marketing manager, CC-4)

CC-4's products are very popular in the local market, and it is treated as one of the most important suppliers of albumin.

Q2: When you decide to collaborate with other parties, are there any criteria in partner selection?

CC-4 believes that collaboration is important in R&D, not only because more opportunities can be provided by relevant partners, which may allow the focal company to get to know the latest developments in a particular area, but also because it can enable the focal company to attract more talent to enhance its sustainability. CC-4 has no objection to working with third parties in other activities within the supply chain; however, it proposed that the potential partner should have a very good business record and be able to show its capability with certain qualifications. To enhance its cost efficiency in R&D and operations, CC-4 tends to collaborate with companies with a relatively complete R&D system or distribution channel. It does not quite trust local 3PLs, and it prefers to do deliveries by itself. The 3PLs that have been chosen are of good reputation and very professional, and are equipped with facilities of temperature/humidity control; the high quality of service provision is vital in CC-4's partner selection.

Q3: To what degree do you intend to maintain your relationship with certain partners?

CC-4 intends to maintain collaborative relationships with most of its R&D partners at a comparatively high level. With some of its key partners, it prefers to communicate with them regularly; a series of long-term projects launched by the partners are co-funded by CC-4. Due to the fact that most of its partners downstream are also carefully chosen, its collaborative relationships are at a high level and relevant production information can be shared with the partners; for the key partners, priority will be given to them by CC-4, and the partners in distribution and logistics will participate in the launch of new products.

Q4: What benefit do you expect from business collaborations?

In the upstream supply chain, the benefits that can be achieved are opportunity and the sustainability of its business. In the downstream supply chain, its market position can be further enhanced with the help of qualified partners. There is no big improvement in operational efficiency and cost reduction; however, the higher payments for relevant services bring more flexibility to CC-4's business.

Q5: What challenges have you met in your business collaboration?

The biggest challenge of CC-4 in collaboration is associated with the ownership of intellectual property. It invests a great deal in a number of long-term projects; however, in some projects, as it is not the only co-founder, it may not be able to get ownership, which will limit its further application of certain patents.

Q6: Do you intend to build collaborative relationships with any particular party or more than one in a certain project/programme/activity...?

It is common for CC-4 to collaborate with more than one party. Most of the time it would like to join a programme when it is in “*the first group*” (R&D manager, CC-4; “the first group” refers to the leading group, where partners in that group are able to pool relevant resources at a maximum level, and the focal company is able to get ownership of the intellectual property).

Q7: In what aspects/activities/processes do you prefer to collaborate with a third party?

Currently CC-4 is only enthusiastic about collaborating with third parties in R&D processes. Since it is able to handle delivery by itself and it is in a way not too worried about the market, it does not care much about collaborations downstream.

(5) CC-5

Q1: How do you identify the role your company is playing in the supply chain?

CC-5 is co-funded by a local university and has experienced a series of capital restructurings; as a pharmaceutical company that mainly produces and sells traditional Chinese medicine and synthetic drugs, CC-5 has certain advantages in holding a number of patents (52), which have been difficult for competitors to achieve in recent years. University B is the most important partner of CC-5 in collaboration. CC-5 does not have too many professional R&D staff members in its group for innovation, and in most of its R&D projects it is in a way playing the role of assistant to University B to execute the policy of “*from university to industry*” (General manager, CC-5).

In procurement, due to the fact that CC-5 is not a large pharmaceutical company with high demand in the market, it is not able to afford a planting base of Chinese herbal medicine; it has to purchase certain Chinese herbal pharmaceutical materials from relevant suppliers and when the suppliers have been locked in, it is not easy for CC-5 to change to others. Therefore, it tends to collaborate with most of its suppliers in a long-term relationship. CC-5 has several very popular products in China’s markets, which lay a relatively good foundation for its marketing. Downstream of the supply chain, as the supplier of those popular pharmaceutical products it is able to bargain with the agency companies; however, it has to concede to make agreements for bundle sales (to promote other varieties of products).

Q2: When you decide to collaborate with other parties, are there any criteria in partner selection?

When there are parties in R&D, procurement or distribution and logistics that show great interest in CC-5's products and would like to have further talks, it will be very glad to negotiate. Due to the limits of CC-5's capability in R&D, any collaboration that may allow it to make progress is welcomed. In the downstream supply chain, CC-5 is open-minded about collaborating with partners that have the required qualifications in sales and delivery.

Q3: To what degree do you intend to maintain your relationship with certain partners?

With University B, CC-5 intends to maintain a very good relationship (at a very high level of collaboration). CC-5 is in a regular business relationship with other R&D institutions. With its suppliers, it is in a way quite dependent on them; high-level collaborations are said to have been built with them. Most of CC-5's deliveries count on 3PLs; however, due to the fact that all of its products are well packaged with a stable morphology, it does not rely on specific 3PLs, and it is easy for it to switch to 3PLs at different service levels.

Q4: What benefit do you expect from business collaborations?

In R&D, the benefits that CC-5 expects are sustainability and opportunity in business, although currently it is in a way safe in marketing due to the slow development in Chinese herbal medicine and synthetic drugs. In procurement, CC-5 expects to ensure stability of supply and thus further enhance the sustainability of its business. In distribution and delivery, collaborations with third parties are expected to bring about benefits like cost reduction in operations.

"It is too expensive for us to do marketing only by ourselves. If the agency company could share the risks for us, why not work with them?" (General manager, CC-5)

Cost efficiency is the main benefit that CC-5 expects downstream.

Q5: What challenges have you met in your business collaboration?

The biggest challenge for CC-5 in collaboration is about work efficiency in R&D activities. It is said that when referring to the new GMP and GSP, it is difficult for Chinese herbal medicine and synthetic drugs to be approved by the relevant regulatory institutions. The leader of the pharmacy department of University B said that “*compared to the chemical/bio-pharmaceutical R&D project, it is difficult to get funding from the government*” and, due to this fact, “*it is not easy to identify and quantify certain compositions of Chinese herbal medicine... innovations in this area are difficult to get approved from a scientific perspective...*” To a pharmaceutical company, any project that cannot generate profit but is always in development is dangerous to its business. However, CC-5 does not have any better solutions to that right now.

Q6: Do you intend to build collaborative relationships with any particular party or more than one in a certain project/programme/activity...?

CC-5 does not mind working with one or more parties in its business if doing so will bring about more benefits. Currently upstream it does not have many collaborations, but in previous years, when there were valid projects, CC-5, University B and University B’s affiliated hospital were the fixed triadic group in R&D.

Q7: In what aspects/activities/processes do you prefer to collaborate with a third party?

CC-5 does not mind working with third parties in any of its supply chain activities; however, currently this is only downstream of the supply chain. It is able to establish certain collaborative relationships with third parties like agency companies and 3PLs.

4.2.3 Highlights of surveys (for case companies)

To build an explanation, the confirmatory surveys were designed and sent to the companies that were interviewed and relevant organizations were introduced to

examine the evidence and continuing data collection. The key points associated with the focal companies that directly contribute to collaborative pattern identification have been allocated in Table 4-4. The survey only required the interviewees to respond from a general perspective. Moreover, the results will only be applied as a reference for further analysis in the following chapters.

Table 1-16 Highlights of survey sent to case companies

	<u>CC-1</u>	<u>CC-2</u>	<u>CC-3</u>	<u>CC-4</u>	<u>CC-5</u>
1. The significance of collaborating with other parties from your company's perspective	Very important	Important	Very important	Very important	Very important
2. The criteria for choosing a business partner from your company's perspective					
(1) Business reputation (including product quality and service quality)	Important	Very important	Very important	Very important	Important
(2) Effectiveness (production/logistics)	Important	Important	Very important	Very important	Very important
(3) Business performance	Important	Does not matter	Important	Important	So-so
(4) Business scale	Important	Does not matter	So-so	Important	Important
(5) Business history (ever worked together)	Important	Important	Very important	Does not matter	Very important
(6) Willingness to collaborate	Very important	Very important	Very important	Important	Very important
3. In regular business relationships, what do you think about the following aspects?					
(1) Trust	Important	Very important	Very important	Very important	Important
(2) Share	Very important	Not important	Important	Important	So-so
(3) Plan	Very important	Not very important	Important	Important	So-so
4. In business projects (joint working projects), what do you think about the following aspects?					
(1) Trust	Important	Very important	Very important	Very important	Very important
(2) Share	Very important	Does not matter	Important	Very important	Important
(3) Plan	Very important	Important	Important	Very important	Very important
5. What criteria might you consider when deciding to upgrade your business relationships?					

(1) Productivity	Very important	Very important	So-so	Very important	Very important
(2) Flexibility	Important	Does not matter	So-so	Important	Very important
(3) Control	Important	Does not matter	Very important	Important	So-so
(4) Reliability	Important	Very important	Very important	Very important	Very important
(5) Lead time	Important	Very important	Important	Important	Important
<i>Please select the option that best fits your description of your business relationships from the perspective of "trust", "commitment", "power" and "dependence"</i>					
Bargaining power to ...					
(1) University	Medium	Medium	Medium low	Medium	Low
(2) Scientific research institution	Medium high	Medium	Medium	Medium	Medium
(3) Hospital (in R&D)	Low	Low	Low	Low	Low
(4) Conventional supplier	High	High	Low	Medium	Low
(5) Project supplier/appointed supplier	High	High	Low	Medium	Low
(6) Agency company	High	Medium	Medium	High	Low
(7) Hospital	High	Low	–	High	–
(8) Pharmacy	High	Very low	–	High	–
(9) Clinic	High	–	–	High	–
(10) Competitor (other pharmaceutical company)	High	Medium	Medium	High	Medium
(11) International competitor	High	High	–	–	–
(12) 3PL	Medium	Very high	Medium	Medium	Medium
Trust in ...					
(1) University	High	High	Medium high	High	High
(2) Scientific research institution	High	High	Medium high	High	High

(3) Hospital (in R&D)	High	High	High	High	High
(4) Conventional supplier	High	Medium	Medium	Medium	Medium
(5) Project supplier/appointed supplier	High	Medium	High	Medium	Medium
(6) Agency company	High	High	High	Low	Medium
(7) Hospital	High	Low	–	Medium	–
(8) Pharmacy	Medium	Medium	–	Low	–
(9) Clinic	Medium	–	–	Low	–
(10) Competitor (other pharmaceutical company)	High	Medium	Medium	Medium	Medium
(11) International competitor	Medium	Medium	–	–	–
(12) 3PL	High	High	Medium	Low	Medium
Commitment to ...					
(1) University	Medium	Medium	Medium	Medium	Medium
(2) Scientific research institution	Medium	Medium	Medium	Medium	Medium
(3) Hospital (in R&D)	Medium high	Medium	Medium high	Medium	Medium high
(4) Conventional supplier	Medium	Medium	Medium	Medium	Medium
(5) Project supplier/appointed supplier	High	Medium	Medium	Medium	Medium
(6) Agency company	Medium	Low	Medium	Low	Medium
(7) Hospital	High	High	–	High	–
(8) Pharmacy	Medium	High	–	Low	–
(9) Clinic	Medium	–	–	Low	–
(10) Competitor (other pharmaceutical company)	High	Medium	Medium	–	–
(11) International competitor	Medium	Medium	–	–	–
(12) 3PL	Medium	Low	Low	Low	Low
Dependence on ...					
(1) University	Medium	Medium high	Medium	Medium high	High
(2) Scientific research institution	Medium	Medium	Medium	Medium	Medium high

		high	low	high	
(3) Hospital (in R&D)	High	High	Medium high	High	Medium high
(4) Conventional supplier	Medium	Medium	Medium	Low	Medium
(5) Project supplier/appointed supplier	Medium	Low	Medium	Medium	Medium
(6) Agency company	Medium	High	Medium	Medium	Medium
(7) Hospital	High	High	–	Medium	–
(8) Pharmacy	High	High	–	Low	–
(9) Clinic	Low	–	–	Low	–
(10) Competitor (other pharmaceutical company)	Medium	Medium	Medium	Medium	Medium
(11) International competitor	Medium	Medium	–	–	–
(12) 3PL	High	Low	Medium	Medium	Medium
6. Does your company consider international business?	Yes, if there are proper opportunities	Yes, very welcome	Yes, very welcome	Yes, if there are proper opportunities	Yes, if there are proper opportunities
7. If your company is to launch an international business, which is the most likely area to develop?	Sales (market expansion)	R&D + sales	R&D	Sales	Supply (BPC, API)

4.3 Illustration of Research Results – Collaborations in Triadic Construction

The literature review has indicated that one of the key elements of the lowest level of collaboration is a direct business connection; and the conceptual framework that has been proposed has argued that only when there are direct business connections between one or another of the participants in a triad can it be a triadic collaboration at all. A primary reason for the formation of any collaboration could be to achieve value that cannot be achieved individually (Touboulic and Walker, 2015). Based on the data collected, the results have indicated that an existing dyadic collaborative relationship could be a foundation of the building of a triadic collaboration; it could be a new strategy for the focal case company in responding to market changes (Jeng, 2015).

In this section, the results will be summarized in two groups from the perspectives of the upstream and downstream supply chain.

4.3.1 Collaboration in the upstream supply chain

(1) R&D segment

The data collected reveals that there are several main participants in R&D activities in the pharmaceutical supply chain, which are outlined in Table 4-5.

Table 1-17 Participants of R&D activities

Supplier <i>(Service/technology provider)</i>	Buyer
Universities	Focal company:
Scientific research institutions	CC-1
Other pharmaceutical companies	CC-2
Hospital	CC-3
Supplier <i>(Funding provider/policy supporter)</i>	CC-4
Authority	CC-5

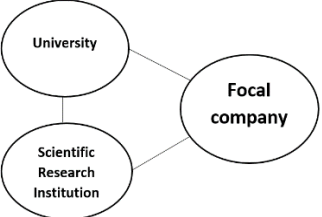
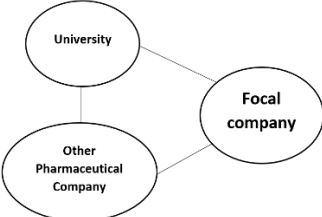
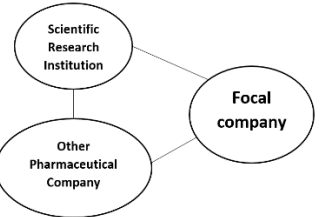
R&D collaboration in a way plays the role of the life-blood in innovation, which can benefit firms in building up specific competencies (Beck et al., 2016). The involvement in R&D activities of more parties, including universities, research institutions and other enterprises, facilitates the building of networks to gain access to various sources of knowledge (Guan et al., 2016). In the network, the focal company can be the integrator (Kamuriwo and Baden-Fuller, 2016) in dividing up and allocating certain innovation tasks among the in-house team and external network partners.

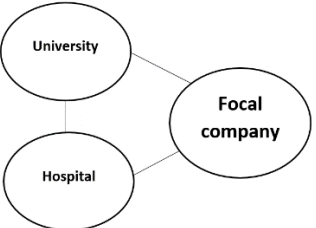
The direct business connection between a focal company and possible collaboration participants usually starts from the development of outsourcing to a similar external partner (Kamuriwo and Baden-Fuller, 2016); and in the early stage of development, a social process of communication to lay the foundation of further knowledge transfer or exchange is preferred.

Universities and SRIs are regarded as the preferential choice in building R&D collaboration to generate learning opportunities for both academia and industry, and know-how about technological problems and changes in market trends (Berbegal-Mirabent et al., 2015). This also has been encouraged by government policy (Guo et al., 2016) with relevant funding and support. The hospital as the base of clinical trials brings much professional talent together; collaboration with hospitals is crucial in pharmaceutical R&D and market launches.

In interviews, most of the case companies stated that they do not really mind working with more than one party in a project. Usually in an R&D project there are more than two organizations for formula design, pharmaceutical tests and clinical trials; each of them plays a part in its own functions to progress the project together. The network building is usually upgraded from dyads, and it is common to see in practice the involvement of a third party in an existing dyadic alliance. Theoretically, the focal company (case company) is able to establish a dyadic relationship with any of the potential partners. When referring to the supply chain mapping of case companies and the feedback from the interviewees, four types of triadic collaboration can be confirmed, as shown in Table 4-6.

Table 1-18 Collaborative triadic modes in R&D segment

Triadic Modes	Description
<p>(1)</p> 	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>All case companies intend to maintain a good relationship with universities and SRIs. Regional social communications among the triad's participants are regularly arranged informally.</p> <p>All case companies made it clear that universities and SRIs are significant participants in their R&D activities. Particular assistance in pharmaceutical analysis can be provided by them with professional facilities; both university and SRI are treated as the think tank and as a sustainable reserve of talent. When involved in the same project, there are possibilities for representatives from both of the institutions and R&D staff in the focal company to get together in solving relevant problems. Usually, the university and scientific research institutions involved do not meet with each other, and certain information associated with problem solving has to be exchanged and is selected and delivered by the focal company.</p> <p>Easily identified in CC-5's business (co-funded by a university).</p>
<p>(2)</p> 	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>The other pharmaceutical company here refers to the one that would like to transfer certain technologies to the focal company. The focal company may authorize its university partners to do relevant pharmaceutical tests or offer other professional support. Participants in the triads would collaborate with efforts to progress the project to the next stage. However, such triads are not very common in their business. Focal companies tend to purchase mature pharmaceutical patents (ready to launch) from another pharmaceutical company with a fixed payment rather than continuing in investment, unless there are particular interests of the focal company in the "other pharmaceutical company".</p>
<p>(3)</p> 	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>Similar to the situations in the triad of "focal company–university–other pharmaceutical company" (2). Possible, however very seldom occurs.</p>
<p>(4)</p>	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>A certain number of universities that have collaborated with case companies are medical universities with affiliate hospitals. The</p>

 <p>The diagram consists of three circles. On the left, there are two circles stacked vertically, labeled 'University' (top) and 'Hospital' (bottom). On the right, there is a single circle labeled 'Focal company'. A vertical line connects the 'University' and 'Hospital' circles. A diagonal line connects the 'University' circle to the 'Focal company' circle. Another diagonal line connects the 'Hospital' circle to the 'Focal company' circle.</p>	<p>university–industry pattern is more efficient in innovation productivity with the involvement of affiliate hospitals, due to the smooth information exchange process.</p> <p>Many other universities involved do not have an affiliate hospital. It is very seldom to see such a triad, as only well-developed projects will move to the “clinical trials” stage. The results will also be presented to case companies directly, where case companies could rearrange the data. Only when the case company has invited relevant universities or research institutions to discuss a project will they be able to get the data.</p>
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As presented in Table 4-6, in the activity of R&D, the participants who are invited for further collaborations and to build triadic collaborative relationships are partners that are in a good relationship with the focal companies; a particular project is usually needed to initiate such collaboration. When the focal company is the project initiator, it normally can be in the central position of a triadic collaboration in the early stages. The pattern of a certain triad is not fixed, and it is largely associated with issues relevant to the project like the content, length of investment, specific requirements and so on.

(2) Procurement segment

The research data indicated that there could be three types of suppliers of the focal company in the procurement activities of the pharmaceutical supply chain (refer to Table 4-7).

Table 1-19 Participants of procurement activities

<u>Supplier</u> <i>(Material provider)</i>	<u>Buyer</u>
Conventional suppliers Project suppliers Appointed suppliers	Focal companies: CC-1 CC-2 CC-3 CC-4 CC-5

In procurement, collaborations with suppliers from the perspective of the buyer have been regarded as value-added activities, which enable the focal company to utilize its own resources and competencies for core businesses (Schmitz et al., 2016). The degree of relationalism and of supplier dependency are considered in deciding the partnering (Vesalainen and Kohtamäki, 2015). With the increase in joint activities or the deepening of integration, the capability of the focal company can be enhanced.

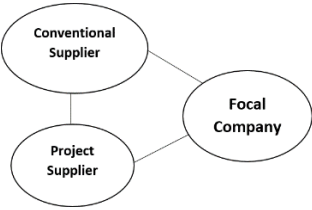
In the case study, the material suppliers are strictly selected according to GMP regulations. Once the suppliers have been determined, the focal companies tend to continue the business over the long term. However, this does not mean that when such

a relationship structure has been settled, there is no way for the focal company to replace the partner. CC-1 and CC-2 pointed out that it is possible to change suppliers (usually referring to excipient providers) as there are many other candidates with relevant production qualifications in the market, and the switching cost is not very high. To change the suppliers of BPC/APIs is comparatively much more difficult when referring to the new GMP regulations; more related pharmaceutical tests are required and the focal company has to declare all the documentation again. To ensure a stable supply, the focal companies tend to produce relevant BPC/APIs by themselves, or purchase from suppliers that are in control.

It is very common that supplier–supplier is in a competitive relationship; two suppliers collaborating is possible when there are pressures on project fulfilment, and yet they could compete at any time without any mutual tasks (Wu and Choi, 2005). To keep the benefit of competitive pressures on suppliers, most of the buyers prefer that their suppliers do not communicate with each other (Wu et al., 2010). However, it is also said that when the focal company is trying to prevent the connection of most of the suppliers, at the same time a smaller number of suppliers may still be able to develop working relationships among themselves.

This research is only able to confirm one triadic mode in procurement (Table 4-8).

Table 1-20 Collaborative triadic modes in R&D segment

Triadic modes	Description
<p>(1)</p>  <pre> graph LR CS(Conventional Supplier) --- FC(Focal Company) PS(Project Supplier) --- FC CS --- PS </pre>	<p><u>CC-1, CC-2</u></p> <p>The project supplier here refers to suppliers partly/fully controlled by the focal company. CC-1 and CC-2 are comparatively large companies in SMEs, which have subsidiaries for API production or investment in certain suppliers of core materials. In this collaborative triadic mode, the selected conventional supplier supplies to both the project supplier and the focal company for further processing or related production.</p>

In Table 4-8, the only type of triadic collaboration is built based on the existing dyadic collaboration of focal company–project supplier. The formation of such a collaboration is a requirement of the existing dyadic alliance. In real cases, only when the existing partner is to be fully trusted by the focal company (when it is fully or partly controlled by the focal company) can this key conventional supplier be shared.

4.3.2 Collaborations in the downstream supply chain

(3) Distribution and logistics segment

Based on the research data, there are two main activities practised in the downstream supply chain. The main participants are listed in Table 4-9.

Table 1-21 Participants of distribution and logistics activities

<u>Supplier</u> <i>(Product provider)</i>	<u>Buyer</u>
Focal companies: CC-1, CC-2, CC-3, CC-4, CC-5 Agency companies	Agency companies Hospitals Pharmacies Clinics OTC buyers
<u>Supplier</u> <i>(Service provider)</i>	
3PL	

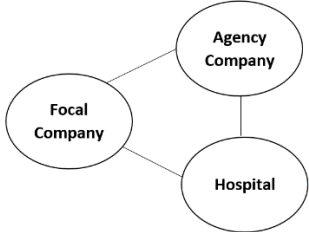
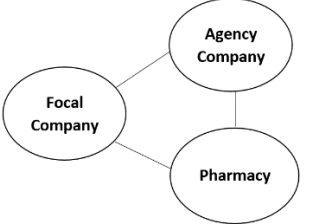
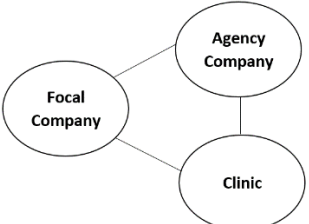
In the downstream supply chain, supplier–buyer/customer collaboration is expected to bring about benefits in inventory management, cost reduction (Uthayakumar and Priyan, 2013), market prediction and customer services (Martinsuo and Sariola, 2015). The involvement of agency companies and 3PLs encourages the development of triadic collaborative modes. In China, agency companies in the pharmaceutical industry can be regarded as one kind of customer from the perspective of the supplying company (the focal company/case company). In one form or another, the agency company can be treated as a third party as well, which helps to distribute certain products for the focal

company. However, when compared to 3PLs, they are not typical third parties who only provide relevant professional services; they also act as wholesalers or retailers. Once the products have been transferred to the pharmaceutical agency companies, the responsibility for further distribution and the risk of a poor market or stockpiling have been passed on.

Outsourcing is one of the main subjects downstream, and third parties can refer to organizations that provide particular services (Stefansson, 2006), or those involved in enhancing a typical market position and maintaining certain relationships (Sariola and Martinsuo, 2015). 3PLs are a typical third party for providing professional logistics services. Moreover, although in terms of their nature agency companies in a pharmaceutical industry are tier customers of the focal company, their ultimate purpose is to distribute the products manufactured by the focal company to the market. It can be argued that they are the third parties invited or authorized to carry out the function of marketing for the focal company.

In the case studies for this research, it can be found that pharmaceutical companies do not mind working with third parties if they could bring about benefits like opportunity, cost efficiency and business flexibility. Especially in the downstream supply chain, CC-1, CC-2, CC-3 and CC-4 expressed that collaboration with agency companies and 3PLs is inevitable. What is more, when referring to supply chain mappings, 3PL as the logistic services provider has been applied throughout the supply chain when there are delivery requirements. The involvement of third parties has in a way built a supporting pathway for the existing dyadic business relationship, where a triadic construction can be formed. The details of a confirmed triadic mode are illustrated in Table 4-10.

Table 1-22 Collaborative triadic modes in distribution and logistics segment

Triadic Modes	Case Company
<p>(1)</p> 	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>To sell products, focal companies have to analyse target hospitals and then send their staff to relevant hospital departments to introduce their products with data explanation and instruction display. When the products have been accepted, trial orders may be generated. When it has entered into the regular procurement process of hospitals, the focal company may authorize certain pharmaceutical agency companies to complete the subsequent procedures.</p> <p>Usually, the focal company will arrange a fixed sales team (could be own forces or agency crews) to take charge of the marketing work for particular products. They will assist a hospital department in training to use the products, and collect and report information like the problems they have met and other requirements proposed by target groups.</p>
<p>(2)</p> 	<p><u>CC-1, CC-2, CC-5</u></p> <p>Hospitals are the usually the target customer group for many pharmaceutical manufacturers, and a large proportion of the human resources in sales departments are arranged to serve hospitals. To ensure that their products can be acknowledged and distributed to other regions in China and purchased by more customers, agency companies are regarded as important partners for market expansion and accurate distribution of bulk ordering from pharmacies. In a key region, after the market has been opened up, agency companies are invited/authorized to further enhance their market position by introducing their products not only to hospitals but also to pharmacies and other retail organizations.</p>
<p>(3)</p> 	<p><u>CC-2</u></p> <p>Similar to the situation introduced in mode 2, the researcher has been told that the focal company is able to sell pharmaceutical products to clinics. However, most of clinics prefer to purchase from agency companies. CC-2 as a marketing-oriented pharmaceutical organization controls an agency company (subsidiary), and the focal company is able to supply clinic customers directly.</p>
<p>(4)</p>	<p><u>CC-2</u></p>

<pre> graph LR FC((Focal Company)) --- H((Hospital)) FC --- OB((OTC buyer)) </pre>	<p>CC-2 is a pharmaceutical company authorized to sell products to OTC buyers directly (through its own pharmacies and online sales platform). The OTC buyer is able to purchase its product in hospitals or place an order with the focal company directly.</p>
<p>(5)</p> <pre> graph LR FC((Focal Company)) --- 3PL((3PL)) FC --- AC((Agency Company)) </pre>	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>3PLs as logistics services providers have been widely accepted by the focal companies. Most of the well-packaged products are able to be delivered by 3PLs. For some products where there is a required temperature and humidity control, CC-4 tends to deliver by itself, while other case companies expressed that self-arranged delivery will only cover the local region or be applied for emergency orders.</p>
<p>(6)</p> <pre> graph LR FC((Focal Company)) --- 3PL((3PL)) FC --- H((Hospital)) </pre>	<p><u>CC-1, CC-2, CC-3, CC-4, CC-5 (can be identified in all cases)</u></p> <p>Similar to the situation explained in mode 5.</p>
<p>(7)</p>	<p><u>CC-1, CC-2, CC-5</u></p> <p>Similar to the situation explained in mode 5. CC-3 and CC-4 do not directly sell to pharmacies, and that is why this research is not able to identify such a mode in their business.</p>

<pre> graph LR FC((Focal Company)) --- 3PL((3PL)) FC --- Pharmacy((Pharmacy)) 3PL --- Pharmacy </pre>	
<p>(8)</p> <pre> graph LR FC((Focal Company)) --- 3PL((3PL)) FC --- Clinic((Clinic)) 3PL --- Clinic </pre>	<p><u>CC-2</u> Similar to the situation explained in mode 5. However, only CC-2 (where an agency company is in control; a series of pharmacies in its brand are in control; direct selling online is available) has express clinics that may come to it directly to order.</p>
<p>(9)</p> <pre> graph LR FC((Focal Company)) --- 3PL((3PL)) FC --- OTC((OTC buyer)) 3PL --- OTC </pre>	<p><u>CC-2</u> Currently, only CC-2 is authorized to sell pharmaceutical products online to OTC buyers directly. Once it has received the electronic orders, the required products will be delivered by appointed 3PLs. The buyers are also able to send feedback via its online business platform.</p>

Referring to Table 4-10, this research has confirmed nine types of triadic collaboration. In downstream activities, the building of triadic collaborations is mostly caused by the outsourcing of distribution (sales) or logistics. The existing dyadic relationship in the mainstream supply chain is the basis of further collaboration. The triadic collaboration could be stable with certain participants, but is not fixed, as the switching cost of third-party partners is relatively low in the downstream supply chain and the trustworthiness of third parties to the focal company is not always high.

4.4 Summary

In this chapter, the findings of the case studies have been presented. The key issues relevant to case companies in interviews and the follow-up survey have been highlighted. With the mappings of different supply chain structures of the five cases and the initial verification of the information listed above, the basic triadic collaborative modes in the pharmaceutical supply chain have been identified.

Most of the pharmaceutical companies started as R&D institutions. However, according to the different strategies encountered in their development, basically there could be two types of companies – one is *R&D oriented* and the other is *marketing oriented*.

R&D-oriented pharmaceutical companies refer to companies that place innovation in a strategic position with continuing relatively large investment. Companies of this type (CC-1, CC-3, CC-4 and CC-5) are more likely to build sustainable collaborative relationships with certain R&D institutions, especially the universities. They are very strict in their partner selection process, and the factors of reputation, effectiveness, performance, business scale, business record and willingness to collaborate are generally important to them (Table 4-3). Some leading companies in this area do care about the power of control in R&D projects and the flexibility of potential partners. It is difficult for a comparatively small developing company to take the leading position in a joint working project, and they usually prefer to work with partners who would like to share more with them.

Marketing-oriented pharmaceutical companies refer to companies that pay more attention to the development of the distribution system; the most obvious characteristic of companies of this type (CC-2) is that they normally have a comparatively complete distribution channel network (Figure 4-3). However, when compared to R&D-oriented companies they do not have many projects in innovation and the capability of their own R&D group is limited; good marketing performance in a way enables them to continue to reinvest to make progress slowly. In partner selection, they do not really care about the business scale of potential partners. In collaborations, they usually give more consideration to productivity, business reliability and how quickly they are able to respond to orders and deliveries (lead time), rather than other factors like power of control and business flexibility (Table 4-3).

Referring to Tables 4-6, 4-8 and 4-10, there are more types of triadic collaborations in a marketing-oriented pharmaceutical company. Moreover, in the five case companies, CC-2 is the only one that is approved to apply to the e-business platform for pharmaceutical sales. Collaborations throughout the supply chain can expect to bring more opportunities and to improve/enhance companies' operational and marketing performance.

Chapter Five : Configuration Pattern of Supply Chain Collaboration – a Triadic View

5.1 Introduction

In this chapter, the details of the configuration pattern of supply chain collaboration will be illustrated from a triadic viewpoint. Based on the levels of dyadic collaboration, further explanations will be provided relevant to the identified configuration patterns of (1) directed collaboration triad (upstream), (2) cultivated collaboration triad (upstream), (3) concerted collaboration triad (downstream) and (4) derived collaboration triad (downstream).

Moreover, to better interpret the topic, in Section 5.3 on the selection of triadic collaboration pattern, there will be a discussion of when organizations would like to involve a third party, and how they should collaborate with their partners when referring to their business goals.

Last but not least, this research will also present the interconversion of triadic collaboration patterns – since some of the triads are built temporarily to complete certain projects, and the role played by the third party may dynamically change when referring to the requirements of the focal company, the triadic pattern can change dynamically as well.

5.2 Triadic Collaboration Pattern

In line with the research results, this research identified several basic triadic collaboration modes. In the supply chain, collaborations can be motivated by different goals; and according to various activities, collaborations differ from partner to partner.

5.2.1 Basic triadic collaboration mode

Referring to the proposed conceptual research framework, collaborations can be motivated by relevant business goals or potential advantages. It has been argued that collaborations can change dynamically (Cantner and Rake, 2014; Petison and Johri, 2008). The factors of trust, commitment, power and dependence could have impacts on the estimation of triadic collaborations.

Based on the results of the interviews and surveys, two basic triadic collaboration modes in the upstream and downstream supply chain (Figures 5-1 and 5-2) can be revealed.

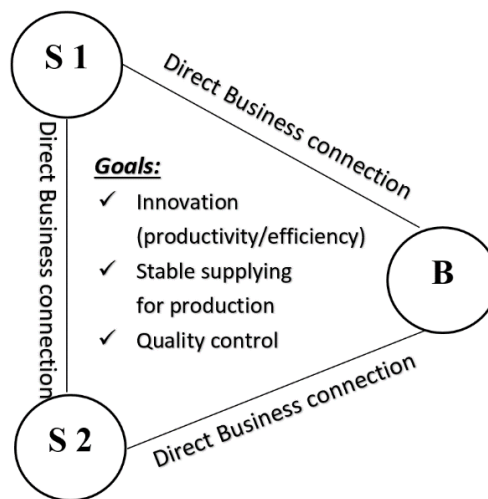


Figure 1-26 Basic triadic collaboration mode upstream (in buyer's perspective)

Referring to Figure 5-1, when the focal company takes the position of buyer in the upstream supply chain, the triadic collaborative mode can be constructed with its suppliers to progress innovation activities or ensure sustained production in the processes of R&D and procurement. Building a direct business connection is usually due to the initiation of a particular project (Ateş et al., 2015) or specific complementary requirements (Baloh et al., 2008; Burt, 2009). To reach the goal of innovation (Brachos et al., 2007), ensure a stable supply and get better quality control (Elder et al., 2015; Liu et al., 2010b) in the upstream supply chain, the focal company may involve more parties to complete certain projects jointly.

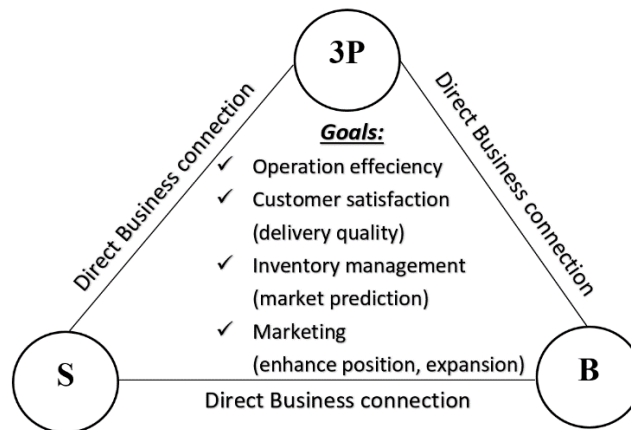


Figure 1-27 Basic triadic collaboration mode downstream (in supplier's perspective)

Figure 5-2 shows that when the focal company takes the position of supplier, the triadic collaborative mode is usually created with the involvement of a third party in distribution and logistics in the downstream supply chain, which helps to satisfy customers' requirements and better complete the business (Gillis et al., 1998; Ngo and O'Cass, 2010). To seek more opportunities in the market and obtain operational efficiency (Ross et al., 2015; Sellers-Rubio and Mas-Ruiz, 2006), most of the third parties are involved due to outsourcing. Besides the original collaborations in the mainstream supply chain, a pathway can be created through the connections with the third party. Building new business connections to form a triadic collaboration is largely dependent on the requirements of the focal company.

5.2.2 Evaluation of levels of collaboration

This evaluation followed the principles of the collaboration pyramid (Cahill, 1996; Grudinschi et al., 2014a) reviewed in a prior section, and this research classified different collaborative relationships into four levels (details can be further referred to in Figure 2-1 and Table 2-2). In levels one and two, participants in the supply chain may build connections according to certain business goals; they may share information

and other resources, but only to a minimal degree. In levels three and four, besides the basic requirements of business connection and goal congruence, the partners will share information to a particularly high degree and even at a maximum; decision synchronization may be asked for in mutual projects, and such a relationship can be expected to last for a comparatively longer period due to the incentive alignment. Therefore, the degree of collaboration can be generally divided into the two levels of high (levels 4 and 3) and low (levels 2 and 1).

The data applied was mainly collected from the interviews and surveys. By practising the analysis techniques of explanation building and pattern matching, a template (Table 5-1) can be prepared.

Table 1-23 Closeness of business connection (collaborative relationship levels)

Degree of Collaboration	Level of Collaboration	Principles (Characteristics)
High	Level 4	<p><i>(1) Direct business connection</i></p> <p><input type="checkbox"/> Direct business contract</p> <p>Or</p> <p><input type="checkbox"/> Direct business contract with focal company, and invited to work jointly on particular project</p> <p><i>(2) Goal congruence</i></p> <p><input type="checkbox"/> Project</p> <p>Or</p> <p><input type="checkbox"/> Particular service/technology support</p> <p><i>(3) Information/resource sharing at maximum level</i></p> <p>(Upstream)</p> <p>R&D segment</p> <p><input type="checkbox"/> Development resource</p> <p><input type="checkbox"/> Intellectual property</p> <p><input type="checkbox"/> R&D data (including feedback on relevant tests)</p> <p><input type="checkbox"/> Other available data and resources</p> <p>Procurement segment</p> <p><input type="checkbox"/> Demand forecast</p> <p><input type="checkbox"/> Usage</p> <p><input type="checkbox"/> Certain R&D data (mainly about the results of relevant tests)</p> <p>(Downstream)</p> <p>Distribution and logistics segment</p> <p><i>Agency partner</i></p> <p><input type="checkbox"/> Productivity</p> <p><input type="checkbox"/> Sales status of certain products in main market</p>

		<ul style="list-style-type: none"> <input type="checkbox"/> Sales plan of certain products <input type="checkbox"/> Feedback from market <input type="checkbox"/> Other available data (including product details in use) <p>Or</p> <p><i>3PL</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Main sales regions <input type="checkbox"/> Details of products (species, characters, attentions) <input type="checkbox"/> Sales forecast (regional demand) <p><u>(4) Decision synchronization in mutual projects</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical records of collaboration in projects <input type="checkbox"/> Trust at comparatively high or very high level <p>Or</p> <ul style="list-style-type: none"> <input type="checkbox"/> Interdependence at comparatively high or very high level <p>Or</p> <ul style="list-style-type: none"> <input type="checkbox"/> Power of focal company is at a comparatively high or very high level <p><u>(5) Incentive alignment</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Willingness to collaborate <input type="checkbox"/> Project <input type="checkbox"/> Share plans of main processes
	Level 3	<p><u>(1) Direct business connection</u></p> <p><u>(2) Goal congruence</u></p> <p><u>(3) Information/resource sharing at a particularly high level</u></p> <p>(Upstream)</p> <p>R&D segment</p> <ul style="list-style-type: none"> <input type="checkbox"/> <i>Selected</i> development resource <input type="checkbox"/> Intellectual property (<i>depends, relevant negotiation required in strict routines</i>) <input type="checkbox"/> <i>Selected R&D data (including feedback on relevant tests, but mainly about the partner's responsible areas)</i> <input type="checkbox"/> Other available data and resources <i>to a certain degree (optional to share)</i> <p>Procurement segment</p> <ul style="list-style-type: none"> <input type="checkbox"/> Demand forecast <input type="checkbox"/> Usage <input type="checkbox"/> Certain R&D data (mainly about the results of relevant tests) <p>(Downstream)</p> <p>Distribution and logistics segment</p> <p><i>Agency partner (most of the options)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Productivity <input type="checkbox"/> Sales status of certain products in main market <input type="checkbox"/> Sales plan of certain products <input type="checkbox"/> Feedback from market <input type="checkbox"/> Other available data (including product details in

		<p>use)</p> <p>Or</p> <p><i>3PL (most of the options)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Main sales regions <input type="checkbox"/> Details of products (species, characters, attentions) <input type="checkbox"/> Sales forecast (regional demand) <p><u>(4) Decision synchronization in mutual projects</u></p>
Low	Level 2	<p><u>(1) Direct business connection</u></p> <p><u>(2) Goal congruence</u></p> <p><u>(3) Information/resource sharing at minimum level</u></p> <p>(Upstream)</p> <p>R&D segment</p> <ul style="list-style-type: none"> <input type="checkbox"/> <i>Selected</i> development resource <input type="checkbox"/> <i>Feedback on relevant tests about the partner's responsible areas</i> <p>Procurement segment</p> <ul style="list-style-type: none"> <input type="checkbox"/> Demand forecast <p>(Downstream)</p> <p>Distribution and logistics segment</p> <p><i>Agency partner</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Productivity <input type="checkbox"/> Sales plan of certain products (<i>roughly</i>) <input type="checkbox"/> Other available data (including product details in use) <p>Or</p> <p><i>3PL</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Details of products (species, characters, attentions)
	Level 1	<p><u>(1) Direct business connection</u></p> <p><u>(2) Goal congruence</u></p>

In Table 5-1, this research details the principles for evaluating the level of a collaborative relationship. The list of characteristics is summarized based on previous research and amended according to the results and analysis of the pilot study. Levels one and two are allocated to the low category due to there not being much extra information, since resources tend to be pooled in the business and there is a lack of in-depth connection. A successful alliance that can reach a high-level collaboration is normally reflected by a willingness to share (Chicksand, 2015) and the exchange of commitment (Heimeriks and Schreiner, 2010). Organizations that collaborate at levels three and four are more likely to be able to keep in step with each other; it is a purposive strategic relationship (Gallear et al., 2012) rather than an ordinary commercial tie.

5.2.3 Triadic collaboration patterns in the upstream supply chain

Upstream, the research results indicated that a triadic collaboration can be initiated by the focal company when there is an appropriate project or a particular requirement to involve a third party in providing specific assistance. Commonly, suppliers involved in triadic collaboration seldom collaborate in business relations with each other voluntarily without the integration initiated by the focal company. Supplier–supplier are in the relationship of “no tie” or “competitiveness” in certain areas (Wu et al., 2010), where there is no direct business connection. The project or the demand for third-party assistance in a way makes the connections possible. To the focal company, ensuring that the power in integration is the premise for expanding their networking means that there must be at least one tie of supplier–buyer in this comparatively high degree of collaboration, and the triadic collaborative modes tend to be formed. In Tables 5-2 and 5-3, part of the results has been demonstrated.

Table 1-24 Supplier–buyer collaboration degree upstream

Segment	Partner	Collaboration Degree				
		<u>CC-1</u>	<u>CC-2</u>	<u>CC-3</u>	<u>CC-4</u>	<u>CC-5</u>
R&D	University	High	High	High (L-3)	High (L-3)	High
	SRI	High	High	High (L-3)	High (L-3)	High (L-3)
	Other pharma	Low	Low	High (L-3)	Low	Low
	Hospital	High	High	High	High	High
Procurement	Conventional supplier (material)	Low (L-2)	Low (L-2)	Low (L-1)	Low (L-2)	Low (L-2)
	Project supplier (material)	High	High	Low (L-2)	High	High

Table 1-25 Supplier–supplier collaboration degree upstream

Segment	Supplier 1–Supplier 2	Collaboration Degree				
		<u>CC-1</u>	<u>CC-2</u>	<u>CC-3</u>	<u>CC-4</u>	<u>CC-5</u>

R&D	SRI–university	Low	High	High	Low	High
	Other pharma–university	Low	Low	High	Low	Low
	Other pharma–SRI	Low	Low	High	Low	Low
	Hospital–university	Low/High	Low/High	Low/High	Low	High
Procurement	CS–PS	Low/High	Low/High	–	–	–

Referring to Tables 5-2 and 5-3, two triadic collaboration patterns can be further framed in Figure 5-3. And two types of triadic collaboration pattern can be identified in the upstream supply chain – *directed collaboration triad* and *cultivated collaboration triad*.

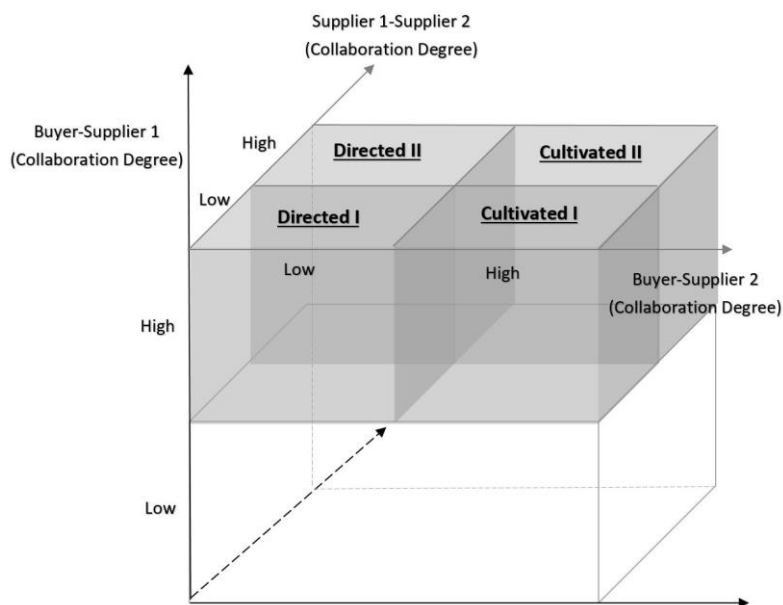
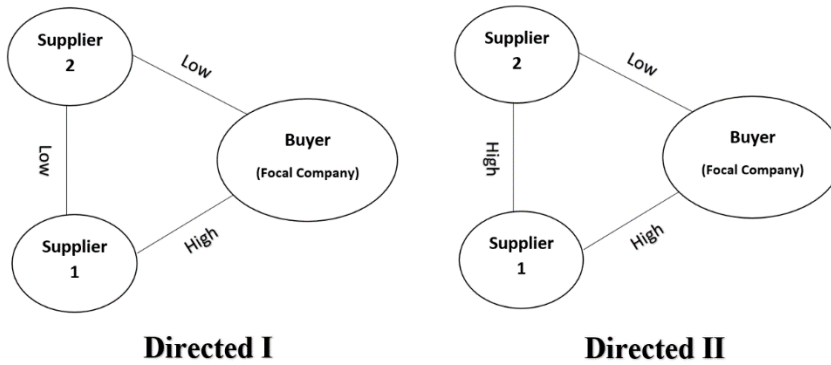


Figure 1-28 Collaborative pattern upstream

(1) *Directed collaboration triads*



In directed collaboration triads, as suppliers of the focal company, one of them collaborates with the buyer at a high level, while the other is in a low-level collaboration with the buyer. The triad is motivated based on the stable relationship between supplier 1 and the buyer; and supplier 2 is involved to assist in certain projects that are jointly worked on by the buyer and supplier 1.

In this case study, a number of upstream triads are in the pattern *Directed I*; the supplier 2 in this mode is associated with both the buyer and supplier 1 in a low-level collaboration (Figure 5-4). In a very few situations, the collaboration pattern is *Directed II*; supplier–supplier is in a good relationship, while the focal company plays only a limited role in building a closer relationship with the newly introduced supplier (Figure 5-5).

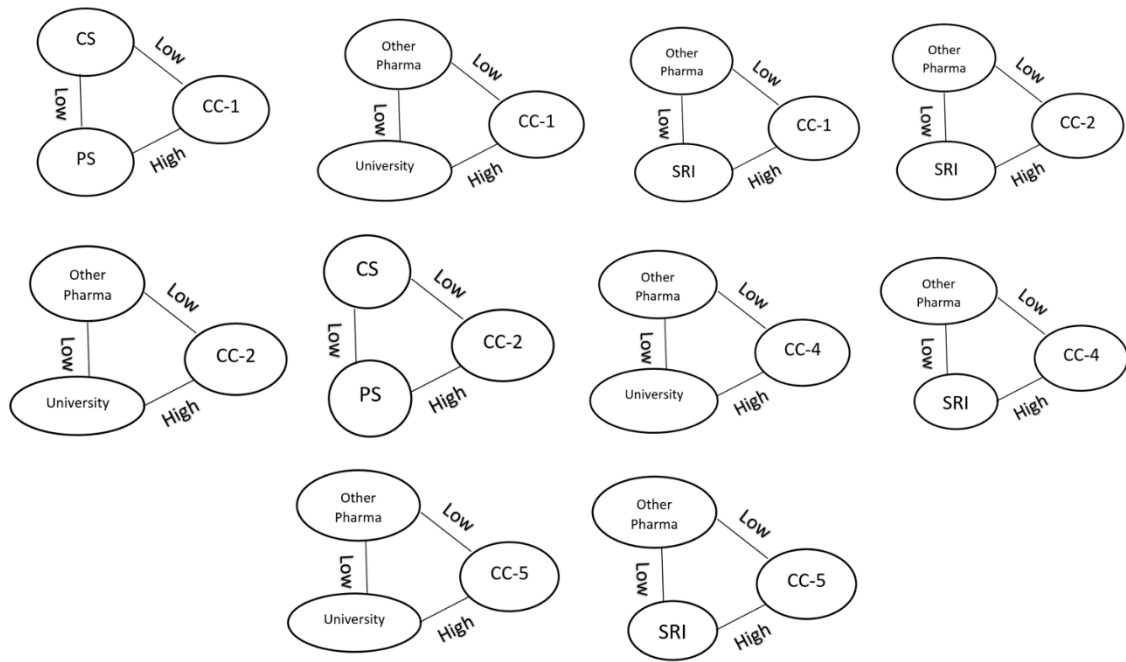


Figure 1-29 Cases of pattern Directed I

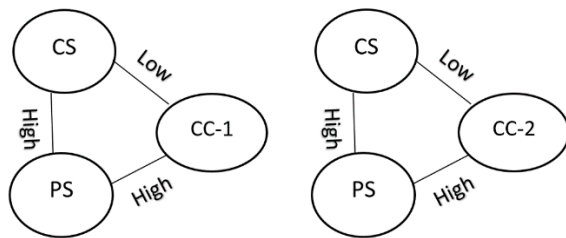


Figure 1-30 Cases of pattern Directed II

A: R&D segment

R&D is crucial to the sustainable development of the pharmaceutical industry (Rees, 2011), which requires continuing investment with large amounts of money. From the perspective of the business operation, it is necessary to increase cost efficiency and collaborate with relevant academic or research institutions (Fiaz, 2013; Kafouros et al., 2015). The university and SRI are the typical parties selected to work with many industries so that they can innovate. Referring to the case introduction and Figure 5-4, the focal companies tend to keep a good relationship with them, and they are in key

positions to build collaborations.

In the case study, some of the pharmaceutical companies (peers of the focal company) are also regarded as business partners (suppliers) from the perspective of service/technology/patent provider. This is an important channel for the focal company to obtain professional assistance in both innovation and marketing. However, the collaboration is usually in regular business behaviour, which means that certain R&D achievements are traded as commodities; the supplier and buyer do not really have to co-research and develop any project. Their relationship is restricted to a basic business connection and knowledge/technology transfer, where the collaboration is at a low level.

Most of the time, the formation of a triad is motivated by a project; and in the project there are usually more than two parties, including the focal company. Projects can be launched by universities or SRIs, which may be sponsored by government. To respond to the policy of academic–industry collaboration, the focal company and the research parties are in a high degree of collaboration. Sometimes, due to the shortage of equipment or other limits to qualification, a third party may be invited to make up for this. In this situation, anyone may have played the role of the third party. The relationship between the new service/technology supplier and the focal company or the existing project partner is a basic business connection. The third party will only have to do the work given by the dyadic alliance, which does not need to know much other information, only when informed. This triadic collaboration is in pattern *Directed I*.

The hospital is another very important service provider for the focal companies, as clinical trials are required to be processed by certain qualified institutions, and the hospital is the leading group (as mentioned by Leader of pharmacy department, University A). When the project is significant, the hospital and the R&D group (the focal company and the research party) may have to sit together and discuss it. There may be motivation for a triad, but in the collaboration pattern of *Cultivated*, which will be further explained in the following section.

In the R&D segment, the *Directed II* pattern cannot be identified from the perspective of the focal companies when referring to this case study.

B: Procurement segment

When parties are collaborating at a comparatively high level, to the focal company its partner is treated as a “buddy” or “relier” (Liu et al., 2010b), who enjoys trust and a certain power in negotiation and contract making. In regular operational processes like procurement upstream, the project suppliers refer to the material providers in a way that is partly or fully controlled by the focal company; they are the only party trusted and committed to by the focal company at a high level.

“We recently acquired one company who was able to produce API and other pharmaceutical materials. This company was one of our suppliers; the materials provided by them are significant to several of our products which sell well. We were sort of in a good relationship in business, and we know them well about their people, facilities, and products. Moreover, referring to the new GMP regulations, the production standard of relevant APIs is becoming more and more strict; many suppliers are forced to upgrade their production lines and factories and the price of some materials keeps on increasing. We don’t know how it could be changed in the future, but we must prepare for that. If it is important to us, and we are able to afford it; the best way to reduce the risks is to manage it by ourselves.” (General manager, CC-1)

“We invested in several of our key suppliers, and we are in a way the biggest or one of the most important stakeholders in those companies. We have to take the priority in their supplying. And in a strategic consideration, some resources they are currently holding can benefit us.” (General manager, CC-2)

The conventional suppliers are material providers that are connected with the focal company in normal business. Collaborations between conventional supplier and buyer are at a comparatively low level. Regular ordering may be done by the focal company, and what has been required is usually not urgent. Although the collaboration level in this situation is not high, the relationship of conventional suppliers and buyer is quite stable in the industry. The focal company tends to work with suppliers over the long term, and it will not change its suppliers easily, only when it has to.

“We are able to change suppliers, and we have a lot of choices. But we prefer not to do it, if we don’t have to. To select new suppliers, we have to do certain research about their products, reputation, market performance, and so on; we have to talk to their people, to negotiate about the contract. I am not saying that the work is difficult; if we can continue the relationship with our current partners, it is more convenient.” (General manager, CC-1)

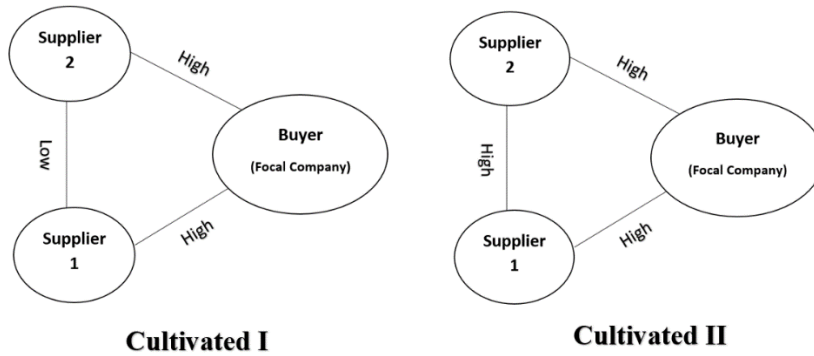
Normally, the suppliers of the focal company in procurement are separately arranged; there is no direct business connection from one to another. However, in this case study it is possible for a triadic construction of collaboration to exist. When one of the suppliers is the “buddy” or “relier” or “family member” (partly or fully controlled), certain production resources can be shared, including purchasing resources; all the conventional suppliers that have ever worked with the focal company or the project

suppliers can be involved.

The research results show that, if the conventional supplier is introduced by the focal company, the relationship of supplier–supplier can be as an initiative or at arm’s length (Liu et al., 2010b; Peng et al., 2013) and the collaboration level will not be very high. From the perspective of the focal company, such a triadic pattern (*Directed I*) will not have a significant impact on its business in general, but has somehow enhanced the relationship of an existing collaboration between the focal company and the project supplier in the aspect of information/resource sharing.

Similar to *Directed I* as has already been discussed, based on a close relationship of the focal company and project supplier, the conventional supplier is in a way the buddy or relier of the project supplier, which is introduced to the focal company. The relationship of the focal company and the newly introduced conventional supplier depends on how important the required material is to the buyer. When the procurement follows the regular routine without any strategic consideration, the collaboration remains low; the triad is in pattern *Directed II*. Different from *Directed I*, besides the enhanced collaboration, some competitive advantages of contract negotiation in the pricing and service provision of the new supplier can be expected from the perspective of the focal company. Moreover, if the new supplier does reliable business and is substantial in its supply, theoretically it is possible for the focal company to upgrade its relationship with the new supplier. The pattern of the new triad can be catalogued as *cultivated collaboration*, which will be further introduced below.

(2) *Cultivated collaboration triads*



In cultivated collaboration triads, both suppliers involved collaborate with the focal company at a high level; even without any mutual task/project, the dyadic relationship of supplier–buyer is well maintained. Such a triad can be constructed when the two suppliers are essential to completing a project, and it is necessary for the two parties to communicate to approach certain goals.

The higher the degree of collaboration between supplier 1 and supplier 2 allowed by the focal company in the project, the more stable and efficient the triad can be expected to be. Generally speaking, supplier 1 and supplier 2 do not really need to connect with each other directly, as the focal company can be the messenger to exchange information relevant to any project. However, integrating the triad enables stakeholders to share information or resources to a maximum degree and then further to speed up issue processing in a particular segment.

Cultivated triads are common in the case study from the perspective of the focal company, based on existing highly collaborative dyads upstream. When two of them are involved in one project, it is worth considering bringing them together for further collaboration. In the early stages of such a triad, the pattern can be called *Cultivated I* (Figure 5-6), where supplier–supplier are in a low-level collaboration. Over time, with the authorization given by the focal company, in certain cases the supplier–supplier relationship may be upgraded to a higher level, and the triadic pattern can be changed to *Cultivated II* (Figure 5-7).

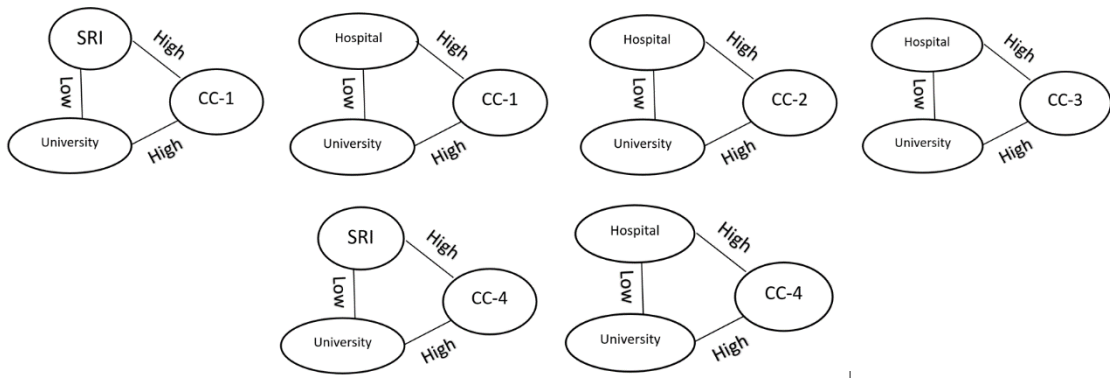


Figure 1-31 Cases of pattern Cultivated I

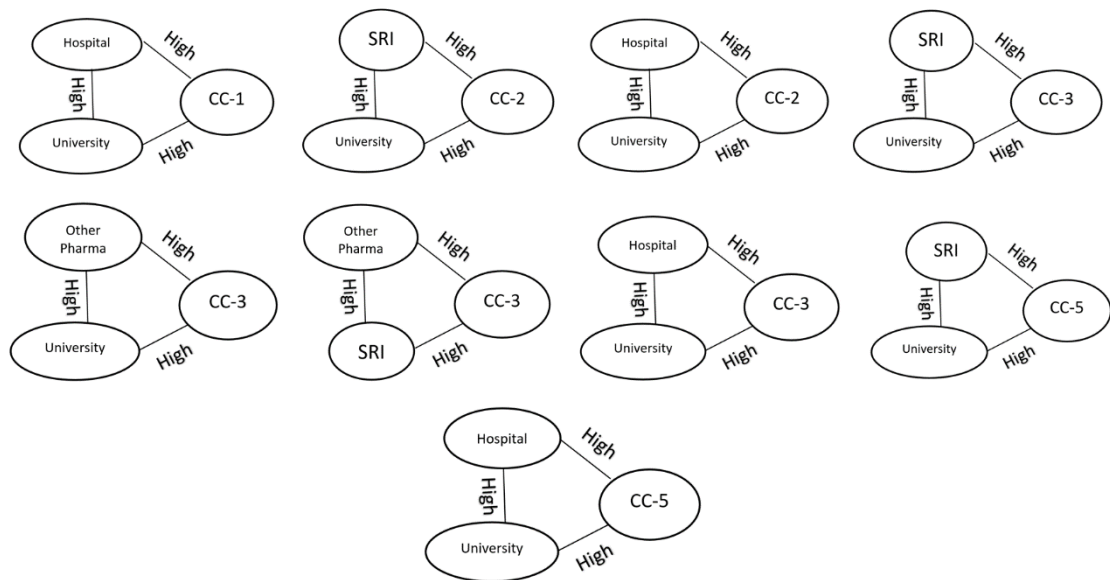


Figure 1-32 Cases of pattern Cultivated II

A: R&D segment

In a directed collaboration pattern, it has been discussed that SRI, university and hospital are parties that have been regarded as very important partners in providing a professional service or technologies. Driven by the policy of academic–industry collaboration (Banal-Estañol et al., 2015), more projects have been launched to encourage innovation and thus to further promote development in science and industry.

In this research, most of the cases involved are R&D oriented (refer to Chapter Four);

teams formed by experts and young talent in a relevant area are a potent force to compete in the market. The attitude held by the focal company to these academic and research institutions is that they are more like reliers rather than buddies. When there are good projects, they are more confident about working with universities or research institutions if they are qualified in a particular kind of service provision or in technical assistance, from the consideration of creditworthiness, professional levels, sustainability and value added.

“We collaborated with many universities, and they are important to our business. Some of our R&D staff have graduated from University A and University B; they were talented students selected by us in relevant projects co-organized by our company and their universities.” (General manager, CC-1)

“We set up an industrial base in a university, and we send our people to that place regularly to communicate with the professors and students. When they have a certain industrialized project, they will contact us. After certain evaluations, we may sit together to further discuss it.” (General manager, CC-2)

“We run a platform for experts in collaborating organizations, like universities, research institutions, our partner enterprise, and hospitals... They can share some information in the industry, including the feedback on certain medicine, changes in regional relevant regulations and so on.” (CEO, CC-3)

“We do not often collaborate with other pharmaceutical companies, and the R&D capability is kind of sufficient to support our development at this stage. We do work closely with universities and research institutions in some projects, especially University A and its affiliate hospital.” (Manager in R&D development, CC-4)

“We were co-funded by University B, and our key area is in Chinese patent medicine. Compared to other pharmaceutical manufacturing, we may have to do more on folk prescription collection, component test and analysis, ingredients purification and so on. Compared to bio-pharmaceuticals and chemical drugs, the GMP put forward even higher requests for us. Collaboration with reliable parties is necessary to us.” (General manager, CC-5)

When a project is launched by the focal company or the focal company is in a crucial position in any project, it can decide to involve another party when needed. If another party is selected from its reliers, the triadic collaboration formed is in a cultivated pattern. And in this pattern, the supplier–supplier relationships are dynamically changed when referring to the nature of the project (government sponsored or co-R&D project or enterprise behaviour), the willingness of the suppliers to collaborate and the focal company’s considerations (the reason for involving a third party – technology/facility support or idea support or strategic disposition).

In a government-sponsored project, the R&D achievements usually have to be reported in detail, including knowledge and application. Once three parties including the focal company have been involved, a high degree of collaboration can be built among the participants. Universities and research institutions are quite similar in providing service/technology to the focal company. In ordinary circumstances (co-R&D project or enterprise behaviour), it is unusual to get them together in one project. However, in some large government-sponsored projects, it is possible, especially in academic–industry collaboration projects. And in *Cultivate II* it is common to see this situation.

“We were often invited to join a meeting where representatives of another research institution are there as well. We are able to communicate under the table, but in special cases when there is a significant problem that has to be fixed in a short time or there are some technical issues that require adjustments in different processes, the focal company may organize such a meeting.” (Head of pharmacy department, University A)

A hospital is a special party to collaborate with in the pharmaceutical industry; it can be a service provider in clinical trials, but most importantly it is a consumer of pharmaceutical products. Referring to GMP regulations, clinical trials are required for all pharmaceutical products before they are formally launched onto the market. Great attention has been paid by the focal companies to maintaining a good relationship with qualified hospitals that can do the trials and provide relevant authoritative feedback. Any triad that involves a hospital in the pharmaceutical industry is normally in a cultivated pattern. Usually they are in *Cultivated I*, but such a pattern can be upgraded to *Cultivated II* at any time when it is authorized by the focal company.

B: Procurement segment

In the procurement segment, the cultivated pattern in a way does not frequently happen. Material suppliers are not asked to work together to produce standardized ingredients. When compared to industries like auto-making or electronic equipment manufacturing, there is no strict demand for other matching requirements. Conventional suppliers are normally in a low degree of collaboration with the focal company, and what they have to do is to fulfil the orders. Not many of the case companies have project suppliers; even in the case companies that do not have them, their businesses are usually

separate. Only when an event like a co-initiated project is launched can a comparatively high degree of collaboration be formed between two different project suppliers (cultivated collaboration pattern).

5.2.4 Triadic collaboration patterns in the downstream supply chain

In the downstream supply chain, the research results have indicated that functional outsourcing in distribution (sales) and logistics is the main cause of triadic collaboration. And in collaboration, the focal company as the supplier to provide pharmaceutical products is connected to relevant customers at different levels.

Dependent on the roles played by the third party in the network (Martinsuo and Sariola, 2015; Sariola and Martinsuo, 2015), the attention given to ties between CC–3P and 3P–Customer is distinct. If the business connection is from a strategic perspective, where the performance of the 3P could have a direct impact on not only customer satisfaction but also aspects of marketing, CC–3P collaborations tend to be maintained by the focal company at a high level. Due to the 3P’s strategic position, the 3P–Customer relationship is able to be built up to a high level also, and sometimes can even be supported by the focal company. If the involvement of the 3P is only to give assistance in distribution or logistics at an operational level, the level of CC–3P collaboration usually depends on the focal company’s trust in the 3P and the willingness of the 3P to collaborate with the focal company. The 3P–Customer collaboration is less considered, which is to complete a certain task only with a basic business connection. The details of the research data can be tracked in Tables 5-4 and 5-5.

Table 1-26 Collaboration degree (dyads in downstream triads)

Segment	Partner	Collaboration Degree				
		CC-1	CC-2	CC-3	CC-4	CC-5
Distribution & Logistics	Agency company	Low (L-2)	High	High	Low (L-2)	Low (L-2)
	Hospital	High	High	High	High (L-3)	High
	Pharmacy	High	High	–	Low (L-1)	Low

	Clinic	Low (L-1)	Low	-	Low (L-1)	Low
	OTC buyer	-	Low (L-1)	-	-	-
	3PL	Low (L-2)	Low	Low	Low	Low

Table 1-27 Collaboration degree (3P–Customer relationship in downstream triads)

Segment	Supplier 1–Supplier 2	Collaboration Degree				
		CC-1	CC-2	CC-3	CC-4	CC-5
Distribution & Logistics	Agency–Hospital	High	High	High	High	High
	Agency–Pharmacy	Low (L-2)	High/Low	Low	Low (L-2)	Low
	Agency–Clinic	Low	Low	Low	Low	Low
	Agency–OTC buyer	-	-/Low	-	-	-
	3PL–Agency	Low	Low	Low	Low	Low
	3PL–Hospital	Low	Low	Low	Low	Low
	3PL–Pharmacy	Low	Low	Low	Low	Low
	3PL–Clinic	Low	Low	Low	Low	Low
	3PL–OTC buyer	-	Low	-	-	-

Referring to Tables 5-4 and 5-5, the results can be further exhibited in Figure 5-8, and the two types of triadic collaboration pattern in the downstream supply chain can be identified – *Concerted Collaboration Triad* and *Derived Collaboration Triad*.

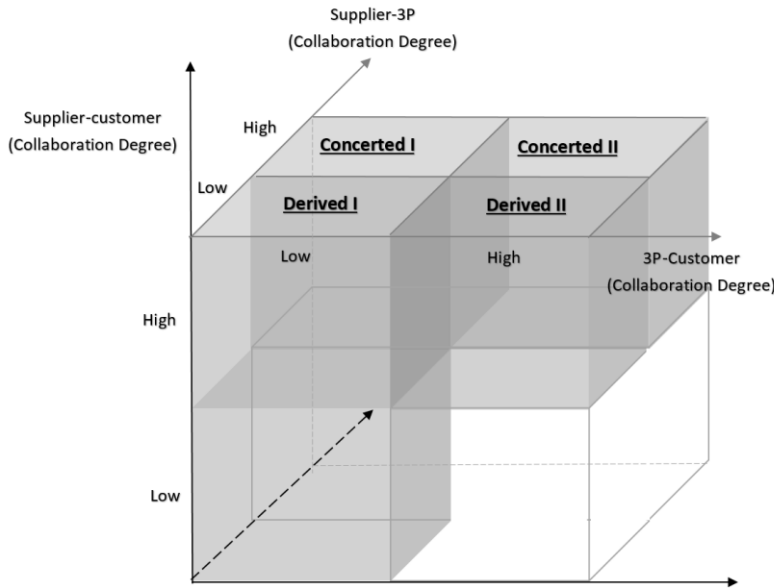
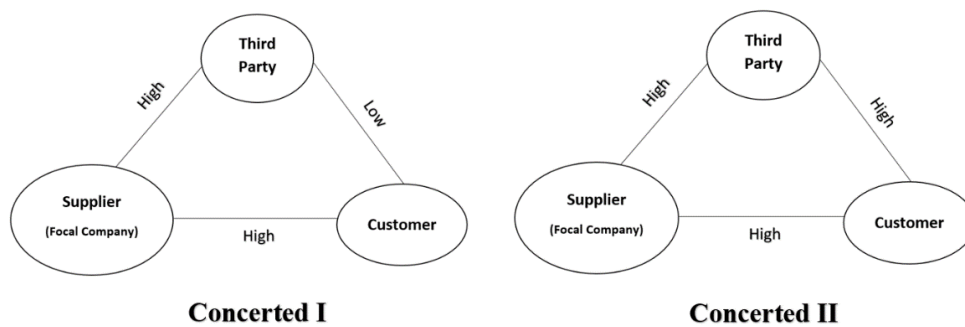


Figure 1-33 Collaborative pattern downstream

(1) Concerted collaboration triad



In concerted collaboration triads, the focal company (supplier) and customer are in a high degree of collaboration. A fixed purchasing contract can be signed between the two parties, and regular communication about products or relevant feedback is usually available when required. The third party involved in the triads is usually the one highly trusted by the focal company, which may represent the focal company explaining the business or delivering relevant services to the customer. It is significant to ensure that there are decisions on synchronization in mutual tasks, and that the business incentives are correlated to a certain degree.

In the downstream supply chain, the core issues are about distribution and logistics. In the pharmaceutical industry, quality inspection is always important and draws attention from the focal company at every stage. GMP and GSP regulations set out many requirements for pharmaceutical companies in their procurement, R&D, production, storage, sales, logistics and so on. Due to the particularity of the products, sales personnel in this industry need to have relevant practice qualifications. Prescription and OTC medicines can only be sold by qualified professional institutions and usually should be equipped with medical guidance.

There are many barriers to market entry for the focal company, and they have to build good relationships (*guanxi*; Murray and Fu, 2016) at both an individual and an

organizational level; this takes time and the costs are high. Moreover, a pharmaceutical product is different from other daily necessities or foodstuffs; it requires a comparatively very high quality in logistics service. For some bio-pharmaceuticals, which are sensitive to temperature and humidity, there are special concerns. All these issues may motivate the focal companies to find a way out of outsourcing, and trusted third parties have advantages in professional areas and are invited to help achieve better performance in distribution and logistics.

In the case study, not many companies tend to collaborate with a third party at a high level; such triadic collaboration can only be identified in CC-2 and CC-3 (Figures 5-9 and 5-10).

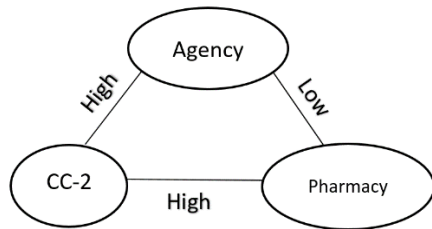


Figure 1-34 Cases of pattern Concerted I

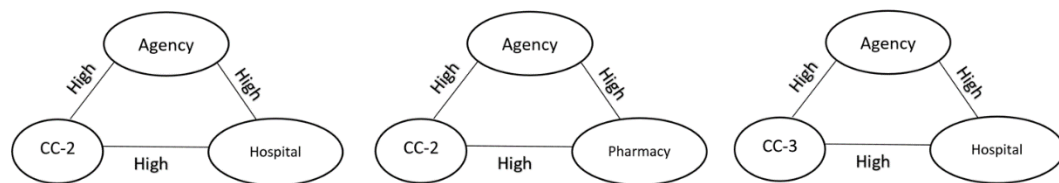


Figure 1-35 Cases of pattern Concerted II

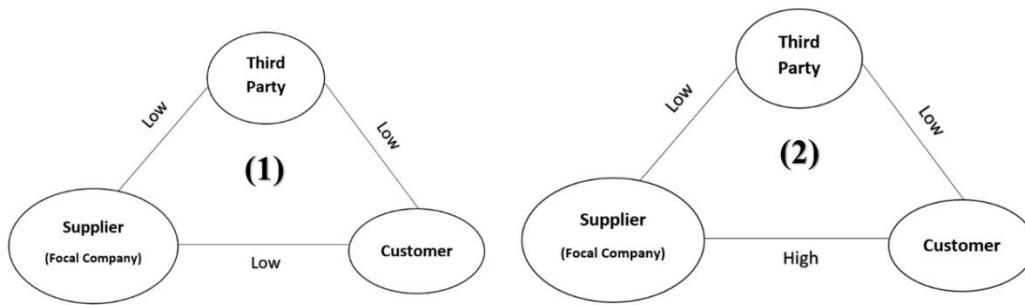
Referring to the introduction to CC-2 in Chapter Four, it is a marketing-oriented pharmaceutical company that has a complete set of distribution systems. It owns an agency company that is equipped with a group of professional sales staff. The agency demonstrated in the case mode refers to the subsidiary, and that is why it can collaborate at a very high level in aspects of decision synchronization and incentive alignment.

CC-2's sales team is mainly assigned to hospital customers, and its job is to introduce its pharmaceutical products to target departments and then to build a long-term collaboration. Once the channel has been opened, CC-2 may leave the rest of the work to its affiliate agency, including *guanxi* maintenance and relevant technical assistance. Any feedback on market demand or information like the adverse effects of certain medicines can be sent by the agency to the focal company. The triad that has been formed is in ***Concerted II***.

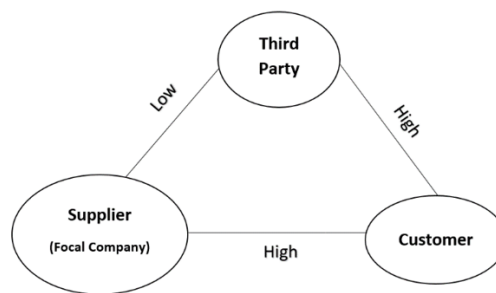
Due to the comparatively high integration in CC-2's downstream supply chain, the demand data can be directly traced in its marketing system and certain priorities can be given to the pharmacy by the focal company. Moreover, there are many other pharmacies that can sell CC-2's products as well. When relevant channels are opened by the focal company, the affiliate agency may be asked to deal with the rest of the issues, including arranging delivery and providing training to retail personnel when needed. Most of the pharmaceutical products sold by pharmacies are OTCs and other common medicines that can be stored in a normal environment. The agency does not have to communicate much about the details other than the products ordered, and the collaboration between the agency and an ordinary pharmacy is not at a comparatively low level. The collaboration triad is in ***Concerted I***.

CC-3 is an R&D-oriented pharmaceutical company, and its core businesses are about R&D in new drugs and technology transfer. It produces several varieties of medicines, but when compared to the other case companies, CC-3 does not have many launched-to-market products in its brand. CC-3's products are known by hospital consumers and the company is in a good relationship with some hospitals due to the joint work in R&D and business connections in clinical trials. Agency companies are treated as important partners to the focal company in product distribution. CC-3 does not quite lean on the agency companies to expand its market. It is generous in sharing and collaborating when there are trusted agencies. Thus, the triad that can be identified in CC-3 is in ***Concerted II***.

(2) *Derived collaboration triads*



Derived I



Derived II

In derived collaboration triads, from the perspective of the focal company the third party is involved as a regular service provider in a common business connection. The third party as a service provider is usually *invited* by the focal company. The tasks given to the third party are normally derived from the non-core business from an overall perspective. In this collaboration, only information relevant to the derived business will be shared; the pathway (supplier–third party–customer) derived from the main line (supplier–customer) is in charge of different but relevant work that may add value to the focal company’s current business. The relationship between the focal company and the customer in the main line does not really have an impact on collaboration in the derived business.

In the case study, the focal company tends to collaborate with any other third parties for its common business at a comparatively low level. The triadic collaborations formed are in *Derived I* (Figures 5-11 and 5-12). *Derived II* (Figure 5-13) is not commonly seen, and the details will be further illustrated.

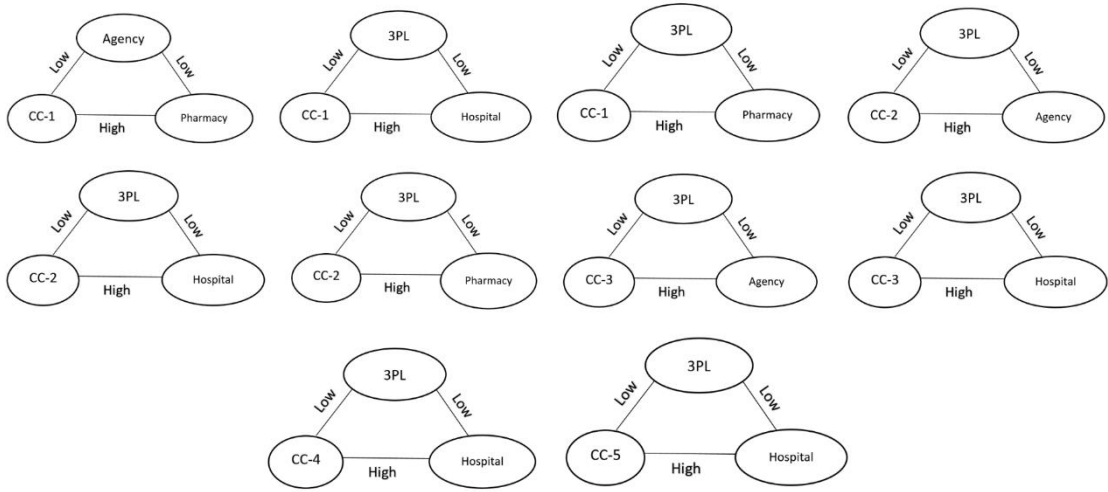


Figure 1-36 Case mode in pattern Derived I (1)

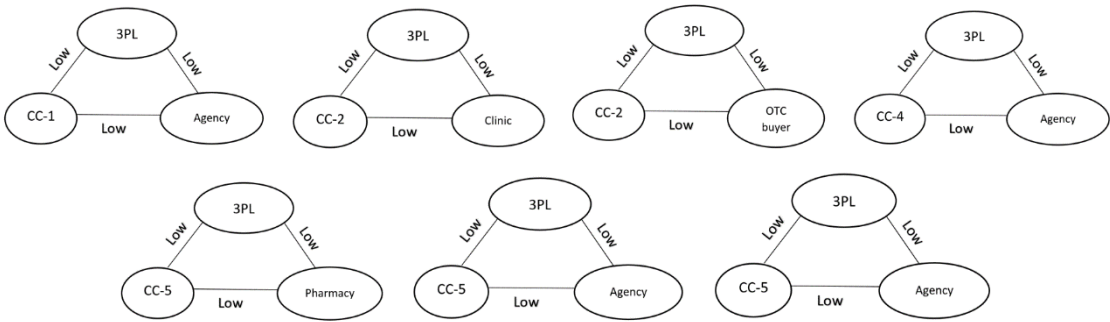


Figure 1-37 Cases mode in pattern Derived I (2)

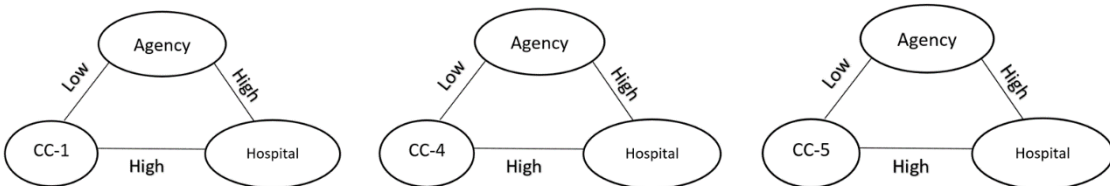


Figure 1-38 Case mode in pattern Derived II

Referring to Figures 5-11, 5-12 and 5-13, most of the third parties involved in the downstream supply chain of the pharmaceutical industry are 3PLs in logistics and agency companies in sales.

The involvement of 3PLs can bring about benefits to the focal company like cost saving and operational efficiency. Case companies do not deny that the 3PL plays an important role in their business, and most of them (CC-1, CC-2, CC-3 and CC-5) have stated that more than 90% of their deliveries have been outsourced to 3PLs. The 3PL partner could be any qualified company and there is no particular preference. The collaborations of the focal companies with 3PLs are at a low level compared to other strategic partners. The benefits of collaborations to the focal company can be reflected in pricing and in the priority of the services provided; and to the 3PLs, a certain amount of traffic can be guaranteed in a set period. The focal company and 3PLs do not work together for delivery, and the focal company makes the plan and then arranges and distributes the order to collaborating 3PLs. The 3PLs must work according to their contracts and are not able to interfere in any decision making by the focal company. The relationship of the focal company and its customers will not have an impact on its collaborations with 3PLs; when there is an order that needs to be delivered, the collaborating 3PLs are the first selected to do the job.

“We have to work with 3PLs, and we are satisfied with their performance so far. They are much more professional than us in logistics, and they have more vehicles with skilful drivers. Some of our products have to be stored at a low temperature; and even in delivery, the temperature control is significant to guarantee the quality. As a pharmaceutical manufacturer, if we want to do the deliveries by ourselves, it would cost a lot.” (General manager, CC-1)

“Most of our products can be delivered by 3PLs; all medicines have been well packaged and the packing materials are well selected from the qualified providers according to relevant standards. Only when the packages are in a damaged condition, the quality may be sensitive to the environment of delivery; or they can be processed in any regular logistics routine.” (Manager in production department, CC-2)

“We collaborate with many 3PLs, but only in order delivery. I know some large 3PLs can provide value-added service in logistics and even in system design; that is expensive, and in the current stage, we do not need that high-level service.” (Manager in marketing department, CC-2)

“We are a small pharmaceutical company and we only have two production lines. Most of our money is invested in R&D and relevant marketing. It is impossible for us to spend more money on logistics. You should know that, if the products only have to be delivered in this region, we may be able to do that. But what if the products are ordered by customers in other provinces far from the city? 3PL is the best choice for us, and almost all of our products are delivered by them.” (CEO, CC-3)

“Normally, we don’t deliver by ourselves. We may do delivery for some emergency small orders in the city, but very seldom.” (Manager in marketing department, CC-5)

The relationship of the 3PL and the consignee (the customer) is a regular business connection, although some of the 3PLs indicate that when they believe the consignee could be a potential customer, they will try to keep the connection with it. The collaboration to be built is only in their professional area around logistics.

“We have many customers in different industries, and customers in the pharmaceutical industry occupy a certain preparation. In collaborations, we do not have much power in negotiation, and sometimes we have to offer some favourable conditions to maintain the relationship.”

“We usually will conduct communications between our customers, not only the ones who pay us, but also the ones who sign for the delivery. If possible we would like to have further collaborations with any party who is interested in our service.” (Regional manager, 3PL-DB)

“Companies in the pharmaceutical industry are not our main customer group, but still we take seriously the collaborations with them. We do not have much bargaining power, and we have to compromise in some situations.”

“We do not offer any other service but delivery. And what we can ensure is to deliver the goods to the set address in time.”

“Most of our customers are small to medium-sized companies. In the peak period, sometimes we may give priority to customers of a comparatively large size.” (Regional manager, 3PL-YZ)

“When it is required, we may design the plan of logistics for our customers, but not very often.”

“We can provide cold-chain transportation, and we have a certain number of customers from the pharmaceutical industry.”

“We do not have much bargaining power in business; without breaking our bottom line, we can concede on some aspects.” (Regional manager, 3PL-ZX)

Above all, the formation of a collaborative pattern in *Derived I* is in a way due to the *outsourcing of logistics* by the focal company. The three parties are associated with each other, but the involvement of the third party will not affect the other two parties in their professional business aspects.

Agency companies in the pharmaceutical industry in China are special customers. When they decide to build a business connection with certain pharmaceutical companies, they have to purchase from that company and then further distribute the products to customers in the following tiers. When the goods have been transferred to

the agency company, the risks of poor sales and the responsibility for relevant distribution will be transferred at the same time. The focal company will not take part in the sales activities of the agency company. In different distribution channels, the focal company will not interfere in the relationship building of the agency company and the customer. When the relationship of 3P and customer is with a low degree of connection, the triad is in *Derived I*; and when the collaboration is to a high degree, the triad is in *Derived II*.

5.2.5 Summary of configuration patterns

The research results have indicated the general formation structure of triadic collaboration (Figure 5-14). Based on an existing collaborative dyad, any party involved in completing or supporting the business is regarded as a third party, which is connected by a pathway and can be bridged with the existing partner of the focal company. A summary of the configuration patterns of triadic collaboration is provided in Table 5-6.

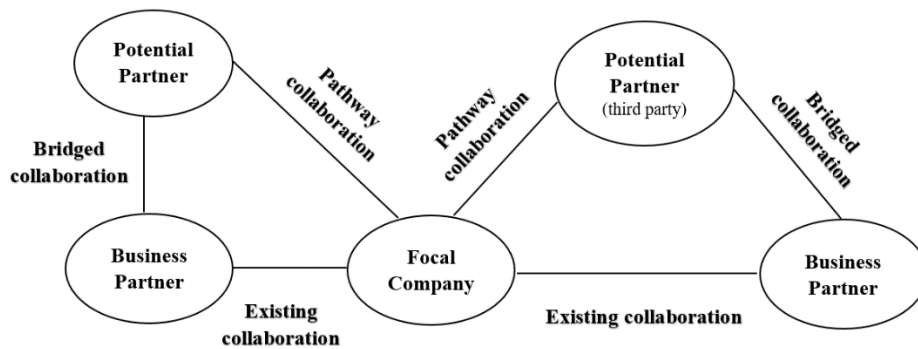


Figure 1-39 Formation of triadic collaboration

The degree of collaboration in Table 5-6 is presented in the order of *existing dyad collaboration*, *pathway dyad collaboration* and *bridged dyad collaboration*. “H” represents high and “L” represents low.

Table 1-28 Summary of triadic collaboration patterns

Triadic Collaboration Pattern		Degree of Collaboration	Application	
Upstream	<i>Directed</i>	<i>I</i>	HLL	<ul style="list-style-type: none"> ▪ Common in R&D segment; possible in procurement segment. ▪ Project requires specific support in business (for example facilities, technologies and other services); pay-to-work business. ▪ Temporary.
		<i>II</i>	HLH	<ul style="list-style-type: none"> ▪ Possible in procurement segment. ▪ Business introduced by high-level trusted partners in collaboration (usually are subsidiaries or other parties in control). ▪ Can be constant.
	<i>Cultivated</i>	<i>I</i>	HHL	<ul style="list-style-type: none"> ▪ Common in R&D segment. ▪ Project requires long-term support in a certain business; or mutually founded case in early stage of business. ▪ Can be constant in a certain period.
		<i>II</i>	HHH	<ul style="list-style-type: none"> ▪ Common in R&D segment. ▪ Mutually founded project; emergent project requires quick and effective response on certain issues. ▪ Can be constant in a certain period; can be temporary.
Down-stream	<i>Concerted</i>	<i>I</i>	HHL	<ul style="list-style-type: none"> ▪ Possible in distribution segment. ▪ Business with ordinary customers (small scale ordering and discontinuity; low-profit project or business). ▪ Can be temporary.
		<i>II</i>	HHH	<ul style="list-style-type: none"> ▪ Possible in distribution segment. ▪ Business with important customers (comparatively large-scale ordering or stable ordering in contract period; high-profit project or business). ▪ Usually constant.
	<i>Derived</i>	<i>I</i>	LLL/HLL	<ul style="list-style-type: none"> ▪ Common in logistics segment;

				<p>possible in distribution segment.</p> <ul style="list-style-type: none"> ▪ Business requires specific support (for example facilities, technologies and other services); pay-to-work business. ▪ Temporary.
		<i>II</i>	HLH	<ul style="list-style-type: none"> ▪ Can be common in distribution segment. ▪ Business in starting phase (business on trial). ▪ Can be temporary, depends on the result of the trial (business performance).

In Table 5-6, in the upstream and downstream supply chain, collaborations in R&D and the procurement segment can change dynamically. According to the different requirements of the business, triads can be formed and maintained in different patterns. Based on an existing dyadic collaboration, a third party like a pay-to-work business is usually in a low-collaborative relationship; the collaboration degree of the bridged relationship depends on the way in which they are introduced to each other – actively or passively bridged. Being actively bridged refers to a third party that originally has a good relationship with the existing partner; being passively bridged refers to a third party that is introduced by the focal company to the existing partner as the requirement in certain situations.

This research has indicated that the means of involvement is affected by the purpose of the triadic collaboration and the role that the third party is expected to play within it. Therefore, in section 5.3.2, this research will discuss partner selection in the establishment of triadic collaboration. The details of triads’ interconversion will be further discussed in section 5.3.3. However, the formation of triadic collaboration will be introduced in the next chapter.

5.3 Selection of Triadic Collaboration Pattern

In the previous section, four types of triadic collaboration patterns were identified: directed collaboration triad (upstream), cultivated collaboration triad (upstream),

concerted collaboration triad (downstream) and derived collaboration triad (downstream). Most of the triadic collaborations formed upstream are motivated by certain R&D projects (Ateş et al., 2015) or associated relationships based on existing close business connections. A number of triadic collaborations formed downstream are mainly due to outsourcing activities (Ross et al., 2005; Soinio et al., 2012; Sojka et al., 2001) or power delegation to a trusted distributor in the downward tiers. The triads can be regarded as the extension of a mainline business in the supply chain, and all new involvements of any existing unions are third parties. The main purpose of involving other participants in a certain project or process is to enhance the performance of relevant activities from a strategic consideration. The selection of a proper triadic collaboration partner is important to business development.

5.3.1 Rationale of partner selection in triadic collaboration

According to the summary illustrated in Figure 5-14 and the triadic collaboration pattern introduced in previous sections, a conceptual diagram of how to pick a triadic partner can be mapped as in Figure 5-15.

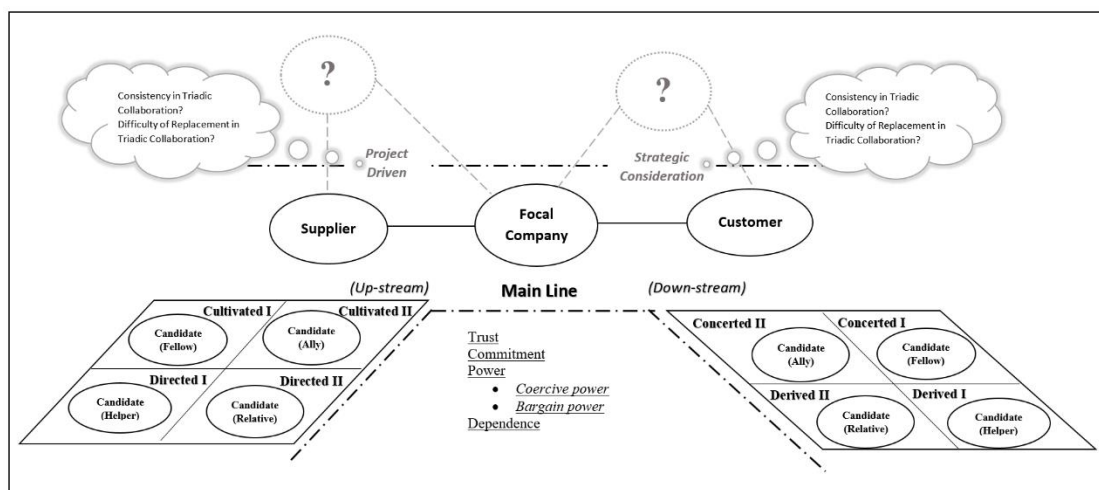


Figure 1-40 Conceptual diagram of partner selection

Theoretically, there could be many candidates (Amorim et al., 2016; Büyüközkan et

al., 2008; Hosseininasab and Ahmadi, 2015) waiting for selection by the focal company in the supply chain. With strategic considerations (Baloh et al., 2008; Siew-Phaik et al., 2013), the focal company has to make it clear why it wants to involve the third party, and what type of triadic collaboration can be formed.

According to the proposed conceptual framework, there are four factors of *trust*, *commitment*, *power* and *dependence* that can have an impact on the level of collaborative relationship that the alliance intends to have. It has been indicated that the collaboration initiators intend to outline the criteria for partner selection on that basis, which can dynamically change and then influence further collaboration extensively.

It has been highlighted that trustworthiness is dependent on principles like the likelihood of achievement of goals or based on established commonalities (Jarratt and Ceric, 2015). Trust between contracting parties is at different levels in certain industries with particular patterns (Sartorius and Kirsten, 2005). Commitment is closely associated with trust and power (Brown et al., 1995; Morgan and Hunt, 1994), which was defined as an enduring desire to maintain a valued relationship that can affect the performance of the partners. The higher the level of trust and commitment, the greater the enduring desire to maintain a valued relationship. Therefore, it can be argued that trustworthiness is built on traceable valued characteristics or features of certain parties in achieving goals and the willingness to maintain collaborative relationships.

During the research interviews, the case companies delivered the very important information that trust is the fundamental factor for any business connection. They tended to refer to the business record, reputation, history of collaboration, capability, productivity, business scale and other potential issues in negotiation and decision making. Trust is built based on such marketing research, and various degrees of commitment will be given to different parties.

There is no written standard in their business practice, and the rule that has been set in partner selection is not always fixed. It could be a two-way selection when considering the factors of power and dependence. Normally, there are two types of power that should be considered – *coercive power* and *bargaining power*. Coercive power refers to the power that a focal company holds to make other parties in collaboration do the jobs it requires, which also in a way represents the power of control.

Bargaining power refers to the degree to which the focal company is able to benefit from the collaborative relationship. Both types of power are usually considered in the exploration of a supply chain collaboration (Hughes-Morgan and Yao, 2016; Liu et al., 2010b; Sheu and Gao, 2014). In the power-dependence matrix created by Cow (cited by Chicksand, 2015), the asymmetry of power between two parties can affect the level of their interdependence in business and thus influence the development of collaborations.

Based on the existing framework of trust and a commitment matrix (Liu et al., 2010b) and power-dependence matrix (Chicksand, 2015), questionnaires were designed in advance and practised in the pilot study. Basic features of the four factors in partner selection could be interpreted from the results of the first-phase analysis. In phase two studies, the same questions relevant to partner selection were asked in the interviews and verified in surveys. By applying the data analysis technique of pattern matching and explanation building, this research was able to match features and levels. The details of selection criteria can be referred to in Table 5-7.

Table 1-29 Criteria of triadic partner selection

Factor	Level	Feature
Trust	High	<ul style="list-style-type: none"> • With very/good business record/reputation in the field. • Previous experience in a similar project. • Ability to complete tasks on time with high quality. • Good capability in problems solving. • Historical business connection (at high frequency). • Business at a certain scale. • Other good features. <p><i>(At least 3 features – high; 3–5 features – higher; 6+ features – highest.)</i></p>
	Medium	<ul style="list-style-type: none"> • With good/not bad business record/reputation in field. • Able to complete tasks on time with high quality. • Able to respond to certain problems to a good degree. • Historical business connection or

			recommended by close partners with a business connection.
		Low	<ul style="list-style-type: none"> • With good/not bad business record/reputation in field. • Able to fulfil certain tasks on time with acceptable quality. • Able to respond to proposed requirement. • Able to report problems and respond to them. <p><i>(3+ features – low; 1–2 features – lower; no features – lowest.)</i></p>
Commitment		High	<ul style="list-style-type: none"> • Show high willingness/interest in collaborating. • Actively create an opportunity to make possible collaboration successful (planning, concession, arranging meeting and so on). • Previous collaboration experience. • Previous collaborative achievement. • Other performance can contribute to convincing the focal company of an ongoing relationship that can be built. <p><i>(At least 2 features – high; 2–4 features - higher; 4+ features – highest.)</i></p>
		Medium	<ul style="list-style-type: none"> • Show willingness/interest in collaborating. • Able to meet and have further discussions on a certain project. • Understand the principle of collaboration (able to concede in certain situations).
		Low	<ul style="list-style-type: none"> • Show little willingness/interest in collaborating. • Would like to talk when there is a certain outline of a project and able to make concessions to a certain degree. • Low switching costs (able to build business connections with others easily or do not have to work with particular group to survive). <p><i>(3+ features – low; 1–2 features – lower; no features – lowest.)</i></p>
Power <i>(Focal Company)</i>	Coercive Power	High	<ul style="list-style-type: none"> • Able to ask triadic partner to share its resources to a maximum level. • Able to ask triadic partner to respond to any change in decision/strategy making. • Able to ask triadic partner to report its performance regularly. • Able to monitor triadic partner’s work. • Able to stop business connection/collaboration at any time. • Able to make request at any time necessary. • Other requirements of triadic partner. <p><i>(At least 3 features – high; 3–5 features – higher; 6+ features – highest.)</i></p>

		Medium	<ul style="list-style-type: none"> • Able to enquire about triadic partner's progress of work. • Able to interfere with triadic partner's work processing to a certain degree. • Able to make requests at any time when needed.
		Low	<ul style="list-style-type: none"> • Able to meet the triadic partner regularly if needed. • Triadic partner able to have an impact on the focal company's certain decision/strategy making. • Able to ask triadic partner to share certain resources, but usually the focal company has to share as well. • When necessary, the focal company has to concede to a certain degree on particular issues. • On a particular issue, the focal company cannot make the decision by itself, but have to discuss it with the triadic partner. • Other issues that the focal company has to consider about the triadic partner. <p><i>(At least 3 features – low; 3–5 features – lower; 6+ features – lowest.)</i></p>
	Bargaining Power	High	<ul style="list-style-type: none"> • The partner is a comparatively small company in the field. • High competition in partner company's professional area. • About average performance in the field referring to a record. • Newly established company/company about to enter new market. • High to very high commitment in collaboration. • High dependence on partner company. • Other issues may increase the bargaining power of the focal company. <p><i>(At least 3 features – high; 3–5 features – higher; 6+ features – highest.)</i></p>
		Medium	<ul style="list-style-type: none"> • The partner company is in a good relationship with one of the focal companies' current business partners. • Comparatively low-frequency business connection. • Show a certain interest in collaboration (medium commitment).
		Low	<ul style="list-style-type: none"> • The partner is a comparatively large company in the field. • Low competition in partner company's professional field. • Very good reputation with good capability in the field of the partner company.

			<ul style="list-style-type: none"> Trusted partner with frequent business connection in a comparatively high-level collaboration. Low commitment in collaboration. Other issues may decrease the bargaining power of the focal company. <p><i>(At least 3 features – low; 3–5 features – lower; 6+ features – lowest.)</i></p>
Dependence	High	<ul style="list-style-type: none"> In certain projects/regular business, the switching cost is high/very high. Share information/resources to a maximum level. Has been worked with for a comparatively long time in core business processes. One of the top professionals in a certain area with a high degree of trust. Monopoly of certain resources. Other aspects make the focal company depend on the partner company. <p><i>(At least 3 features – high; 3–5 features – higher; 6+ features – highest.)</i></p>	
	Medium	<ul style="list-style-type: none"> Frequency business connection in a comparatively long-term/good relationship in business. A necessary partner in certain business processes, but not unchangeable (when they need to change to other partners, it is not difficult to find substitutes). 	
	Low	<ul style="list-style-type: none"> Never invited into any project. Switching cost is very low. Seldom connect with in business. No particular competitive advantages can be provided. Partner is in a not very significant segment/market. Low commitment in business. <p><i>(At least 3 features – low; 3–5 features – lower; 6+ features – lowest.)</i></p>	

5.3.2 Role determination of the third party

Referring to the criteria and the actual needs of the focal company, the potential candidates are usually pictured in different roles with different characters. Resting on the overall data analysis, the results hint that for different candidates, the difficulty of grouping into an existing business is at distinct levels, and the stability of collaborations

built with those third parties is different as well. The phenomena can be presented in terms of *consistency in triadic collaboration* and *difficulty of replacement in triadic collaboration*. A matrix associated with triadic partner selection can be illustrated in a matrix as in Figure 5-16.

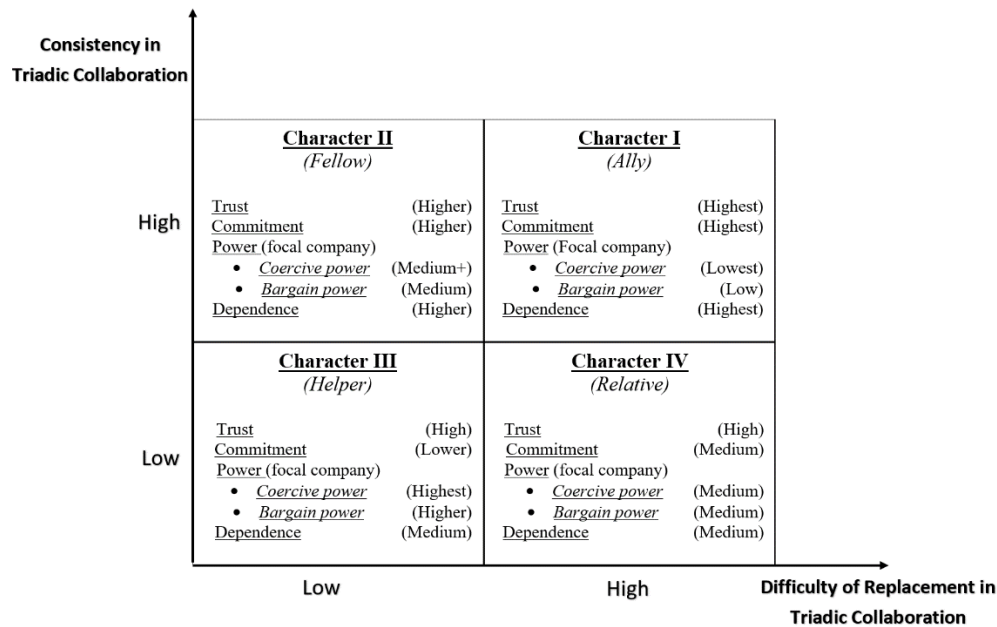


Figure 1-41 Mode of triadic partnership

Referring to Figure 5-16, the roles of the third party are mainly of four types – *Ally*, *Fellow*, *Helper* and *Relative*.

Ally – A highly trusted party, which is capable of co-working with the focal company in its core business with a noticeable contribution.

Fellow – A highly trusted party, which would like to and is able to assist the focal company to achieve certain goals or fulfil relevant tasks.

Helper – A trusted party, which can be invited to execute certain functions of the focal company to complete the mainstream business.

Relative – A trusted party, whose particular performance can be traced based on the mainstream business relationship.

The research reveals that candidates in *Character I (Ally)* and *Character II (Fellow)* enjoy comparatively higher trust and commitment, and the focal company intends to maintain such a collaborative relationship, which can be shown in the high dependence of the business. However, the Fellow partner has to comply with the arrangements made by the focal company without much bargaining power, while the Ally partner with a higher bargaining power is allowed to discuss and negotiate before any decision and action are taken in the collaboration. The candidates in *Character III (Helper)* and *Character IV (Relative)* should be highly trusted parties in the business, but the Relative partner may be given a higher commitment due to their business connection with the existing partner. To the focal company, a certain dependence can be enhanced due to their inertia in business (Huang et al., 2013), but never be at a very high level; and the business model is usually *pay to work*. Collaborations with a Helper partner and a Relative partner are in a contractual relationship (Rahman et al., 2014) and there is not much of a safeguard in the permanent collaboration. And in this situation, the focal company tends to have higher power from both a coercive power and a bargaining power perspective.

The Fellow partner and the Ally partner are more likely to be grouped into an existing project, where their consistency of triadic collaboration is at a comparatively higher level. When a certain triadic collaboration has been built, the Ally partner and the Relative partner are more difficult to replace due to their strategic positions in the business. The Ally partner shares the most information and resources with the focal company, which is risky to replace; the Relative partner is in a good relationship with the focal company's existing partner, to maintain the existing dyadic collaboration and to better fulfil a certain project. It could be difficult to find another Relative partner that can be trusted by both existing parties in the collaboration.

The Helper partner is not easily integrated into a triadic collaboration; it is the ability of the Helper partner that can assist in constructing a triad, but mostly in supporting only work that does not touch on many strategic issues. The low consistency of this triadic collaboration and its less strategic position make it comparatively not quite as difficult to replace in a triadic collaboration.

5.3.3 Partner selection from a dynamic perspective

The research evidence shows that in the initial stage of a triadic collaboration, partner selection is acknowledged to proceed in line with the requirements at present. In a certain period, the partner selected is fixed within an established collaboration. Partners in different roles are expected to bring about various benefits to the whole business, and can have a direct impact on the configuration pattern in the formation of a triadic collaboration. However, this could dynamically change (Ateş et al., 2015) due to the ending of a certain project or any other strategic considerations.

In this section, partner selection in building a particular triadic collaboration pattern will be discussed from a dynamic perspective rather than a static view.

(1) Partner selection in the upstream supply chain

If a party can be highly trusted and shares beliefs (Ming et al., 2014) in developing a common value system, it is said to be very significant for collaboration sustainability. When the candidate shows a great interest in collaboration and would like to sit together for further discussion, it is a good sign for the focal company to strive for the initiative in the integration of the alliance; and such a candidate can be regarded as a potential Ally partner.

As has been argued in the previous discussion, a triadic collaboration is usually built based on an existing dyadic collaboration at a high level; information and resources can be shared to a maximum degree. To achieve goal congruence, regular communications are required, while any decision made by the focal company should consider the partner's comments and suggestions. If the candidate would like to do so as an existing alliance and is allowed by the focal company to further communicate with the existing partner, the three of them can exchange their latest progress without many barriers. They can be selected to join certain mutually founded projects or a project required to pool ideas and resources. The Ally partner is a good choice to be involved in forming a triadic collaboration in *Cultivate II* (a pattern that requires a high level of

collaboration among three participants). The coercive power and bargaining power of the focal company in *Cultivate II* are very low, and this is partly due to the high dependence of the Ally when the triad has been formed.

Referring to Figure 5-16, the Fellow partner can be trusted to a comparatively high level. If in negotiation the focal company is in a way able to have an impact on the mutual business (with comparatively large power in collaboration) and the candidate still would like to work with it, such a candidate can be considered as a potential Fellow. As a Fellow, the candidate may have to consider the arrangements made by the focal company and to make further plans. The candidate should be able to let the focal company know its relevant capabilities in business and all other related basic information to gain trust, and the focal company can select what to tell, but not everything. A candidate regarded as a Fellow can be invited to join a collaborative triad in the pattern of *Cultivated I* (a pattern that requires long-term assistance from the third party for support in a certain business). With the increase in the dependence level and similarity in business, it is possible for the Fellow partner to be upgraded to an Ally partner; it depends on the focal company's strategy making, which will be further discussed in the following section.

To the focal company, when it only requires certain functional support in a specific project, a trusted Helper may be needed for a temporary period. When there is an existing dyadic collaboration for a project, such a Helper may not have to join the project and know every detail of the business. The Helper partner just has to complete the tasks given by the existing alliance and respond to relevant issues. Any candidate parties that can provide required support for the focal company can be the potential Helper. And the involvement of the Helper partner can build a triadic collaboration in *Directed I* (a temporary pattern for particular requirements). The trust level can be enhanced in line with the increasing number of collaborations, and it is possible for a Helper to be involved as a Fellow when the focal company believes it is the right time.

There is one type of company that is introduced by a high-level trusted existing partner of the focal company. The involvement of such a company could be the requirement of a certain mutual project or motivated by an emergency decision that needs relevant support in a short time. Based on an existing high-level dyadic collaboration, the focal company may not have to pay much attention to relationship

establishment and maintenance, as they can count on the existing partner that introduced the third party. This type of company is the Relative partner. The triad that can be built with the Relative partner is in *Directed II* (a temporary pattern at the beginning, but can be constant in a long-term project). When the focal company is satisfied with the traceable record of the Relative partner's performance, the relationship between the Relative partner and the focal company can be promoted in theory; however, this was not identified in this research.

(2) Partner selection in the downstream supply chain

The research has indicated that in the upstream supply chain, the outsourcing of certain functions is temporary according to the relevant requirements of the project (Ateş et al., 2015). In the downstream supply chain, the outsourcing of certain functions can be constant based on the strategic considerations of the focal company to achieve cost efficiency, operational effectiveness and flexibility (Nystén-Haarala et al., 2010; Sepehri, 2011; Singh and Power, 2009). The principles of third-party involvement downstream are quite similar to those upstream. Compared to partner selection in the upstream supply chain, downstream there are more choices. In the downstream supply chain, the existing close and constant dyadic relationship is built by the focal company and the customer. The main outsourcing activities are distribution and logistics, and the third parties to be involved are agency companies and 3PLs.

Candidates that can be involved as an Ally are usually subsidiaries of the focal company or parties partly controlled by the focal company. To capture the market (Qu and Yang, 2015), the focal company has to avoid uncertainties; for this it is essential to select parties that can be trusted at a very high level.

In this research, it is argued that a very high level of collaboration can be achieved by vertical integration (Leavy, 2006; Peyrefitte et al., 2002b). When the customers and the market are very important to the focal company's business, such trusted parties can be involved as the Ally partner. The triad that can be built in this situation is in *Concerted II* (a pattern that can be maintained constantly with a comparatively lower

risk in marketing). Referring to Figure 5-16, in *Character I*, the power of the focal company over the partner should be low. However, referring to theories relevant to subsidiaries and associate companies, if the focal company holds all or most of the shares in certain parties, the focal company is able to control those parties, and its power should be great. Therefore, when the candidate is a subsidiary or party controlled by the focal company, it should be regarded as a special Ally partner. There could be highly trusted parties that can be involved as an Ally to enhance downstream performance. However, it should be noted that this could be risky for the business, since the focal company does not have so much power to control and bargain with the Ally partner. The high dependence may make it difficult for the focal company to find any substitute in a short term.

A highly trusted party that is able to satisfy certain requirements of the focal company and would like to give priority to the focal company's business can be invited to be the Fellow partner in the downstream supply chain. The triad that can be built is in *Concerted I* (a temporary pattern, but one that can be constant in a comparatively long contract period). Compared to the Ally partner, the Fellow partner is only involved to expand the market or to serve the ordinary customers of the focal company. To enhance control of a significant market (Peyrefitte et al., 2002a), it is better for the focal company to hand over marketing-related issues to special Ally partners. When the normal Ally partners begin to lose the trust of the focal company or the focal company can notice threats coming from the Ally partner in marketing, the Ally partner may be gradually demoted to a Fellow partner.

In the downstream supply chain, when a candidate comes to the focal company with existing market resources and traceable, reliable business records, it can be selected as a potential Relative partner. The Relative partner downstream can contribute to the formation of a triadic collaboration in *Derived II* (a temporary pattern that may be applied in the starting phase of a certain business). Referring to the case studies, the results have indicated that when a relevant choice has been made, the focal company tends to inspect that for a period. If the focal company is satisfied with the performance of the third party, it may step further into the collaboration. It is also possible for the Relative partner to be formally invited as an Ally partner.

When a third party is not only required to respond to requirements in business

without being appointed, any parties that are able to satisfy the relevant requirements can be regarded as candidates to be a Helper partner. A triad in the downstream supply chain co-built with a Helper partner is in *Derived I* (a temporary pattern motivated by pay-to-work business). In the outsourcing of logistics, it is very common to see 3PLs as a Helper partner. In the triadic relationship, 3PLs do not have much bargaining power in business, although the results show that most of the focal companies have a very high dependence on them in delivery. This may be due to there being too much choice of candidates in the research region, and the switching cost is quite low (Yang et al., 2016); the focal company is highly reliant on the industry, but not on a particular organization.

5.3.4 Role transformation of the third party

Based on the discussions above and referring to Figure 5-16 (mode of partner selection), the transformation of various roles in the different triadic collaboration patterns can be illustrated as in Figure 5-17.

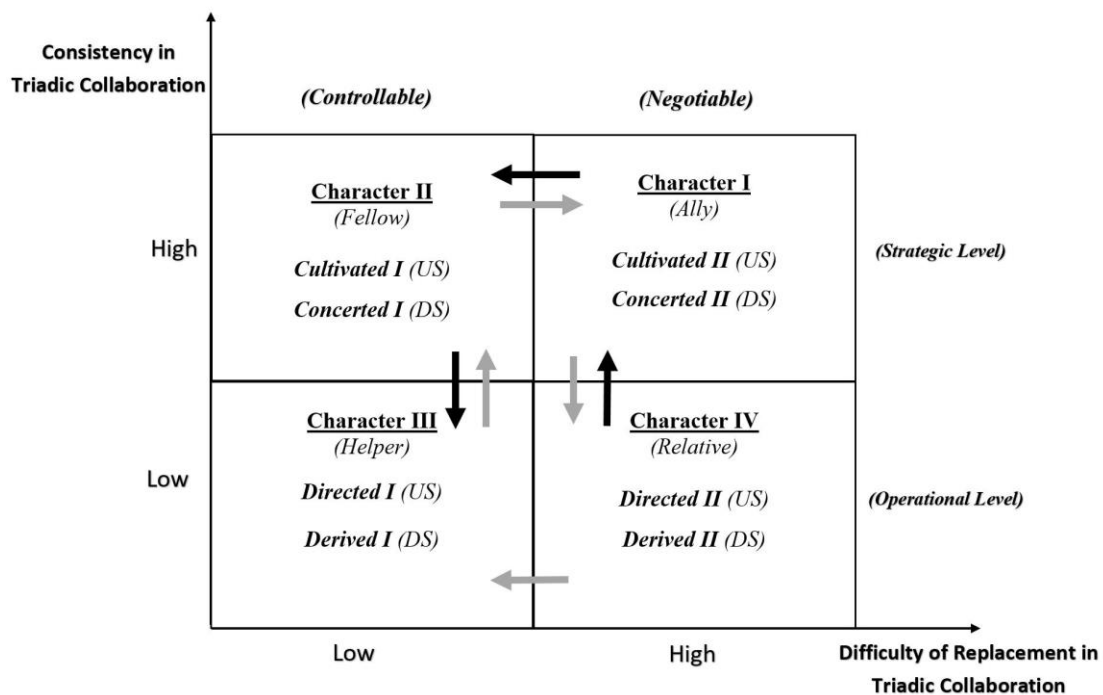


Figure 1-42 Role transformation and pattern selection

Since some of the triads are temporarily built to complete a certain project, the role played by the third party may dynamically change when referring to the requirements of the focal company. Therefore, the triadic pattern could change dynamically as well. The level of a third party's consistency in a triadic collaboration is relevant to the focal company's decisions taken with considerations at the strategic and operational levels.

In Figure 5-17, the research results show that the triadic collaboration patterns can be interconverted at the same level or across different levels. In this section, the details of the interconversion of certain triadic collaboration patterns will be discussed.

(1) Conversion at the same level

Referring to Figure 5-17, at the strategic level, the patterns in ***Cultivated (I, II)*** or ***Concerted (I, II)*** can be a good choice. The third party that is involved is mostly in the character of Ally and Fellow, which can be trusted at a high level and usually shows a strong willingness to collaborate in a certain business. The third party can facilitate both partners with high consistency in the triadic collaboration. However, compared to *Pattern II*, *Pattern I* is more controllable from the perspective of the focal company. In *Pattern II*, the third party tends to follow the arrangement informed by the focal company and then responds to the requirements of the existing alliance. In *Pattern I*, when there are differences within the collaboration or changes in the business, the existing dyadic alliance has to negotiate with the third party involved before they make any decisions.

Pattern I can be changed to *Pattern II*. In the upstream supply chain, it has been discussed and proved that most triadic collaborations are built for a specific project that is temporary (Ateş et al., 2015). In *Pattern II*, referring to the difficulty of replacing the third party in a triadic collaboration, it can be argued that the third party involved should be the one with a good capability for work, and it is necessary for the focal company to keep a constant good relationship with it. In the research, the case studies show that some partners in *Character I (Ally)* can be transferred to *Character II (Fellow)* after the project; and the partners that have been transferred can be a good assistant to the focal company in some other similar projects. In the downstream supply chain, it has been

argued that a high dependence on and a not very high power of the third parties can cause higher risks in marketing. When the focal company is able to sense the threats that come from the third party in marketing-related issues, they may adjust the strategic layout and gradually demote the third party from *Character I* to *Character II*. The focal company will make the connection with the most important customers who have potential, and the third party may not be granted further promotions.

Similarly, *Pattern II* can be changed to *Pattern I* as well. In the upstream supply chain, the Fellow partner can be the potential Ally partner preserved by the focal company. When it is time (certain suitable projects), a highly trusted Fellow can be promoted to an Ally. In the downstream supply chain, if the third party was demoted from an Ally and the focal company is continually losing confidence and trust in it, it is difficult for *Pattern II* not to be changed to *Pattern I* and even the third party could be competent. However, if the Fellow is increased in level from a Helper that is reliable with a satisfied and traceable business record, it may be worthwhile to try to promote a Fellow into an Ally. Or there is another possibility that has been discussed – vertical integration. If the third party can be fully or partly controlled by the focal company, it can turn out to be a special Ally, which is different from the normal Ally; the focal company tends to have high-level power over a special Ally, but lower-level power over a normal Ally.

At the operational level, the pattern in *Directed (I, II)* or *Derived (I, II)* can be a good selection. These patterns are usually temporarily built to satisfy the demands of business in the short term. The involvement of the third party is usually in a pay-to-work mode. The third party's consistency in a triadic collaboration is low, which means that it may only focus on specific issues, but not be given everything from a certain project or business.

Compared to *Pattern I*, the third party in *Pattern II* is more difficult to replace. When considering the collaborative relationship with an existing partner or the requirements of a certain potentially long-term business, it is worthwhile to try to work with the introduced third party, compared to anybody in the service market. In this situation, the credibility of a potential partner is relatively high and it can be trusted. The collaboration with *Character III (Helper)* is more controllable. *Character IV (Relative)* is in a way closely associated with an existing partner and introduced by a certain

mutual demand, and any changes relevant to the collaborative issues have to be negotiated with the existing partner; the focal company cannot make decisions on its own.

At the operational level, *Pattern I* is usually not able to be changed to *Pattern II*. Due to the perspective of the focal company, especially downstream, it may lose control of the market gradually, which is quite risky. The focal company may have to take action to stop this by taking competent third parties into its own team and stopping relevant collaborations with ambitious partners. However, *Pattern II* can be converted into *Pattern I*. The case studies have indicated that in a contractual period, *Pattern II* can be constant, but there is no safeguarding of continuing work. In this situation, it is possible for the third party to be involved in other projects or businesses when required, and it is in a position very similar to Helper partners.

(2) Conversion across different levels

Referring to the literature review, the advantages that can be achieved at the operational level of collaborations are cost reduction/efficiency, effectiveness and flexibility. The advantages that can be obtained at a strategic level are sustainability and opportunity. In line with these research results, it has been indicated that collaborations at an operational level pay attention to immediate interests (quick benefits) and collaborations at a strategic level focus on long-term interests (regeneratable benefits). Theoretically, the interconversion of collaborations at an operational level and at a strategic level depends to a large extent on the decision made by the focal company. To obtain immediate interests, a temporary collaboration with a strong capability in problem solving is enough, like the patterns in *Directed (I, II)* and *Derived (I, II)*; but to strive for long-term benefits, usually a more stable and tacit collaboration pattern is required, like the patterns in *Cultivated (I, II)* and *Concerted (I, II)*.

Compared to *Pattern II* upstream and downstream, *Pattern I* is more controllable. Therefore, the interconversion of collaboration patterns across the operational level and strategic level is more convenient. In the upstream supply chain, a reliable Helper can

be invited to have further collaboration if the focal company is satisfied with its performance, and a long-term contract can be offered to a qualified Helper partner. If the focal company is not satisfied with the performance of a current Fellow company or there is a more important strategic layout, within or after the contractual period the focal company can move the partner down from a strategic level to an operational level.

In *Pattern II*, it is comparatively not that free for patterns to interconvert from one level to another. It may be due to the special position of the third party involved. Compared to third parties in other characters, the Ally partner and the Relative partner have more power to bargain with the focal company due to their higher collaborative relationship with the existing dyadic collaborations. Any decisions relevant to going up or down levels should be negotiated with at least one of them, and the focal company should not make decisions by itself easily. It is very possible for the patterns to interconvert, but it requires relevant negotiations.

5.4 Summary

The first section of this chapter illustrated the four triadic collaboration patterns through the whole supply chain according to various business segments. In the second section, the issues related to pattern selection in the supply chain were discussed.

Generally speaking, in the upstream supply chain there are four types of triadic collaboration pattern: *Directed I* and *Directed II* collaboration triad and *Cultivated I* and *Cultivated II* collaboration triad; and in the downstream supply chain, there are four types of triadic collaboration patterns as well: *Concerted I* and *Concerted II* collaboration triad and *Derived I* and *Derived II* collaboration triad.

All the triadic patterns are built on an existing stable dyadic collaboration between the focal company and a participant in the mainstream supply chain. According to the various requirements of different business segments upstream (R&D and procurement) and downstream (distribution and logistics) for long-term or short-term interests, third parties are involved in supporting the focal company's business development. The selection of a third-party partner is significant to the formation of triadic collaborations, and parties in various characters of Ally, Fellow, Helper and Relative are in different

degrees of trade collaboration, which in a way influences the stability and persistence of a particular triadic collaboration.

The triadic collaboration patterns are not always constant after being established; they can be interconverted at the same level or across different levels in certain circumstances according to the specific requirements of the business or strategic layout. The research results have indicated that besides the operational level, it is difficult for the character to change from a Helper partner to a Relative partner, where *Pattern I* cannot change to *Pattern II*; all other triadic patterns can be interconverted with related patterns.

Chapter Six : Transformation of Collaborations from Dyadic to Triadic Construction

6.1 Introduction

In this chapter, this research will explain more about how triadic collaboration can be built with dyads. Moreover, the impact of outsourcing on the formation of triadic collaboration will be further explained.

In the first section, all possible triadic constructions in various business segments of the pharmaceutical supply chain in this research will be reviewed; the formation of triadic collaborations will be highlighted with further discussion and illustration. Based on the arguments made in the previous chapter, a triadic collaboration is usually built on an existing stable dyadic collaboration, and all the existing dyadic collaborations in the case studies will be listed to better explain the formation of relevant triads.

In the second section, the role pattern played by the focal company in the formation of triadic collaboration will be discussed; the research results have indicated that the focal company tends to have power that can be represented as decision-making authority at different levels, which can have an impact on the means of relationship establishment and maintenance (the selection of triadic collaboration patterns).

6.2 Collaboration Transformation from Dyadic to Triadic

In theory, a triad refers to a construction formed with three entities. Based on the conceptual framework proposed, ideally three interconnected dyads should be established to build a triad. However, besides dyads built with the focal company, usually there is no tie between the other two participants, and sometimes they are in competition (Wilhelm, 2011). The indirectly connected participant can be bridged and formed into a triadic collaboration, but not always.

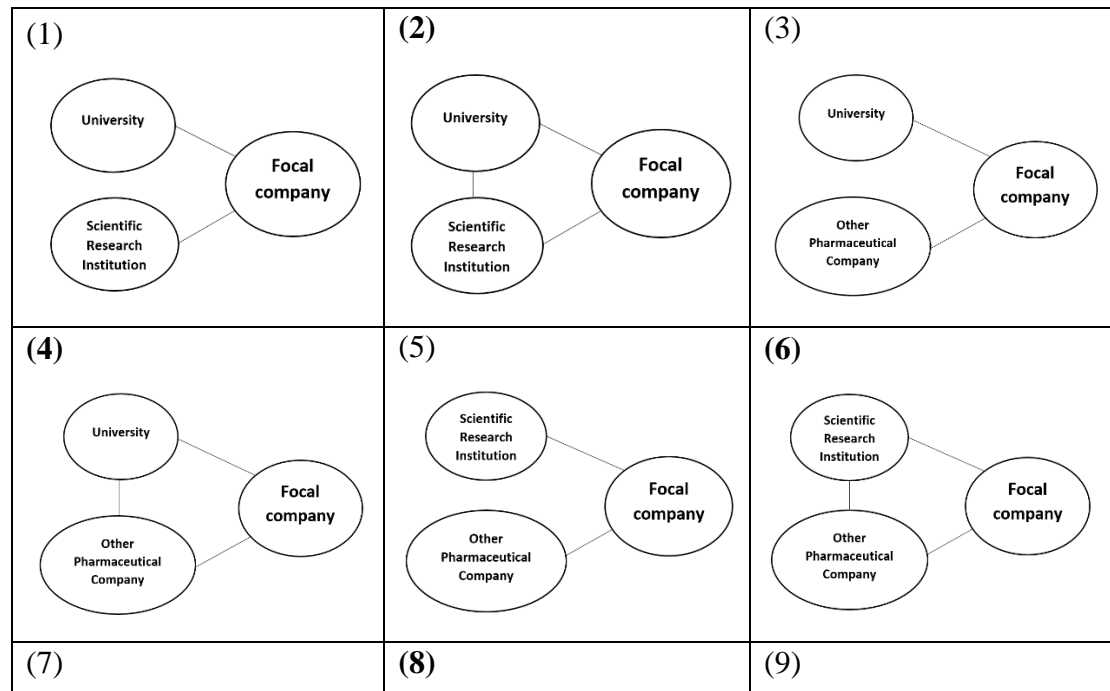
In this section, all possible triadic configurations revealed from the research results

will be illustrated; the transformation of collaboration from dyadic to triadic will be interpreted on a theoretical basis.

6.2.1 Possible triadic configurations in the supply chain

The research identified 18 modes of triads in the R&D segment, 6 modes of triads in the procurement segment and 15 modes of triads in the distribution and logistics segment (39 modes in total; Tables 6-1, 6-2 and 6-3). In triadic collaboration estimation, only when there are direct business connections among the three participants can it be regarded as collaboration. There are 14 modes of triadic collaboration that can be traced in the case study. And according to the summary listed in Table 6-4, a triadic construction does not always mean a triadic collaboration; within the same group of participants, only a few groups can be transformed into a triadic collaboration.

Table 1-30 All possible triadic constructions in R&D segment



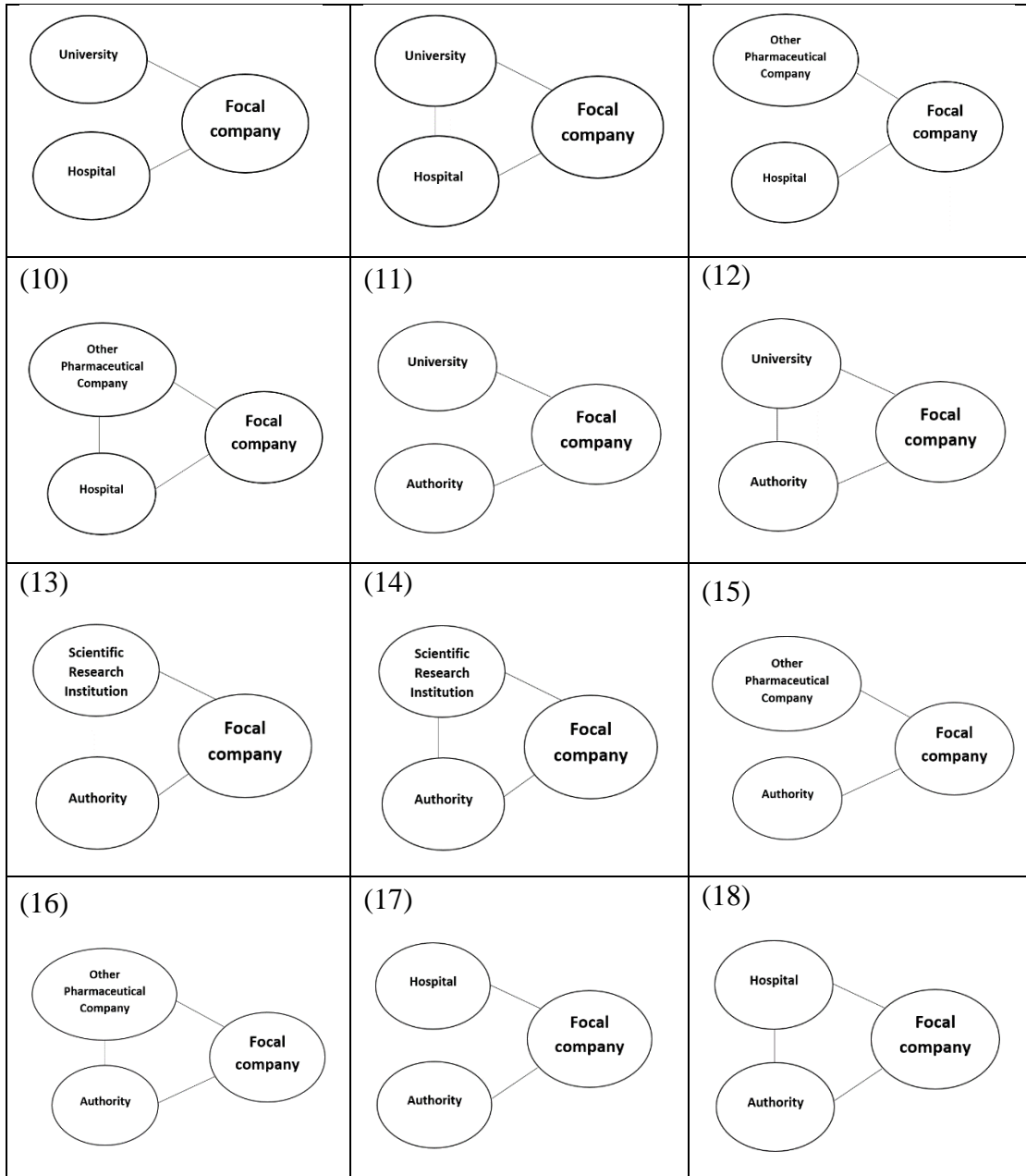
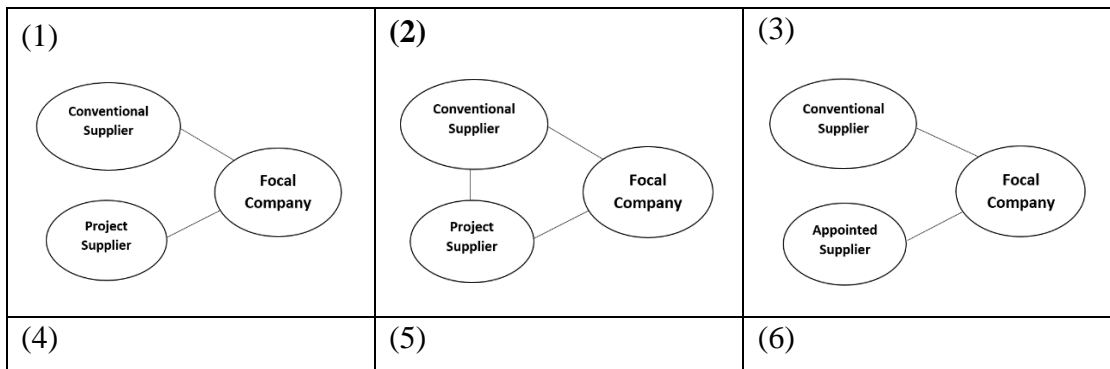


Table 1-31 All possible constructions in procurement segment



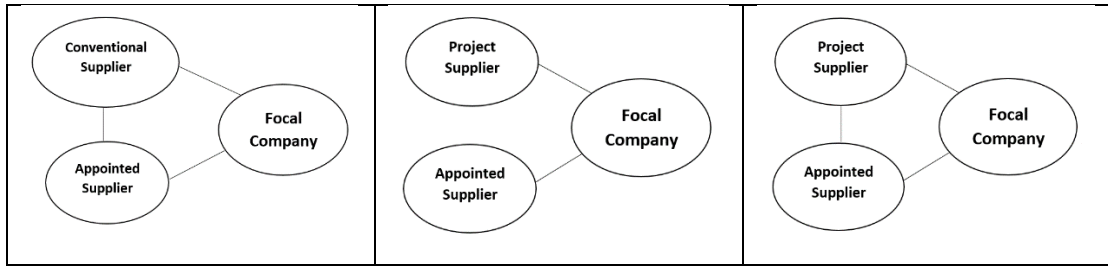
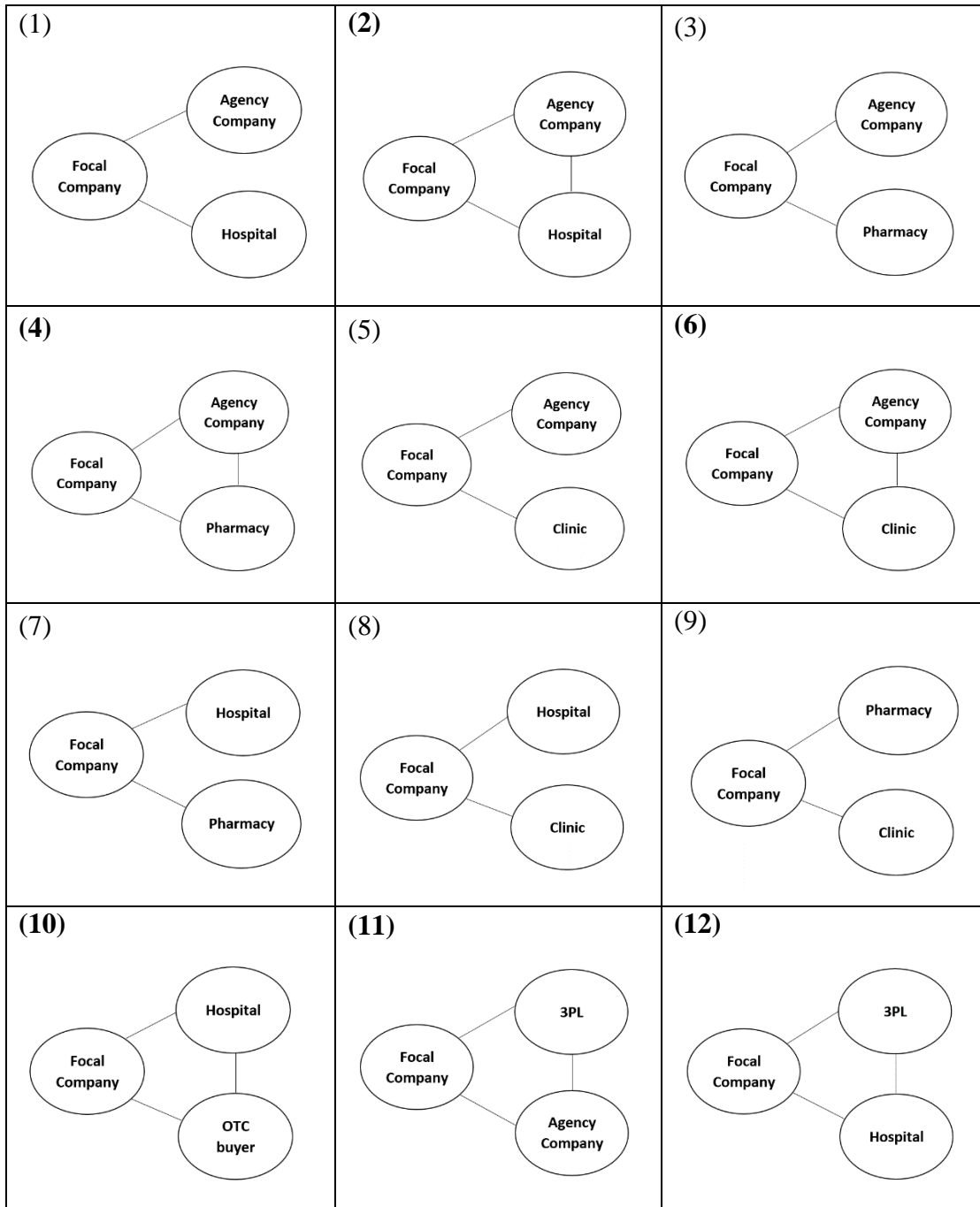


Table 1-32 All possible constructions in distribution and logistics segment



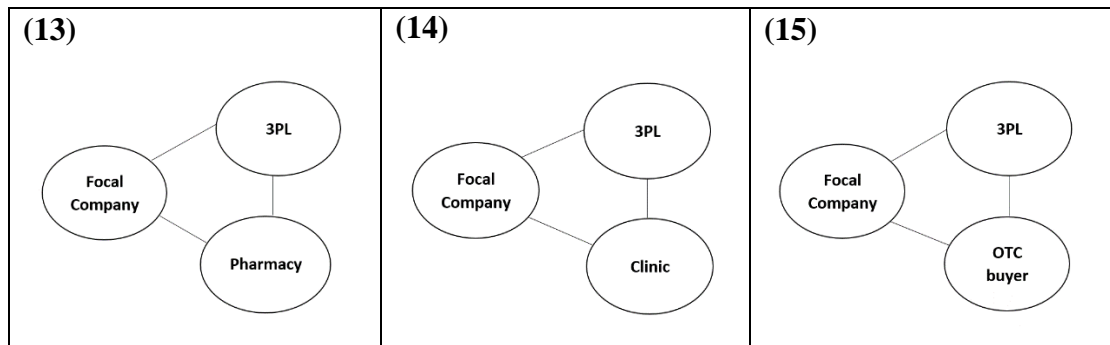


Table 1-33 Summary of traceable triads

	CC-1	CC-2	CC-3	CC-4	CC5
Traceable Possible Triadic Construction	<u>R&D:</u> (1), (2), (3), (4), (5), (6), (7), (8), (11), (13) <u>Procurement:</u> (1), (2) <u>D&L:</u> (1), (2), (3), (4), (7), (11), (12), (13)	<u>R&D:</u> (1), (2), (3), (4), (5), (6), (7), (8), (11), (13) <u>Procurement:</u> (1), (2) <u>D&L:</u> (1), (2), (3), (4), (5), (6), (7), (8), (10), (11), (12), (13), (14), (15)	<u>R&D:</u> (1), (2), (3), (4), (5), (6), (7), (8), (11), (13) <u>Procurement:</u> (1) <u>D&L:</u> (1), (2), (11), (12)	<u>R&D:</u> (1), (2), (3), (4), (5), (6), (7), (8), (11), (13) <u>Procurement:</u> (1), (3), (5) <u>D&L:</u> (1), (2), (11), (12)	<u>R&D:</u> (1), (2), (3), (4), (5), (6), (7), (8), (11), (13) <u>Procurement:</u> (1) <u>D&L:</u> (1), (2), (3), (4), (7), (11), (12), (13)
Traceable Triadic Collaboration	<u>R&D:</u> (2), (4), (6), (8) <u>Procurement:</u> (2) <u>D&L:</u> (2), (11), (12), (13)	<u>R&D:</u> (2), (4), (6), (8) <u>Procurement:</u> (2) <u>D&L:</u> (2), (4), (6), (10), (11), (12), (13), (14), (15)	<u>R&D:</u> (2), (4), (6), (8) <u>Procurement:</u> 0 (No) <u>D&L:</u> (2), (11), (12)	<u>R&D:</u> (2), (4), (6), (8) <u>Procurement:</u> 0 (No) <u>D&L:</u> (2), (11), (12)	<u>R&D:</u> (2), (4), (6), (8) <u>Procurement:</u> 0 (No) <u>D&L:</u> (2), (4), (11), (12), (13)
Possible Triadic Construction Transformed into Triadic Collaboration	<u>R&D:</u> (1) to (2) (5) to (6) (7) to (8) <u>Procurement:</u> (1) to (2) <u>D&L:</u> (1) to (2)	<u>R&D:</u> (1) to (2) (5) to (6) (7) to (8) <u>Procurement:</u> (1) to (2) <u>D&L:</u> (1) to (2) (3) to (4) (5) to (6)	<u>R&D:</u> (1) to (2) (5) to (6) (7) to (8) <u>Procurement:</u> No <u>D&L:</u> (1) to (2)	<u>R&D:</u> (1) to (2) (5) to (6) (7) to (8) <u>Procurement:</u> No <u>D&L:</u> (1) to (2)	<u>R&D:</u> (1) to (2) (5) to (6) (7) to (8) <u>Procurement:</u> No <u>D&L:</u> (1) to (2) (3) to (4)

Any single dyad in a triadic construction represents a business relationship, and they are essentially separate from each other. Contracts are normally negotiated with individual parties for a particular business, and the commitments to various partners are

at different levels. Dyadic collaborations are influenced by the factors of company reputation, business capability, willingness to collaborate (Fynes et al., 2005; Kohl et al., 2015; Tsou, 2013) and so on. It is said that structural holes (Burt, 2000, 2004, 2009) originally exist among all associated parties of the focal company; and in a regular business, the focal company mainly has to pay attention to how to maintain individual dyadic relationships (Choi and Wu, 2009).

Referring to the illustrated triadic constructions, it can be seen that the focal company is in a way able to integrate the business with individual parties, and under certain circumstances the relevant individual parties can be bridged. In the next section, the details of how triadic collaboration can be built on dyads will be presented. Moreover, the possible structure within a certain triadic construction will be identified. Based on the theory of bridges and bridge decay (Burt, 2000, 2004, 2009), the formation of triadic collaborations is expected to be explained from a dynamic perspective.

6.2.2 Transformation in the upstream supply chain

In the upstream pharmaceutical supply chain, there are two segments in the case study – R&D and procurement. The research results indicate that upstream, the main dyadic relationship is supplier–buyer. The core supplier–buyer relationships can be summarized as follows:

R&D segment

University–Focal company; SRI–Focal company;

Other pharmaceutical company–Focal company; Hospital–Focal company;

Authority–Focal company

Procurement segment

Conventional supplier–Focal company; Project supplier–Focal company;

Appointed supplier–Focal company

It has been revealed that upstream the mechanism applied to integrate dyads into triads is a bridge concept (Li and Choi, 2009). Based on the research data, the results hint at two types of bridge: in-segment bridge and cross-segment bridge (Figure 6-1).

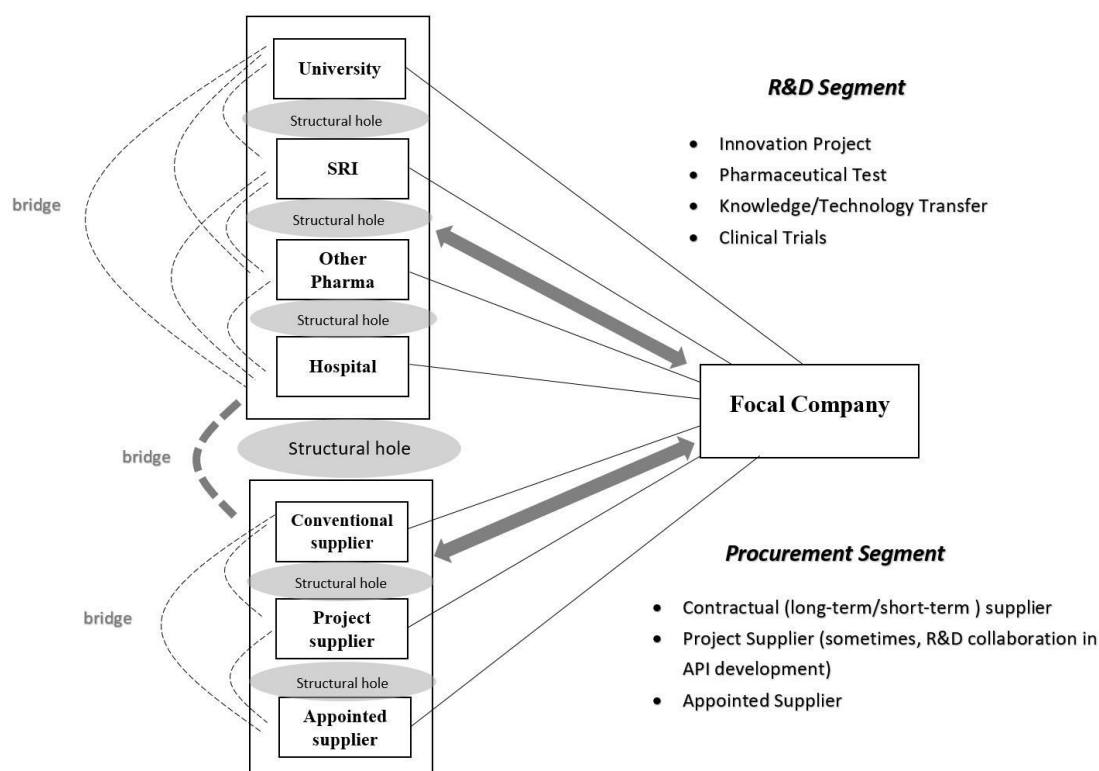


Figure 1-43 Transformation in upstream supply chain

Innovation rests on the R&D segment, which is very important to the sustainable development of the focal company (DiMasi et al., 2016). Compared to other activities in the supply chain, the R&D segment requires more support from technology, ideas and relevant services like pharmaceutical tests and clinical trials. Activities in the procurement segment usually ask for reliable supplies of physical goods or materials. The supplements and functions of various suppliers in these segments are different, and in different cases the significance of the degree of certain supplier-buyer dyads is different as well. In Table 6-5, a general analysis of a supplier's function and its significance to different case companies has been conducted.

Table 1-34 Supplier function analysis

Supplier	Supplement	Significance to Case Companies
University	<p>Ideas: University as an educational research institution has a group of professional tenants; knowledge transfer mechanisms in China (Bebegal-Mirabent et al., 2015) and increasing investment in innovation (Boeing et al., 2016) encourage the university to collaborate more with industry. Some universities hold a certain number of property rights in innovation, and industry can further develop these to save more inputs in and shorten the time in the launch phase.</p> <p>Technology: Appropriate facilities in the university and research staff promote relevant technology to an up-to-date high level. Collaboration with the university is a means of reducing the risks of applying immature technologies.</p> <p>Talent: High-quality educated graduates and expertise in research are the fresh force to enhance industry's sustainability (Bebegal-Mirabent et al., 2015).</p>	<p>Important to case companies CC-1, CC-2, CC-3, CC-4 and CC-5.</p> <p>As a long-term partner, a regular connection between a certain university and the focal company is carefully maintained; some companies (CC-1, CC-2 and CC-5) have even launched long-term cooperation projects with universities in a particular research field to enhance their competitiveness in the market, with quick responsiveness to changes in requirements.</p> <p>When universities have been invited into certain projects, the degree of significance is even updated to a higher level.</p>
SRI	<p>Ideas, technology: Similar to university. However, when compared to the university, SRIs in collaboration are usually specialized in a particular area rather than in all general subjects, which means that in a certain specific direction, working with an SRI could be more efficient in innovation productivity (Boeing et al., 2016).</p>	<p>Important to case companies CC-1, CC-2, CC-3, CC-4 and CC-5.</p> <p>Usually regarded as project partners by the focal company. There is regular communication between the focal company and the relevant SRI, although usually only on general aspects.</p> <p>When there is a particular project that needs support from the SRI, a higher-level collaboration is required. Compared to most of the universities, working with SRIs is more effective, as there are usually no other tasks (like teaching) to distract their concentration.</p>
Other Pharma	<p>Technology: In these case studies, this refers to the relevant mature technologies or intellectual property rights. Some R&D-oriented pharmaceutical companies tend to transfer their technological achievements to others to make products in order to absorb capital in the initial development period.</p>	<p>Could be important, but not always necessary (CC-1, CC-2, CC-3).</p> <p>Case companies tend to have their own R&D team and keep a good relationship with other research institutions. Although it may take a long time for them to develop a new drug, they do not really rely on work with other pharmaceutical companies, in consideration of the relevant risks in further marketing and related subsequent inputs.</p>

		When a certain business connection is built, the other pharmaceutical company could be important to the focal company. However, compared to collaborations with research institutions, the business relationship is much more like a buying-and-selling one; there is little substantive communication other than when a mutual project will be created.
Hospital	Service (clinical trials): A hospital is a special service provider in the pharmaceutical industry. When referring to the relevant regulations, all of the launched-to-market pharmaceutical products must be replicated in clinical trials to ensure safety and effectiveness. Qualified hospitals are trusted as the hosting organizations of these clinical trials.	Very important to case companies CC-1, CC-2, CC-3, CC-4 and CC-5. As an essential partner in the R&D of pharmaceutical companies, the feedback of the hospital is significant to the focal companies to improve their products and make them qualify for the launch-to-market level. Certain relevant reports generated by the hospital are required by authorities in the verification process.
Conventional Supplier (Material)	Excipients and other pharmaceutical materials: These are materials used in the manufacturing process for the purpose of long-term stabilization, or to confer therapeutic enhancement or to enhance pharmaceutical products' performance (Elder et al., 2015; Katdare, 2006). Compared to APIs, excipients are inactive components that are comparatively easier to gain from sufficient suppliers in the market; and the dosage used in pharmaceutical products is higher than for APIs.	Important to most of case companies (CC-1, CC-2 and CC-5), but not irreplaceable. Necessary components in pharmaceutical manufacturing, and essential to most patent medicines. Even required to be certificated by qualified institutions with relevant safety studies, which may be costly and time-consuming (Elder et al., 2015); there are plenty of choices in China's market for the focal companies. With the improvement of China's market supervision system, all conventional suppliers in the pharmaceutical industry have to follow GMP and GSP regulations to update their production and standardize their distribution; the increasingly formal degree of the supplying market in a way helps to reduce the switching cost of focal companies. It is also going to be easier for them to find proper suppliers.
Project Supplier (Material)	API: Important components of pharmaceutical products (Herrmann et al., 2015), which are the drug itself inserted into pharmaceutical products. Compared to excipients and other pharmaceutical materials, ensuring long-term availability of APIs is important in production. Excipients and other pharmaceutical materials (including Chinese herbs): Considering cost and availability, pharmaceutical companies usually have multiple sources of excipients supply (Elder et al., 2015). In this case research, a pharmaceutical company with a Chinese patent	Very important to case companies CC-1, CC-2, CC-4 and CC-5. The API can influence the curative effect to a large extent, which is described as the "soul" of any medicine (R&D manager, CC-2). <i>"To change a supplier of API is comparatively much more difficult than to change an excipient supplier"</i> (General manager, CC-5). If affordable, they tend to buy out the supply of a particular API or further interfere with the supply by a takeover of relevant suppliers.

	<p>medicine production line tends to work closely with particular suppliers, and some of them even have their own planting base (partly/fully controlled by the focal company – CC-1).</p>	<p><i>“Not many pharmaceutical companies have their own planting base, only when their production reached a certain scale”</i> (General manager, CC-5). Thus, to ensure the sustained availability of their production, they have to work closely with certain project suppliers. To have their own planting base or suppliers in control is said to be one of the most secure ways to ensure availability of the required materials.</p>
<p>Appointed Supplier (Material)</p>	<p>Special material (blood plasma): referring to CC-4; all plasma providers are appointed institutions, which are not allowed to provide blood plasma to other companies. Such pharmaceutical products require high-quality logistics from procurement to their finished product distribution.</p>	<p>Very important to pharmaceutical companies in producing plasma products (CC-5).</p> <p>Blood plasma is said to be in a status of <i>“demand exceeding supply”</i> (General manager, CC-5). It has to build its own blood bank to ensure its material supply with the considerations of safety and sustainability. All suppliers are required to sign a contract with the focal company, and commit to supply the focal company only.</p>

Referring to Table 6-5, the research indicates that the focal company as the buyer of services/technology/products (materials) tends to treat suppliers in different ways in regard to the significance of the supplements required. In the previous chapter, it has been argued that in the supply chain, triadic collaboration is always built based on an existing dyadic alliance. Upstream, the relationships of university–focal company, SRI–focal company, hospital–focal company and project supplier–focal company are normally able to be a good base for this, while there are particular projects or special requirements that demand joint working. The suppliers are originally separate from each other; the mechanism of bridging the holes between them can be further interpreted as follows.

(1) In-segment bridge

The dyads formed by the focal company and suppliers in the same segment are usually motivated by a particular functional demand. It is possible that certain different parties can provide similar functional support in a one-segment system (refer to Table 6-5). In a regular business connection, structural holes lie between any two participants, although they may be connected indirectly due to their individual collaborations with the focal company. To bridge the hole between any two parties is the first step in approaching triadic collaboration (Gill, 2014; Li and Choi, 2009; Zaheer and Bell, 2005). In Table 6-6, some identified triadic modes that are able to be further bridged into full triads are listed. There are four main reasons that may contribute to bridging any two parties: ① functional complementarity; ② joint project; ③ introduced by existing partner; and ④ particular requirements.

Table 1-35 Bridges identified in case study

Segment	Triadic Mode to Demonstrate Structural Hole to Be Bridged	CC-1	CC-2	CC-3	CC-4	CC-5
R&D	(1) to (2) University & SRI to be bridged	√ ① ②	√ ① ②	√ ① ②	√ ④	√ ① ②

		④	④	③④		④
	(3) to (4) University & other pharmaceutical company to be bridged	√ ①④	√ ①④	√ ① ② ③④	√ ④	√ ①④
	(5) to (6) SRI & other pharmaceutical company to be bridged	√ ①④	√ ①④	√ ① ② ③④	√ ④	√ ①④
	(7) to (8) University & hospital to be bridged	√ ①④	√ ①④	√ ① ② ④	√ ④	√ ①④
Procurement	(3) to (4) Conventional supplier and project supplier to be bridged	√ ③④	√ ③④			

Possible reasons to bridge: ① functional complementarity; ② joint project; ③ introduced by existing partner (“a friend of my friend is my friend”; Carson et al., 1997); ④ particular requirements.

(2) Cross-segment bridge

In the pharmaceutical industry, in this case study, this research is not able to confirm that there is any cross-segment bridge, where there is no clear evidence to show that the parties in the R&D segment are directly connected with certain material suppliers in the procurement segment. Occasionally, some of the material suppliers may need help in R&D to lead to a better supply, and assistance from the focal company will be given. It is said that when the focal company (buying company) plays the role of mediator or when the buying company is in a very good relationship with the outsourced R&D party, the material supplier usually does not have to be in direct contact with the R&D party. However, when the R&D party is the integrator or it is a team-designed activity, the R&D party and the material supplier can be bridged (Ateş et al., 2015).

In the upstream supply chain, there is a very special supplier (funding supplier) – authority (governmental institution) – which is able to provide the focal company with political support and relevant funding. Referring to Tables 6-1 and 6-4, authorities tend to fund projects launched with universities and SRIs. Once the funding has been released to the focal company, there is usually no direct link between the authority and the other party involved. Moreover, the triadic participants are not eager to bridge the

structural hole that existed. In the interviews, most representatives of case companies presented the viewpoint that in the relationship with government or governmental institutions, they do not have any power except to follow the rules. Some comparatively large companies may be able to make certain suggestions to related institutions, but they do not have the power to interfere in an authority's decision making in any way. This does not mean that triadic collaborations with authorities are impossible. When the authority is not only a funding provider but a project initiator (organizer), participants are driven (forced) to sit together to discuss how to approach certain goals. In this case study, this situation cannot be proved according to the representatives' statements; there is no cross-segment bridge.

6.2.3 Transformation in the downstream supply chain

In the **downstream supply chain**, the formation of triads is mainly due to the involvement of third parties in distribution and logistics. The results show that the main dyadic relationship is supplier–customer. The detailed dyadic modes can be summarised as follows:

Focal company–Agency company; Focal company–Hospital;

Focal company–Pharmacy; Focal company–Clinics; Focal company–OTC buyer

Theoretically, more triads can be built by bridging different customers downstream. However, no one is really trying to do so in the case study. Platforms may be provided for pharmaceutical consumers to give feedback on products, where there is no true strategic alliance among customers in responding to the service or products provided by the focal companies.

The research pinpoints that, in the downstream supply chain, the building of triads is not about bridging existing dyadic relationships, but building a new pathway through outsourcing (Figure 6-2).

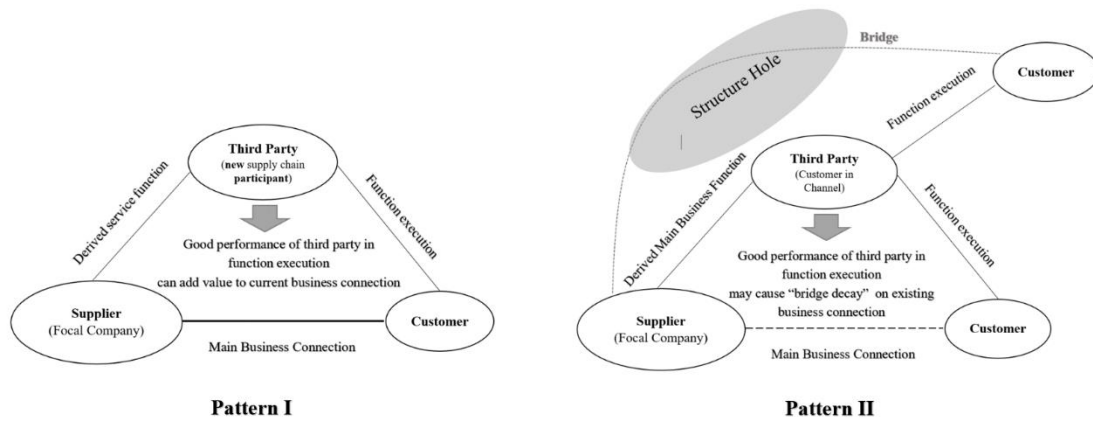


Figure 1-44 Transformation in downstream supply chain

Referring to Figure 6-2, the third parties involved through outsourcing are pharmaceutical agency companies and 3PLs – one is to help the focal company to further distribute products, and the other is to help to deal with all distribution-related logistics. In outsourcing, a third party can be defined as a firm that can provide services in executing certain supply chain functions like R&D, procurement, production, sales and logistics (Azzi et al., 2013; Fixler and Siegel, 1999; Scherrer-Rathje et al., 2014; Teirlinck and Spithoven, 2013). It is believed that outsourcing is a good way to smooth business and enhance cost efficiency (Fixler and Siegel, 1999). What the third parties are asked to do is monitored by the focal company, and the focal company has to be responsible for the performance of the third party to a certain degree. Customers downstream will count in any unsatisfactory issue when purchasing under the name of the focal company.

To construct a triad, it has to be noted that the involvement of a third party does not mean the disconnection of existing supply–demand relationships. Even though more than one of the core functions like R&D and sales tend to be outsourced nowadays, the outsourcing should always be value-added activities (Soinio et al., 2012) to a particular business, rather than depriving relevant core functions to produce a fault in the supply chain.

In this research, it has been noted that most of the agency companies are not a typical service provider to the focal company, as they can also be the customers. Moreover, the focal companies do not pay the agencies for their selling work, and the agency

companies have to be responsible for their own profit and loss. Agency companies make orders to the focal company according to their market forecast. Once the pharmaceutical products required have been transferred to the agency company, the relevant duty of further distribution and risks of poor sales have been transferred at the same time.

Above all, two types of outsourcing that contribute to the transformation from dyads to triads can be summarized, which are non-core business outsourcing (Pattern I) and core business outsourcing (Pattern II). The details of how a third party may be involved will be further introduced with evidence as follows.

(1) Transformation through non-core business outsourcing (service function outsourcing) – Pattern I

Business processes can be transferred into smaller standardized tasks (Gerbl et al., 2015) and thus outsourced to lower-cost vendors. In the pharmaceutical industry, logistics services are regarded as a non-core business and tend to be outsourced (Rees, 2011); the money and resources saved can be reinvested into core businesses like R&D and production. The motivation to outsource logistics to 3PLs can be concluded to be economics, flexibility in operation, capability building and risk reduction (Ateş et al., 2015; Rahman and Korn, 2010).

In the downstream supply chain, the cost of logistics could be high. Pharmaceutical products made by case companies can be sold to different regions in China, and the volumes required vary according to different customers. Compared to general freight, more attention has to be paid to the logistics of pharmaceutical products. Some biological medicines are sensitive to the degree of temperature and humidity; thus, vehicles equipped with professional facilities are required. Delivery performance can have a significant impact on customer satisfaction (Rahman and Korn, 2010). To ensure the quality of delivery, pharmaceutical manufacturers have to invest a lot in building logistics infrastructure, preparing vehicles and drivers, training relevant staff and so on if they want to do the work themselves.

With the involvement of 3PLs, the focal companies do not need to spend much on logistics-related issues. 3PLs are able to provide a professional service and execute the delivery function of the focal company to send products to given addresses. Although focal companies have to pay for the service, compared to the possible sum of inputs to maintain a function in logistics themselves, outsourcing is a much more economical and practical way.

Currently, there are many 3PLs in China that can be chosen by the focal companies; delivery can be arranged to anywhere whenever it is required. Moreover, with the development of information technology (Kumar et al., 2006) and the application of technologies like radio frequency identification (RFID) and Global Positioning System (GPS), 3PLs' performance can be better monitored and outsourcers are able to coordinate their business in a more flexible way.

When cost can be reduced in non-core business activities, more flexibility can be given to the focal company in arranging its work, as it is more likely to focus on its core business in strategic considerations (Rees, 2011), like enhancing capabilities in innovation and production in the pharmaceutical industry. For some marketing-oriented companies like CC-2 and an R&D-oriented company that is trying to complete its market channels like CC-1, a comparatively large amount of money has been invested in the distribution segment.

In delivery, there could be many uncertainties that cause order delays (Ateş et al., 2015). The involvement of 3PLs cannot change the fact of certain risks existing; however, the possible risks can be transferred.

(2) Transformation through core business outsourcing – Pattern II

To define the core of supply chain management, Rees (2011) pointed out that the core business is the mission to support the sustainable development of a certain industry with continual delivery of competitive advantages; in the downstream pharmaceutical supply chain, business processes relevant to marketing can be recognized.

In this case study, it can be found that in the downstream supply chain, agency

companies can be treated as one of the most important channels of pharmaceutical products distribution in China (PwC, 2009). The sales function can be transferred to a third party for marketing, and the agency group is the middle customer, but is also a marketing service source provider. Referring to the level of *market difficulty (MD)* and *financial importance (FI)*, a guideline for sourcing in a marketing service procurement segment can be identified (Rees, 2011). When there is comparatively high MD, close relationships are suggested to be estimated, no matter how much it may cost. When the MD level is not very high, acquisitions or regular trading can be made dependent on how much money you would like to pay, and no close relationship is required.

CC-2 is the only case company that owns an agent and a retail chain, and at the same time it tends to have a good relationship with most of the other agency companies. CC-1 and CC-5 have their own sales force but still would like to keep a good relationship with agency companies to further solidify or expand their markets. CC-3 focuses on R&D and it does not have many products; it usually trades with agency companies in a regular business relationship. CC-4 mainly relies on its own marketing team; regular business relationships are maintained with most of the potential agency partners. In the interviews, it can be noticed that most of the managers do not deny that dyadic relationships with agency companies are dynamically changed according to MD; there is no clear evidence to show that FI is significant to case companies' decision making in maintaining or upgrading their collaborative relationships.

"We do need to work with agency companies, but we do not always rely on them. We make efforts to enter the markets and tend to keep our position in control. Agency companies are welcomed to purchase, and if they are able to promote our selling that would be great. Usually, we will not take time and money to ask for collaborations with an agent." (General manager, CC-1)

"We have a lot of pharmaceutical products; it is impossible for us to distribute all of them by ourselves. To work with agency companies is very important to our business... on some occasions, we do not have much bargaining power in our collaborations, and we need their help to access some regional markets and to promote sales. We may give favourable prices to some agent companies, and relevant profit losing could be the expenses you mentioned in the business process. However, as long as we are profitable, we do not really care about the expenses. In the long term, usually we benefit." (General manager, CC-2)

"To collaborate with an agency company is a process of two-way selection. We will see their record of selling – whether they are able to help us in marketing; and do they sell similar pharmaceutical products. The agency company may only choose to purchase several varieties in our product list, but refuse others. To encourage them to take more, we may give them certain discounts." (CEO, CC-3)

In the interviews, the researchers were informed that most of the agency companies have pharmaceutical products from different manufacturers, and they have certain preferences according to *market requirements, reputation of manufacturer, quality or therapeutic effect, price or profit* (representatives from agency companies). To reduce the risk of a dull sale, agency companies have to purchase based on market forecasts. Mainly, there are two sales directions: one is to the hospital, which is able to retain more profit; the other is to pharmacies, which are able to contribute less profit.

“Most of the time, pharmaceutical companies come to us, and we can get discounts... for some really popular varieties or products with famous brands, when the market requires we have to source actively.” (Regional marketing manager, AC-1)

Agency companies can be treated as the manufacturers’ representatives (Ross et al., 2005) when they play the role of the sales force in promoting a particular product, which may determine how a firm can interact with its customers and gather information to understand the market. This is different from the agent (Rees, 2011) that is usually mentioned in US or EU research (Lukkari and Parvinen, 2008; Gillis et al., 1998; Rees, 2011), and pharmaceutical agency companies in China take the responsibilities of both agent and distributor.

Basically, there are differences between agents and distributors. An agent (Sojka et al., 2001) can be a person or a group of people employed by the principal company to make contracts on its behalf, where the agent does not enter into any contractual relationship and it does not take any related risks. A distributor (Bhaskaran and Jenkins, 2009; Liu et al., 2010) is the customer of the principal company; it buys goods at an agreed price and further benefits from reselling in the market. Rees (2011) points out that to involve an agent may result in higher costs due to the increase of workload in separately administering all the individual customers and accounts maintenance. Although it may enable the principal company to access customers more directly and support an awareness of its brand in the market, the challenges of system control will increase the burden on the development of the principal company. To involve a distributor may relieve the stress in business management with better invoicing and credit control, but weaken brand awareness and reduce the profit margin.

The mechanism of a Chinese pharmaceutical agency company combining the functions and accountabilities of a traditional agent and distributor in a way makes it

more flexible for principal companies in business and prepares them for possible collaborations. Referring to related provisions in the Drug Administration Law of the People's Republic of China, prescription medicines cannot be directly sold to patients. Collaboration with agency companies is an inevitable trend to gain competitive advantages in marketing.

(3) Transformation life cycle

Referring to the above discussion and the research results, it has been indicated that most collaborations happen during the periods of growth, maturity and decline of a product life cycle (Figure 6-3). In a general way, agency companies would not join the principal companies' process of launching a new product (especially a prescription pharmaceutical product).

MD is comparatively very high in the introduction stage. Once a certain product has been accepted by the healthcare provider (e.g. hospital) and it can get market admittance, the level of MD may start to decrease. Agency companies may be involved at the time when the market has fundamentally acknowledged the product. In this situation, the business of an agency company is market penetration (Rees, 2011), and a triadic construction can be formed during this period. As time goes by, the market may be oversupplied with a certain variety of pharmaceutical products or new products with advanced therapeutic effect, and the level of MD may increase; it could be that the principal company will reshuffle its marketing layout. Decay (Figure 6-2, Pattern II, transformation through outsourcing of core business) may happen then, and the agency company will fully take over the marketing responsibility until it is gone.

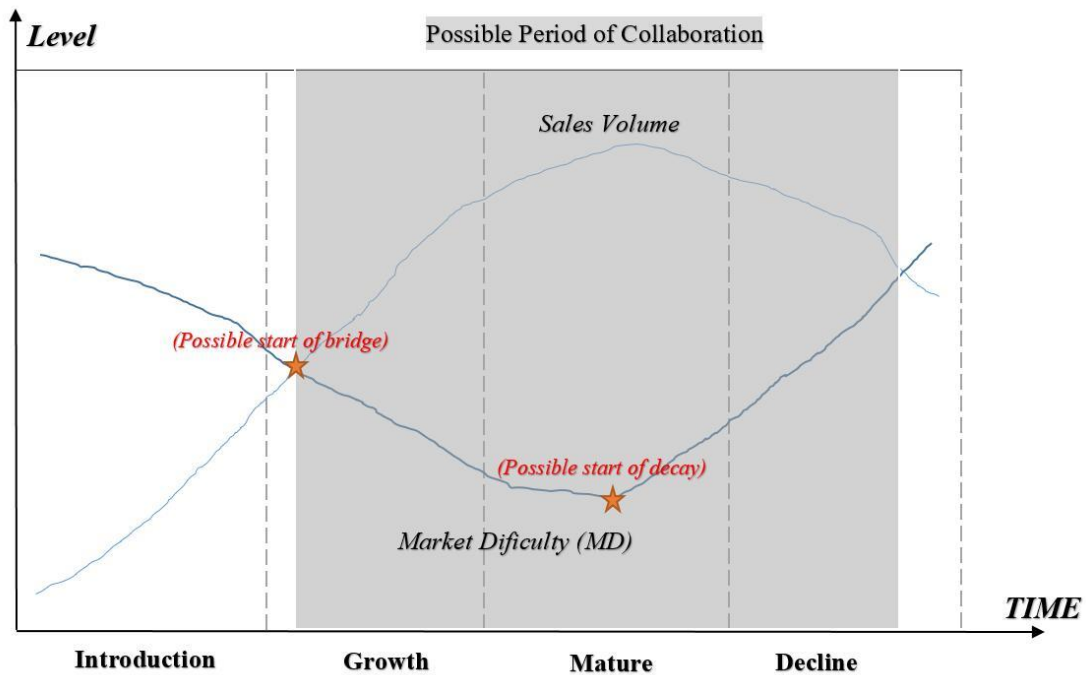


Figure 1-45 Collaborative issues in life cycle time line

In Pattern II of transformation through core business outsourcing (Figure 6-2), there is a situation in which the principal company can be bridged with the agency company. In some cases, new products (non-prescription products) can be bundled and assigned to collaborative agency companies. Considerable discounts will be given to agency companies to encourage them take orders for new medicines, and a remarkable profit margin gives more flexibility to agency companies in marketing to do promotions.

With the development of technology and the encouragement of government in e-commerce, some pharmaceutical manufacturers have authority to sell OTCs online (e.g. CC-2). Healthcare provider customers like pharmacies and clinics can purchase certain pharmaceutical products from principal companies directly. At the present stage, the triadic construction of collaboration can remain at the time it has been formed. Currently not many principal companies are granted permission to enter the e-commerce platform and only a limited selection of pharmaceutical products are available online.

6.3 The Role of the Focal Company in the Transformation

In this section, the roles played by the focal company upstream and downstream and its power/duties in transformation will be discussed. Issues of bridge and bridge decay of the involved parties will be explained in a comprehensive way.

This research identified eight types of role the focal company can play in the transformation from upstream to downstream (Table 6-7).

Table 1-36 Summary of roles played by focal company

Supply Chain	No.	Role	Feature
Upstream	1	<i>General Buyer</i>	<ul style="list-style-type: none"> • Basic role pattern • Follows regular trading routine and holds the decision-making authority • No evidence to show that any business relationship between two material suppliers of one buyer is able to be bridged directly
	2	<i>Business Integrator</i>	<ul style="list-style-type: none"> • Holds absolute decision-making authority • Based on very high level of trust and commitment in alliance • Able to decide partly or fully to integrate in approaching goal • Enjoys great power in business communication
	3	<i>Project Initiator</i>	<ul style="list-style-type: none"> • Holds relative decision-making authority • Similar to an outsourcer (but more involved in a particular business) • Large share of initial investment • Priority in sharing benefits
	4	<i>Project Partner</i>	<ul style="list-style-type: none"> • Holds some decision-making authority • Mostly in R&D segment • Has to pool knowledge and resources to the scale and depth of partnering
Downstream	1	<i>Product Supplier</i>	<ul style="list-style-type: none"> • Common role pattern in dyadic collaboration • Holds a certain decision-making authority • Very limited contribution to triadic collaboration building • A necessary role to initiate a business and set the foundation for triadic collaboration
	2	<i>Outsourcer</i>	<ul style="list-style-type: none"> • Holds decision-making authority in its main sales channel (direct sales to tier customers); however, does not have decision-making

			<p>authority once it has been passed to relevant agency companies for further selling</p> <ul style="list-style-type: none"> • Triadic collaboration can be formed or disorganized dynamically • Significant in the transformation of dyads into triads
	3	<i>Business Partner</i>	<ul style="list-style-type: none"> • Holds decision-making authority (not absolute) and has to concede sometimes • Two-way selection • Size and reputation of focal company relevant and important to triadic collaboration building
	4	<i>Business Supporter (Service Provider)</i>	<ul style="list-style-type: none"> • Holds certain decision-making authority • Core business outsourced require service/technology support • Significant to business sustainability • Double-edged sword in transformation

6.3.1 Roles played in the upstream supply chain

(1) Focal company as general buyer (basic role pattern)

The first role played can be identified as the focal company as general buyer, in which the focal company acts as the buying firm and establishes business relationships following a regular trading routine. The focal company usually holds decision-making authority. This is the basic role played by the focal company, and both service and material suppliers should be involved based on a comparatively high level of trust and commitment. Particularly in regard to material suppliers, once they have been chosen, referring to certain regulations, the suppliers have to be registered; the lock-in mode (Rees, 2011) is a way to equip suppliers with growing power according to market development. With the increasing dependence on a chosen supplier(s) and the extension of a focal company's business, acquisitions may happen to enhance the power of control by vertical integration (Dannels and Setareh, 2008; Ellram, 1991; Peyrefitte et al., 2002); this can be observed in CC-1 and CC-2.

In this role, there is no clear evidence to show that any direct business relationship is

created between two material suppliers of one buyer. However, it lays a good foundation for further network collaboration in the future. The historical business records of locked-in suppliers will be considered by the focal company in deciding whether to upgrade its relationships and integrate them into a possible triad.

“We do not know whether the suppliers do collaborate with each other, and what we care about is whether they are able to satisfy our order. We tend to acquire suppliers which are very important to us if we are able to afford it. As family members, we share our resources, they decide to take it or not.” (General manager CC-2)

Referring to the description above, it can be seen that as the general buyer, the focal company collects useful resources, and there are possible triadic partners in there. When the time is right, the focal company will switch its role to a business integrator to build a network step by step. As the first step of the network, the triadic collaboration pattern may possibly be formed.

This research found similar configurations of triadic collaboration, which have been reviewed and discussed from the perspective of interaction (Ateş et al., 2015). The focal company as the buyer played the role of mediator. The estimation of triadic construction is based on a context of existing triadic relationships. Although it has been argued that triadic collaborations are dynamically changing, not constant (Ateş et al., 2015; Tsou, 2013), what has been presented is only a freeze-frame of a particular triad.

This research can argue that relationship mapping in a triadic construction does not always mean collaboration. To get to know more about how participants can collaborate in a triadic construction, this research will have to catch every frame that contributes to that, even though the triadic collaboration is not yet built. That is why this research keeps the discussions open related to the roles played by a focal company as a general buyer.

(2) Focal company as business integrator

The focal company can be labelled a business integrator (Ateş et al., 2015; Tuomela and Salonen, 2005). In such a role, the focal company holds absolute decision-making

authority, which can be observed in CC-1 and CC-2. Referring to the mission and strategy applied by the focal company, partners are chosen to be partly or fully integrated in approaching certain goals like batch order fulfilment. In this situation, the focal company can control relevant participants or enjoy great power in its business communications.

In a triad, if the focal company plays the role of business integrator, it takes the responsibility for sorting out the needs of the buying company and available resources according to suppliers' capability (Ateş et al., 2015). Moreover, this requires the focal company to provide solutions to any problems and risks that can be anticipated (Li et al., 2015). To support this, a very high level of trust and commitment between the parties is needed. The suppliers involved may have to make a short-term sacrifice to give priority to the focal company's business.

"We do not have the right to dictate to others in business if we do not hold their stakes. Integration happens in the relationship development with our key suppliers... a network is possible, but not very often... we are not a big pharmaceutical company... although we have many varieties of products, it does not mean that they always produce in large batches. It is really seldom that we collaborate with our suppliers to produce, but it is true that we communicate often and sometimes share the plans." (General manager, CC-2)

Above all, being able to have a big impact on a possible partner's business is a sort of premise of integration and further networking in the supply chain system. And when the focal company decides to build a triadic alliance, it can be realized in a comparatively short time and be carried on in an orderly way.

The triadic construction is based on the building of dyadic integration in controlling certain inputs or supplies of production (Mpoyi, 2003). Much of the literature has pointed out that integration can be an industry-specific strategy to bring about competitive advantages (Forslund and Jonsson, 2007; Leavy, 2006; Seo et al., 2014). Clear interorganizational priority and definitions are significant to processing on a company-wide level (Forslund, 2014). The more integration the better (Fabbe-Costes and Jahre, 2008), which is believed to enhance the focal company's power to obtain benefits. Triadic collaboration, which should be a higher level of integration, requires the alignment of the incentives of the relevant participants (Hinkka, 2013), and the focal company is to act as a decision maker and a controller.

In the upstream supply chain, the suppliers are mainly service and material suppliers.

In the study of CC-1 and CC-2, it can be found that the focal companies are very limited in controlling their service suppliers in R&D activities. It is possible for them to integrate their material suppliers when required. In a collaborative triad, when the suppliers are highly integrated (fully controlled by the focal company), such collaboration is regarded as an internal strategic arrangement that could be temporary, but it is also possible for it to persist for a long time; when the suppliers are in low integration (one of them is partly controlled or both of them are partly controlled by the focal company), the triadic collaboration is usually a short-term decision that happens in a particular situation only. The bridging and decay of two individual suppliers depend on the focal company's decision according to its mission and strategy. The formation of a triadic collaboration is up to the will of the business integrator.

(3) Focal company as project initiator

In the upstream supply chain, the focal company usually acts as the project initiator (Kohl et al., 2015) in the pharmaceutical industry. As a project initiator, the focal company holds relative decision-making authority; communication and resource sharing are important aspects that draw the wide attention of the focal company in network collaborations.

In this research, a project here mostly refers to an R&D project, which means that the focal company requires external help from other parties in new drug exploration. In some research, such collaborations can be treated as activities for outsourcing (Beregal-Mirabent et al., 2015; Fiaz, 2013; Yakhlef, 2009). Certain activities or functions of R&D are outsourced to research institutions to innovate with lower capital and lower risk of case failure (Teirlinck and Spithoven, 2013), which is said to be particularly important to SMEs, since they may have to face more difficulties and are under greater pressures in competition.

R&D as a core-related activity can benefit from outsourcing by accessing fresh knowledge and new technology. The focal company is in the role of an outsourcer. The role of outsourcer is different from the one this research will discuss in the next section (downstream supply chain). In the downstream supply chain, when certain functions or

activities have been outsourced, the focal company tends to remain hands-off from the relevant business, and instead concentrates on the development of another area.

In the upstream supply chain, although the focal company is the outsourcer of R&D activities, it is much more like the initiator of a particular R&D project. The purpose of any R&D-relevant activities is to launch a new product. The focal company usually requires control of intellectual property and other proprietary rights (Rees, 2011), and it is impossible for it to be hands-off from the outsourcing business. Triadic collaborations oriented by an R&D project are possible and can be observed in all the case companies (CC-1, CC-2, CC-3, CC-4 and CC-5). Different from the role played by a business integrator, a project initiator is more like a supervisor rather than a dictator. In this situation, the focal company is trying to carry on being interactive but not to give orders only.

The initiation of an R&D project does not mean that the focal company can always benefit from it (Soh and Subramanian, 2014). High knowledge redundancy and relevant coordination costs could happen before any actual value is created. In a triadic collaboration, the project initiator has to consider when a firm may be able to benefit from such collaboration in terms of financial, social and human resources from a sustainable perspective (McKelvey et al., 2014).

“R&D is our core business, and we do need to work with other research institutions... as a small company, the capability of our own R&D team is very limited, and that is why we invest a lot in building a platform for better networking. Although most of the time only general communications were made and it takes time for us to sort out useful information to further develop, we believe that ‘great things may be done by mass effort’. Compared to reviewing and researching possible projects by ourselves only, to run such a platform at the same time saves us more in time cost and opportunity cost.” (R&D manager, CC-3)

It can be seen that as a project initiator, a comparatively large share of initial investment and higher risk tolerance may be required in network building. The bridging of participants can be sustained from a long-term perspective, and the relationship could be deepened when a valuable project is initiated. However, the change in any relationship between two suppliers is under the eyes of the focal company.

(4) Focal company as project partner

When the focal company is labelled a project partner (Ateş et al., 2015; Bresnen and Marshall, 2000) rather than a project initiator, it means that the focal company is in a way involved in order to realize a certain market value. The focal company holds some decision-making authority during R&D processes according to its willingness to cooperate in terms of financial investment and the result of relevant negotiations on ownership of intellectual property and other proprietary rights. In this situation, the project is usually initiated by a research institution, and the focal company is selected for involvement.

In much science–business and university–industry research (Berbegal-Mirabent et al., 2015; Boehm and Hogan, 2013; Fiaz, 2013), collaboration can be defined as all forms of agreement between two or more organizations to work together and pool resources for innovation or problem solving. When a project initiated by a research institution is introduced to the focal company, the focal company can choose to work with it or not at the beginning of the connection. However, once it has decided to join in, it has to be prepared to concede at the same time as initiating a contract.

Compared to research institutions, the focal company usually has more industry experience and better market awareness (Boehm and Hogan, 2013). From the focal company's point of view, in most cases the establishment of a partnership in R&D is said to be aiming at creating opportunities in both innovation and business perspectives (McKelvey et al., 2014). In a triadic construction of collaboration, the collaborative modes are upgraded from single-partner R&D project to multi-partner (Mishra et al., 2015). The project team size has been increased, which requires all participants to pay more attention to coordination to ensure consistency and efficiency of R&D to reduce the time to product launch, and thus strive to gain more time for the focal company to benefit in marketing, which is attractive (Schuh et al., 2014).

However, due to the fact that the focal company does not have absolute decision-making authority in the R&D process, the contribution of its market awareness may possibly be restricted when opinions from different parties diverge from each other. Referring to the scale and depth of partnering, in some cases the focal company may like to be involved and to invest certain material and financial resources to keep good relationships with the institutional partners, even though the project may not be able to produce market value at the present stage, or it might take longer to produce value

(Boehm and Hogan, 2013).

As a project partner, the focal company has to do business when referring to other parties' opinions in an alliance. Some scholars argue that, to SMEs as a project partner, one of the biggest benefits is to gain higher learning potential and approbation (Teirlinck and Spithoven, 2013). Being a project partner should be a strategic decision.

In the case studies, the playing of such a role can be observed. CC-1 and CC-2 are comparatively larger companies than CC-3, CC-4 and CC-5. When acting as a project partner, CC-1 and CC-2 tend to have higher power of control in a multi-partner project. CEO of CC-1 explained:

“We invest in research centres of key universities in supporting their development financially and sometimes send our people there to give seminars. We are sort of the leading bio-pharmaceutical manufacturer in this region. When there are projects with potential market value, we are usually able to be informed and invited to join in. If we do believe this could be a good project, we will make a step forward and strive for further collaboration to launch new products... We always try to get relevant proprietary rights or at least to guarantee we are the only one able to produce the co-product for as long a period as possible.”

For CC-3, it seems like enhancing its reputation and approbation of R&D in the pharmaceutical industry is more important than creating value through production currently. For CC-4 and CC-5, their products are in stable demand and according to their statements, *“we tend to pace ourselves”* and *“it is difficult for many other pharmaceutical companies to get (Chinese herbal drugs) patents for new pharmaceutical products referring to the latest GMP and GSP.”*

These companies do not urgently want to develop R&D. CC-5 in particular is co-founded by a local university; as a regular project partner, it is just not aggressive as a contestant for relevant proprietary rights and always would like to collaborate with any project given by the co-founder.

To further discover collaborative patterns, this research interviewed and sent a survey to relevant collaborative research institutions of the focal companies, and was informed as follows:

“We do not really rely on a particular pharmaceutical company to do research... there is no compulsory requirement for us to collaborate with industry in value creation... for some very

promising projects, we can get more financial support from a governmental special fund.”
(Head of R&D department, University A)

It can be seen that in a particular project initiation, the research institution holds decision-making authority to a large degree. When building a triadic collaboration, the bridging or decay of business relationships is not up to the decision of the focal company. Only when the focal company is chosen as the *executor*, to transfer certain knowledge from an academic area into an industrial area, can it convene related parties when needed. To SMEs sourcing from external parties, the role of project partner could be their normal status.

6.3.2 Roles played in the downstream supply chain

(1) Focal company as product provider (supplier)

As a party upstream from the perspective of customers, a common role played by the focal company in the downstream supply chain is product provider (supplier; Björklund and Forslund, 2013). The core business for the focal company is to distribute products and satisfy its customers to the maximum extent.

In this research, pharmaceutical products can be divided into two categories – prescription medicine and OTC medicine. For regular customers (healthcare providers), currently this research is not able to get any direct evidence to show that they tend to collaborate with each other in drug procurement.

Referring to Figure 5-2 and the discussion in section 5.2.2, it has been noted that most triadic collaboration happens when a third party is involved or when one of the tier customers acts as the third party in the distribution channel. In this situation, triadic constructions may be able to be identified in supply chain mapping. However, if there is no evidence to show that direct business connections exist between the target customers, it cannot be regarded as a collaboration. Thus, when the focal company is in this role, this research can argue that there is a very limited contribution to forming triadic

collaborations.

In previous research, the dyad of supplier–customer in the downstream supply chain was normally discussed in terms of the seller–buyer relationship (Benton and Maloni, 2005; Chen and Fung, 2013). Due to the market dynamism and complexity of supply (Cannon and Perreault, 1999), the formation of collaborative relationships among the focal company and customers is affected by the dependence on certain products; the flexibility of changes in business refer to unforeseen and changing conditions (Chen and Fung, 2013).

In the pharmaceutical industry, if the customers are not the end customers, they are actually playing the role of middleman; at the same time, they are competitors in marketing. They may be able to get to know each other’s relevant sales information, but usually there is no direct business connection between them. Only when one of them is upstream in the role of regional agency company is it possible to observe triadic collaborations in the downstream supply chain.

In one situation, as the normal product/service provider, the focal company is significant in paving the way for further network collaboration – that is when the focal company takes the initiative in marketing to make its products enter a particular target region and provide relevant pharmaceutical services; the role it is in is actually like a marketing pioneer.

CC-1, CC-2 and CC-5 have their own sales teams for marketing. This research was informed by CC-1 and CC-2 that the hospital is their key market. In hospitals, usually there is a department called the *pharmacy department*; functions of this department are “*clinical drug quality control, clinical pharmacology check, and drug distribution*” (General manager, CC-3). Different hospitals have their own principles for selecting and introducing new drugs. As one of the pharmaceutical suppliers in the market, especially as an SME, sometimes it is possible that agency companies do not want to take the responsibility for marketing; they have the right to choose to collaborate or not.

To survive and strive for future development, the focal company has to make the first move with financial and human capital investment. In this process, the focal company is in a comparatively disadvantaged position. However, once it has been chosen, it can only obtain relevant decision-making authority after a considerable period. This could

be a necessary step to attract possible third-party partners (agency companies) in the future when needed.

(2) Focal company as outsourcer

In the downstream supply chain, the focal company playing the role of outsourcer (Azzi et al., 2013) refers to a third party that is involved in executing certain functions or activities that should be done by the focal company. In section 5.2.2, triadic collaborations are mostly formed or disorganized dynamically according to changes in market conditions.

In triadic collaborations formed by service outsourcing, as the outsourcer, the focal company plays a central role in enabling a full connection triad, which can be identified as a triadic collaboration in our research. However, in other explorations of the triads' construction, the third party should be the one in the central role to bridge the seller and the buyer (Peng et al., 2013); or the third party is actually directly connected with both the seller and the buyer in triad building (van der Valk and van Iwaarden, 2011) and is in the central position. This may be due to the fact that it was trying to identify a certain role from a functional perspective rather than from a business perspective.

When a focal company plays the role of outsourcer, especially in non-core business outsourcing activities, it still holds decision-making authority in general trading issues. The main reason for such outsourcing can be to respond better to the environment or to enhance the effectiveness of networking (Peng et al., 2013; Yang et al., 2013). To derive a pathway by involving a third party is a strategic consideration to improve supply chain performance (Fabbe-Costes and Jahre, 2008). The focal company is always the controller in such triadic collaborations.

In the downstream of all case companies, such dyads are easily observed. The activity that most tends to be outsourced is logistics (CC-1: >70%, CC-2: >98%, CC-3: \approx 100%, CC-4: <30%; CC-5: >90%). Most of the products that can be handed to 3PLs for delivery are well-packaged ones with stable properties. Products that are sensitive to temperature or humidity and delivered by 3PLs require special care in facilities and

operation. When the customers do not have any specific 3PLs for delivery, the focal company holds absolute decision-making authority.

“We usually refer to reputation, price, and business record of 3PLs... we may not choose the most expensive ones although better services may be given, but we will not choose the cheapest one as well; we always have to guarantee the quality of our products...” (Operations manager, CC-2)

Most of the case companies stated that a big brand (international) 3PL is comparatively more expensive than local 3PLs. Although extra services of consultancy and operational planning can be provided, they prefer to take the essential service of delivery only.

“I do not deny that the famous 3PLs are able to provide excellent services, and I know it could be useful if we can learn from them to improve our operational system... but we do have to consider the costs and for our company in its current stage, we do not need those additional services in a hurry... maybe in the future, we will see.” (General manager, CC-1)

Triadic constructions, formed through the involvement of 3PLs, are in a performance enhancement format of collaboration. The core business is still in control of the focal company. The viewpoint of *“the professionals do professional”* (General manager, CC-1) in a way promotes the development of commercial behaviour. Customers are more alike to accept such a business mode, due to the noticeable benefits in operational efficiency and logistical effectiveness. In the current stage most of the focal companies only outsource their delivery function to 3PLs and the collaborations are mostly at the operational level; the triadic construction does not contribute to any mission design and strategy making. If in the future the focal company would like to work more closely with certain 3PLs and buy extra services in consulting, the role played by the focal companies may be able to be transferred to a business partner (discussed later).

Besides CC-3, none of other case companies tends to fully outsource the sales function. In the follow-up survey, CC-1, CC-4 and CC-5 stated that they do not really depend on agency companies. CC-2 stated that it depends on an agency company to a large degree; however, the agency company it fully trusts and collaborates with the most is the one that it can fully control. As the outsourcer, the focal companies prefer to keep close relationships with most of their key customers. Although it is possible for them to outsource the sales of certain products in particular regions, third-party involvement is usually applied as a measure to make better sales and to enhance marketing performance. In such triads, the focal company holds the decision-making

authority in its main sales channel (direct sales to tier customers). However, it does not have decision-making authority once products have been passed to relevant agency companies for further sales.

(3) Focal company as business partner

In the downstream supply chain, the role of partner (Halldórsson and Skjøtt-Larsen, 2006; Sambasivan et al., 2013) is different from the one upstream that has been discussed. Upstream, the partner refers to the participant involved in a project that is temporary; here the business partner can be defined as the participant involved for a certain business purpose and the collaborative relationship can last for a comparatively long time. The focal company does not hold absolute decision-making authority, and it may have to concede when needed.

To 3PLs, the focal company seldom plays the role of business partner, especially SMEs. Being partners is a two-way choice and requires sustainable mutual benefits (Gallear et al., 2012; Sodhi and Son, 2009). In the development of SMEs, especially in the early stage, the order batches are not stable and thus the concessions given by 3PLs are very limited. Moreover, although there are many choices of 3PLs for focal companies, the switching cost is not high.

“To reduce costs is important to us, and we would like to work with any 3PLs if they are capable of safe delivery at low prices.” (General manager, CC-5)

To establish collaborations with certain 3PLs may bring about flexibility in operations, but lose the opportunity for possible further cost reduction if they are unable to find bargains. The partnering may lead to organizational inertia (Huang et al., 2013) and hinder focal companies from further development.

It is not absolute that the focal company will not play the role of a business partner in logistics outsourcing. CC-1 acknowledged that it tends to keep a good relationship with some 3PLs. Although there is no contract to clearly present the partnering, it works

with those 3PLs regularly and receives considerable discounts in business. This may be due to the fact that CC-1 is a comparatively mature, medium-sized company in the stage of transferring from a medium to a large company, and most of its products are biopharmaceuticals that require particular care, so trusted 3PLs are crucial to the company. Relying on its own professional sales team, it can pace itself in marketing and arrange its supplies well. Currently, it is building a distribution centre, and during the talks with its CEO it emerged that it is very interested in further collaboration with 3PLs.

When the focal company is not only the outsourcer but also the business partner, the triadic construction can be more effective in serving customers. From a sustainable perspective on the industry and even the society, such partnering can contribute to the application of revised logistics in the pharmaceutical industry (Amaro and Barbosa-Póvoa, 2008).

To the agency company, the focal company is sort of happy to act as a business partner under some circumstances. Although most of them have their own sales team, they tend to send them into local markets.

Their customers are in different provinces of China.

“In other (not local) markets, we work with agency companies in different regions. We do not always depend on a particular agency company, but it does not mean the agency company is not important to us.” (Manager in marketing department, CC-2)

As a business partner, the focal company would like to offer relevant training and even send representatives to a regional office to assist its partners when required. More discounts can be given to partners. Certain production and marketing information can be shared. In CC-3’s distribution channel, an agency company is very important. According to its CEO:

“We do not sell by ourselves, and we would like to work with agency companies. We are only a small pharmaceutical company, and currently our profit mainly comes from R&D and transfer of technology. To work with an agency company can reduce the risks relevant to certain legitimacy problems and help to save money in marketing.”

CC-3 would like to be a business partner to the agency companies with which it desires further collaboration. However, due to not being famous, in its current

partnerships with agency companies CC-3 has no obvious advantages in collaboration, and it always has to give concessions.

Above all, the formation of triads can be affected by the size and reputation of the focal company in collaborations. To play the role of business partner is a strategic consideration, which may help to consolidate existing triads or build new triads through the linkage created by agency partners.

(4) Focal company as business supporter (service provider)

The role of business supporter (Carson et al., 1997; Stefansson, 2006) can be tagged on to the focal company when a collaboration has been established. In triads formed through core business outsourcing, such a role of focal companies is very important in relationship maintenance and R&D improvement.

In the downstream supply chain, customers' feedback is significant to the sustainability of a focal company's business (Blome et al., 2014). In a triadic construction, the focal company is the supporter of both the third party and the customer. To 3PLs, the focal company can convey valuable feedback from its own experience and its customers' experience to help 3PLs improve their performance and thus better serve the markets. To agency companies, it can provide relevant training and answer questions proposed by customers, or respond about certain side effects of pharmaceutical products that have been reported.

As a business supporter, the focal company is not only helping to firm up the triadic construction, but also to ensure market stability. To customers, when the agency company is not able to satisfy their requirements, they can directly report or connect to the focal company. If the focal company collaborates with a relevant third partner to solve proposed problems or requirements, the triad will remain. However, if the focal company is able to respond directly to the customer without the involvement of any associated third party, it is possible that such a triad will decay to a dyad. Thus, it can be seen that the role of business support is a double-edged sword in triad formation.

6.3.3 Summary of focal company's roles

In the upstream supply chain, when the focal company is in the role of business integrator or project initiator, it could enjoy comparatively more decision-making authority; the central position enables it to decide on any bridge or decay in the triads. The transformation of dyads to triads usually rests on the connector in the central position with a purposeful proposal. The role could be static over a relatively long time within a contract period. However, it can dynamically change over time, due to the nature of interest chasing in business (Ailawadi et al., 1995; Boeing et al., 2016). With the increase of interdependence and the development of individual entities, power tends to be in equilibrium; the focal company may transfer to project partner and give up certain priorities if it would like to continue such a collaboration.

In the downstream supply chain, the outsourcer is the role that is very familiar to most of the focal companies, as a number of activities in the distribution and logistics segment have been outsourced, and it is very common in R&D-oriented companies. In non-core business outsourcing (logistics), the focal company as outsourcer holds much of the decision-making authority. In core business outsourcing, the focal company holds decision-making authority in its main sales channel (direct sales to tier customers); however, it is not constant.

Once the products have been passed to relevant agency companies for further selling, the focal company does not have the right to interfere in future distribution. At the same time, the focal company could be the service provider to support the agency company when it needs technical coaching. As time goes by and with the deepening of trust, the role of the focal company may further transferred to that of a business partner.

It is a dynamic process of transformation. The role of outsourcer can initiate the formation of a triadic collaboration. The role of business partner can firm up the established collaboration or decay the current bridge between customers, and bridge to a new customer through the partner agency. Compared to the roles played in the upstream supply chain, downstream the focal company should be able to play more roles at the same time and deal with more complex situations in line with dynamic change.

6.4 Summary

This chapter explains how existing dyadic relationships in the supply chain can be integrated into triadic collaborations. The research indicates that the role played by the focal company is significant to the formation of triadic collaborations.

In the upstream supply chain, the focal company can play the role of general buyer or business integrator or project initiator or project partner; and the focal company tends to hold a certain decision-making authority no matter what role it is in. The basic triadic construction is usually motivated by the demand of the focal company to complete certain projects or ensure relevant, reliable and stable supplements upstream. Such a demand makes it possible for individual parties to be connected directly and indirectly in the early stage of the business. A structural hole usually exists between indirectly connected parties, and the possible reasons referred to for this bridging could be functional complementary, joint project, introduced by existing partner or other particular requirements.

In the downstream supply chain, the focal company can play the role of project provider or outsourcer or business partner or service supporter. The third party's involvement is mainly due to the agent mechanism and the outsourcing of logistics. The focal company is not always in the central position in the formation of triadic collaborations. In product distribution, the existing collaboration of seller–customer can decay due to power delegation from the focal company to the agency company. And with the help of the agency company, the focal company is able to bridge with new customers, where the agency company is in the central position of such a triad's formation.

What is more, the research has indicated that outsourcing is an effective method for manufacturers to enhance their innovation capability and operational efficiency, which is generally necessary to the development of industry. More resources can be pooled and arranged to apply in the optimized system if the focal company is able to play certain roles with proper leadership or responsiveness. This research illustrates that the formation of triadic collaboration is usually due to the involvement of a third party that

is motivated by outsourcing (especially in the downstream supply chain).

The research also shows that in some situations like full outsourcing of distribution, the existing collaboration can decay, where the triadic construction is in line but not in a loop and cannot be regarded as a mode in triadic collaboration. Therefore, the role played by the method of outsourcing can be a pusher, but also a separator.

In the same project or within the contractual period, the role played by certain participants could be constant, but this is not absolute. Most of the time the focal company is in the central position in a triadic collaboration, and the role it plays can in a way affect the roles played by other partners, according to the degree of decision-making authority that has been held.

Chapter Seven : Impacts of Triadic Collaborations on Supply Chain Performance

7.1 Introduction

In the following sections, the impacts of supply chain performance caused by triadic collaborations will be explored. Referring to the principle of triadic collaboration formation, it is based on an existing dyadic collaboration, and a pathway is generated through the involvement of a third party, which is constructed by two other connected dyadic collaborations. Theoretically, the involvement of any third party is required by particular business events, and the triad built should be able to promote the performance of relevant activities. To verify this, the research results will be analysed and discussed.

The functions of each of the dyads involved in building the triadic collaboration to optimize the overall performance of the pharmaceutical supply chain will be illustrated separately. The details of how a triadic collaboration may influence supply chain performance will be further explained.

7.2 Performance Indicators of Supply Chain Collaboration

A supply chain is formed by a series of different activities (Kumar and Malegeant, 2006); its functional processes (Boulaksil and Fransoo, 2010; Lowman et al., 2012) are linked to satisfying demands in the market, where parties that come from different industries are involved. When talking about supply chain performance, it can be measured from different perspectives like quality performance (Fynes et al., 2005), innovation performance (Kafouros et al., 2015), manufacturing performance (Fynes et al., 2005), logistics performance (Azzi et al., 2013) and so on.

There are many indicators in performance measurement like productivity, profitability, decision capability and cost efficiency, which are derived from various industry considerations and mechanisms in the supply chain (Schuh et al., 2014). The

practice has indicated that performance is usually studied in the context of a particular supply chain activity, and it is difficult to measure a chain's performance with a fixed indicator. It has been argued that the desire to obtain certain competitive advantages (Ambrose et al., 2010; Co and Barro, 2009; Kafouros et al., 2015) motivates the establishment of collaboration, and the achievement of those advantages can be performance indicators. Thus, based on the research results, in this section this thesis will discuss chain performance with the indicators of sustainability, opportunity, cost efficiency, effectiveness, flexibility and legitimacy as reviewed in the literature, and identify them with more detailed definitions (Table 7-1).

In many studies, manufacturers are regarded as the focal company or the principal company in a supply chain (Ailawadi et al., 1995; Fayezi et al., 2012; Kumar and Malegeant, 2006; Petison and Johri, 2008). This research intends to explore this from the perspective of focal companies, as they are the most important participants in the supply chain (network) associated with different parties to build collaborations.

Table 1-37 Performance indicators of the supply chain

Level	Indicator	Definition
Strategic	<i>Sustainability</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to maintain the continuation of relevant business (Schaltegger and Burritt, 2014; Van Hoof and Thiell, 2014). • In the upstream supply chain, sustainability may imply long-term collaboration with potential partners, which enables the focal company to apply relevant resources to ensure continuing innovation and production. • In the downstream supply chain, sustainability is about a minimum probability of business failure (Fiedler and Deegan, 2007) with stable market performance.
	<i>Opportunity</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to access new fields/resources/markets (Kohl et al., 2015; Mabey and Nicholds, 2014). • In the upstream supply chain, opportunity can be the possibility of the focal company developing/launching new drugs or being involved in the latest projects or getting valuable new supply resources. • In the downstream supply chain, opportunity usually refers to the focal company that is more likely to expand its markets and get connected with more customers directly or indirectly.
Operational	<i>Cost efficiency</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to save money in certain processes (nodes) of the supply chain; and meanwhile, related performance can be improved to a maximum level (Kohl et al., 2015; Yang et al., 2013). • In the upstream supply chain, cost efficiency is a relative concept, which means that in R&D or procurement processes, the focal company is able to use comparatively less money to maintain or improve the performance of innovation and production. • In the downstream supply chain, it refers to the focal company that is able to realize certain tasks by using comparatively small amounts of money; or by using a certain amount of money, more tasks can be completed.
	<i>Effectiveness</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to focus on core business and fulfil relevant tasks and requirements in a comparatively short time (Cao and Zhang, 2011; Leavy, 2006). • In both upstream and downstream supply chain, the effectiveness could be the leverage of resources and knowledge; all involved companies can perform at a maximum level in supporting the focal company's business.
	<i>Flexibility</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to respond quickly to demand or requirement changes internally and externally (Duclos et al., 2003; Narayana et al., 2014; Stevenson and Spring, 2009). • Both upstream and downstream, when any unexpected issues happen in supply chain processes of R&D, production, distribution and logistics, the companies involved, including the focal company, are able to notice them and come up with effective strategies to address them.

Political	<i>Legitimacy</i>	<ul style="list-style-type: none"> • Generally refers to the focal company that is able to get relevant political or regulatory benefits if it appears legitimate according to rules and regulations (Boehm and Hogan, 2013; Fiedler and Deegan, 2007; Ramanathan and Gunasekaran, 2014). • In the upstream supply chain, the benefits could be obtaining intellectual property or production permission, financial support with preferential policies, funds for special purposes and so on. • In the downstream supply chain, legitimacy refers to the focal company that is able to sell legitimately. When referring to certain regulations, some products cannot be directly sold to end customers, and they must be distributed by legitimate channels.
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Referring to Table 7-1, based on the literature review and conceptual framework proposed, there are six performance indicators that can be identified on three levels. Sustainability and opportunity show whether an established collaboration can contribute to the whole business from a long-term perspective (Chen, Paulraj and Lado, 2004; Siew-Phaik, Downe and Sambasivan, 2013) and are at the strategic level. Cost efficiency, effectiveness and flexibility display how the established collaboration can be connected with the supply chain system and organize business activities (Salehi Sadghiani et al., 2015) and are at the operational level. Legitimacy presents the response of an established collaboration to government or public affairs (Huang et al., 2015) and is at the political level. In the upstream and downstream supply chain, the definition of the same indicator could be interpreted in different ways.

7.3 Impacts of Dyadic Collaboration

In this research, the results hint at core dyadic collaborations in the upstream and downstream supply chain, which can be summarized as in Table 7-2.

Table 1-38 Dyadic collaboration in the supply chain

Relation Mode	Upstream	Downstream
<i>R-1</i>	<i>CC-University</i>	<i>CC-Agency company</i>
<i>R-2</i>	<i>CC-SRI</i>	<i>CC-Hospital</i>
<i>R-3</i>	<i>CC-Other pharma</i>	<i>CC-Pharmacy</i>
<i>R-4</i>	<i>CC-Hospital</i>	<i>CC-Clinic</i>
<i>R-5</i>	<i>CC-Authority</i>	<i>CC-OTC</i>
<i>R-6</i>	<i>CC-Conventional supplier</i>	<i>CC-3PL</i>
<i>R-7</i>	<i>CC-Project supplier</i>	–
<i>R-8</i>	<i>CC-Appointed supplier</i>	–

In the supply chain, dyadic collaborations are common in the segments of R&D and procurement upstream and in the segments of distribution (sales) and logistics downstream. Referring to Table 7-2, in the upstream supply chain, R-5 is a special dyad. Authorities can be regarded as a funding provider and a policy maker; all industrial and academic parties have to comply with them and have to be monitored. Currently, there

is no direct evidence to show that the formation of certain triads is affected by the involvement of an authority. However, a project or meeting organized by the authority in a way provides the related parties with a platform to communicate, which may contribute indirectly to the establishment of triadic collaboration.

The focal case company can be classified as two types (R&D oriented and market oriented) in the case study profile. The impacts of dyadic collaboration on the supply chain can be summarized as in Table 7-3.

Table 1-39 Summary of impacts (dyadic collaboration)

Supply Chain	Business Orientation	Impacts		
		Strategic Level	Operational Level	Political Level
Upstream	R&D oriented	<ul style="list-style-type: none"> • Size does matter • The indicators show that a larger company tends to gain more sustainability and opportunity 	<ul style="list-style-type: none"> • Size does matter • To a larger company, it could be more cost efficiency in supply chain activity • To a larger company, collaborative work can obtain more effectiveness • Particularly in the procurement segment, dyadic collaboration can bring about more flexibility in business 	<ul style="list-style-type: none"> • Size does matter • To a larger company, more advantages in legitimacy can be achieved
	Market oriented	<ul style="list-style-type: none"> • In the R&D segment, relatively less sustainability can be obtained (collaboration with research institution) • Compared to a smaller R&D-oriented company, more opportunity is gained in the procurement segment 	<ul style="list-style-type: none"> • Due to the fact that the case company is comparatively large in all SME case companies, the indicator shows they are able to get most of the advantages of cost efficiency, effectiveness and flexibility on an operational level • The results of interviews and survey from the focal company's upstream partners have indicated that they do not care much about the business orientation of the focal company; they tend to treat it the same. Therefore, there are reasons to believe that the impacts should be similar to those listed for an R&D-oriented business 	<ul style="list-style-type: none"> • There is no particular regulation to distinguish legitimacy relevant to different business-oriented companies. Therefore, there are reasons to believe that, the impacts should be similar to those listed for an R&D-oriented business
Downstream	R&D oriented	<ul style="list-style-type: none"> • Size does matter • Scale of sales force does matter • Type and quality of product 	<ul style="list-style-type: none"> • When business connections have been established, the indicator shows that there is no big difference among different-sized companies 	<ul style="list-style-type: none"> • There is no big difference among different-sized companies

		<p>do matter</p> <ul style="list-style-type: none"> • A larger company tends to gain more sustainability and opportunity • A company with a larger sales force tends to have more opportunity in business with key customers • A company that produces scarce but popular patented products tends to obtain more sustainability 		
	<i>Market oriented</i>	<ul style="list-style-type: none"> • Compared to an R&D-oriented company, enjoys a wider customer group and more opportunities. • Based on the results from interviews and surveys downstream, size does matter • Type and quality of product do matter • A larger company tends to gain more sustainability and opportunity • A company that produces scarce but popular patented products tends to obtain more sustainability 	<ul style="list-style-type: none"> • When business connections have been established, the indicator shows that there is no big difference among different-sized companies 	<ul style="list-style-type: none"> • There is no big difference among different-sized companies

In this section, the impacts of dyadic collaborations on the supply chain will be illustrated according to the identified performance indicator at different levels.

7.3.1 Impacts on the upstream supply chain

In the upstream supply chain, the main activities are R&D and procurement, and all participants are involved to ensure the focal company's innovation and production. Within the framework generated in the protocol (Appendix One), the research results can be summarized in Tables 7-4, 7-5 and 7-6.

The tables below were produced according to the dyadic modes and collaboration modifications identified. As part of pattern matching, it helps to locate the data that has been collected into target conditions.

Table 1-40 Possible dyadic collaborative relations in the upstream supply chain

Dyadic Relation Mode	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8
	Service/Technology Provider				Funding Provider	Pharmaceutical Material Provider		
	University	SRI	Other Pharma	Hospital	Authority	Conventional Supplier	Project Supplier	Appointed Supplier
CC-1	√	√	√	√	√	√	√	–
CC-2	√	√	√	√	√	√	√	–
CC-3	√	√	√	√	√	√	–	–
CC-4	√	√	–	√	√	√	–	√
CC-5	√	√	√	√	√	√	–	–

Table 1-41 Advantages generated in (high-level) dyadic relation modes

Case	RM	Strategic Level		Operational Level			Political Level
		Sustainability	Opportunity	Cost Reduction/ Cost Efficiency	Effectiveness	Flexibility	Legitimacy/Political/ Regulatory Benefit
CC-1	R-1	+	+	No	+	+	+
	R-2	+	+	+	+	+	+
	R-3	No	-	+	+	+	+
	R-4	+	+	+	+	+	+
	R-5	+	+	No	No	No	+
	R-6	+	+	+	+	+	No
	R-7	+	+	-	+	+	+
CC-2	R-1	-	+	No	-	-	+
	R-2	-	-	+	+	+	+
	R-3	No	+	+	+	+	+
	R-4	+	+	+	+	+	+
	R-5	+	+	No	No	No	+
	R-6	+	+	+	+	+	No
	R-7	+	+	-	+	+	+
CC-3	R-1	-	+	No	+	-	-
	R-2	-	+	No	+	-	-
	R-3	-	+	No	+	-	-
	R-4	-	-	+	+	+	+
	R-5	-	-	No	No	No	-
	R-6	-	-	-	+	+	No
CC-4	R-1	+	+	No	-	-	+
	R-2	+	+	-	+	+	+
	R-4	+	+	+	+	+	+
	R-5	+	+	No	No	No	+
	R-6	+	-	-	+	+	No
	R-8	+	+	+	+	+	No
CC-5	R-1	+	+	+	+	+	+
	R-2	-	-	+	+	+	+
	R-3	-	+	+	+	+	+
	R-4	+	+	+	+	+	+
	R-5	+	-	No	No	No	-
	R-6	+	+	+	+	+	No

+: usually able to be achieved; -: difficult to achieve/observe, but possible; No: very difficult to observe or not able to be achieved

Table 1-42 Most possible advantages that can be achieved by (high-level) dyadic collaboration

	Strategic Level	Operational Level	Political Level
CC-1	<i>R-1: Sustainability, Opportunity</i> <i>R-2: Sustainability, Opportunity</i> <i>R-3: (Difficult)</i> <i>R-4: Sustainability, Opportunity</i> <i>R-5: Sustainability, Opportunity</i> <i>R-6: Sustainability, Opportunity</i> <i>R-7: Sustainability, Opportunity</i>	<i>R-1: Effectiveness, Flexibility</i> <i>R-2: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-3: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-4: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-5: (No)</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-7: Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-3: Legitimacy</i> <i>R-4: Legitimacy</i> <i>R-5: Legitimacy</i> <i>R-6: (No)</i> <i>R-7: Legitimacy</i>
CC-2	<i>R-1: Opportunity</i> <i>R-2: (Difficult)</i> <i>R-3: Opportunity</i> <i>R-4: Sustainability, Opportunity</i> <i>R-5: Sustainability, Opportunity</i> <i>R-6: Sustainability, Opportunity</i> <i>R-7: Sustainability, Opportunity</i>	<i>R-1: (Difficult)</i> <i>R-2: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-3: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-4: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-5: (No)</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-7: Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-3: Legitimacy</i> <i>R-4: Legitimacy</i> <i>R-5: Legitimacy</i> <i>R-6: (No)</i> <i>R-7: Legitimacy</i>
CC-3	<i>R-1: Opportunity</i> <i>R-2: Opportunity</i> <i>R-3: Opportunity</i> <i>R-4: (Difficult)</i> <i>R-5: (Difficult)</i> <i>R-6: (Difficult)</i>	<i>R-1: Effectiveness</i> <i>R-2: Effectiveness</i> <i>R-3: Effectiveness</i> <i>R-4: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-5: (No)</i> <i>R-6: Effectiveness, Flexibility</i>	<i>R-1: (Difficult)</i> <i>R-2: (Difficult)</i> <i>R-3: (Difficult)</i> <i>R-4: Legitimacy</i> <i>R-5: (Difficult)</i> <i>R-6: (No)</i>
CC-4	<i>R-1: Sustainability, Opportunity</i>	<i>R-1: (Difficult)</i> <i>R-2: Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-4: Legitimacy</i>

	<p>R-2: Sustainability, Opportunity</p> <p>R-4: Sustainability, Opportunity</p> <p>R-5: Sustainability, Opportunity</p> <p>R-6: Sustainability</p> <p>R-8: Sustainability, Opportunity</p>	<p>R-4: Cost Efficiency, Effectiveness, Flexibility</p> <p>R-5: (No)</p> <p>R-6: Effectiveness, Flexibility</p> <p>R-8: Cost Efficiency, Effectiveness, Flexibility</p>	<p>R-5: Legitimacy</p> <p>R-6: (No)</p> <p>R-8: (No)</p>
CC-5	<p>R-1: Sustainability, Opportunity</p> <p>R-2: (Difficult)</p> <p>R-3: Opportunity</p> <p>R-4: Sustainability, Opportunity</p> <p>R-5: Sustainability</p> <p>R-6: Sustainability, Opportunity</p>	<p>R-1: Cost Efficiency, Effectiveness, Flexibility</p> <p>R-2: Cost Efficiency, Effectiveness, Flexibility</p> <p>R-3: Cost Efficiency, Effectiveness, Flexibility</p> <p>R-4: Cost Efficiency, Effectiveness, Flexibility</p> <p>R-5: (No)</p> <p>R-6: Cost Efficiency, Effectiveness, Flexibility</p>	<p>R-1: Legitimacy</p> <p>R-2: Legitimacy</p> <p>R-3: Legitimacy</p> <p>R-4: Legitimacy</p> <p>R-5: (Difficult)</p> <p>R-6: (No)</p>

As shown in Tables 7-4, 7-5 and 7-6, it can be seen that collaborating with research institutions is common to the focal company wanting to seek sustainability. The university is regarded as the new force in R&D, although compared to SRI it may be less effective and flexible in its commercial project and require sustained investment. The general manager of CC-1 explained:

“To collaborate with a university is important to us, we tend to invest in terms of facilities or setting up scholarship projects. Usually, such investments are not meant to gain particularly substantial feedback, we just want to keep the relationship and to attract more talent to join us. In a particular area, it is a long-term collaboration, we keep on doing research in a certain area, and it may take time to figure out new things, but when there is a new breakthrough, we can get more than we have invested; and compared to research by ourselves in that long time, that is a real bargain... you should know that we have a lot more business.”

Besides, the focal company can get special funds for key projects (launched by itself or by the university) registered with a relevant authority. In a sustainable view, collaboration with universities can benefit the focal company’s business all round. To work with an SRI is usually required by a particular project by the focal company; it pays an SRI and asks for help in any relevant pharmaceutical analysis.

When in a project, the collaboration of the focal company and the SRI is at a comparatively very high level. However, other than for a relevant project, not many collaborative actions can be observed in this research. It is possible for the focal company and SRI to communicate on informal occasions, and sometimes they can meet at conferences arranged by the authorities.

The SRI is one of the essential business partners of the focal company that can bring about many advantages in cost efficiency, effectiveness and flexibility. It is able to provide a certain certificate to prove the qualifications of the focal company's pharmaceutical products. Therefore, the focal company should always pay attention to maintaining the relationship with an SRI.

The focal company may collaborate with other pharmaceutical companies when it has the intention to purchase the potential partner's technology or certain proprietary rights. At the strategic level, such collaboration enables it to get new resources that it may apply to further develop its business. At the operational level, it saves more money on R&D and it can further promote the project with the help of its partners, as it has paid for that. Thus, the advantages of effectiveness, flexibility, as well as legitimacy on the political level can be achieved.

Referring to the case studies for this research, when compared to the R&D-oriented company, the marketing-oriented focal company (CC-2) tends to do this more. It may be due to its limited R&D capability and motivated by its ambitions for business expansion.

To work with a hospital is sort of an indispensable process for pharmaceutical R&D due to the requirement for clinical trials. It is important to the sustainability of the focal company's business, and building a long-term relationship with a hospital is essential to the development of any pharmaceutical company through the entire supply chain.

CC-1 and CC-5 even associate with a relevant university and its affiliated hospital to do R&D on a particular project; the advantages that can be achieved at all three levels have been identified. CC-3 is a little different from the others, as it is more difficult for it to get advantages at the strategic level, because compared to the other four case companies, CC-3 is the smallest, with only two lines for pharmaceutical production in a limited variety. Currently, it tends to focus on R&D, especially on technology

development, and then benefits from transferring to other pharmaceutical companies. When a pharmaceutical product is able to access the process of clinical trials, its central position can be replaced; and CC-3 will only be a regular participant. In recent years, CC-3 did not collaborate with hospitals in clinical trials quite as often. It is difficult for it to build a sustainable relationship with the hospital, which indicated that it is not able to obtain more new resources.

The dyadic construction of the focal company and the authority cannot be discussed from the typical perspective of collaboration. Pharmaceutical companies can accept funding or rewards from an authority like the local government when relevant evidence can be provided to prove the value of their projects. It is said that to further improve China's national health service system, the Chinese government intends to make more favourable policies and set up more special funds to encourage the development of a domestic pharmaceutical industry, according to its 12th Five-Year Healthcare Development Plan. Most case companies believe that this is a *good opportunity* (CC-3, CC-4, CC-5) for their business.

However, at the same time, the newly launched GMP did put a lot of pressure on them as well.

"The new GMP is launched to select the superior and eliminate the inferior, we have to progress both the quality control system and the manufacturing plants to meet their requirements..." (CEO, CC-3)

All pharmaceutical companies should pay attention to any political or regulatory change. To survive and thus better compete in the market, they have to continually strive for more benefits and opportunities by following the steps of authority. Just like CC-2's general manager said: *"we do not collaborate with government, we follow them."* It decides the sustainability, opportunity and legitimacy of focal companies' business at the strategic and political level. This is in a way the premise for any advantage that can be achieved at the operational level.

When the focal company has decided to purchase from relevant suppliers, the suppliers tend to be locked in. However, this does not mean that it is absolutely impossible to replace them.

"We do not try very hard to maintain the relationship with our suppliers... we will see their price and quality and then compare them with others." (General manager, CC-1)

Usually, the focal company tends to purchase from fixed suppliers. But if it is able to find other suppliers that can provide products with the same quality or even better quality at a comparatively lower price, it is still possible for it to make a change. Some scholars have argued that the locked-in supplier may cause a switching cost, and the buyer may not easily be able to change to alternatives quickly (Cannon and Perreault, 1999). In the pharmaceutical industry, due to the strict requirements for quality control, changing a locked-in supplier may be even harder. And that is why pharmaceutical companies (CC-1 and CC-2) with a certain economic ability tend to take over or invest in several very key suppliers (project suppliers) to ensure that their business has a sustainable supply.

The fully controlled suppliers usually have to satisfy the focal company first rather than making a profit from other businesses. Priority should always be given to the focal company. Although maintaining the relationship could be costly, advantages of cost efficiency, business effectiveness and flexibility can be achieved.

CC-4 is the only case company that has a series of appointed suppliers. The appointed suppliers are invested in and signed up to the focal company as special suppliers. Besides CC-4, the appointed suppliers cannot provide any relevant materials or products to other pharmaceutical companies within the contract period; and CC-4 can guarantee to purchase all the materials or products from the appointed suppliers. Such a relationship is very stable, and is able to bring about advantages at both strategic and operational levels.

7.3.2 Impacts on the downstream supply chain

In the downstream supply chain, the main activities are distribution and logistics. Dyads formed by the focal company with an agency company or a hospital are very common; outsourcing of logistics makes the focal company's communication with 3PLs inevitable. The research results are summarized in Tables 7-7, 7-8 and 7-9.

Table 1-43 Possible dyadic collaborative relations in the downstream supply chain

Dyadic Relation Mode	R-1	R-2	R-3	R-4	R-5	R-6
	Agency	Hospital	Pharmacy	Clinic	OTC	3PL
	Company				Buyer	
CC-1	√	√	√	–	–	√
CC-2	√	√	√	√	√	√
CC-3	√	–	–	–	–	√
CC-4	√	√	–	–	–	√
CC-5	√	√	√	–	–	√

Table 1-44 Advantages generated in (high-level) dyadic relation modes

Case	RM	Strategic Level		Operational Level			Political Level
		Sustainability	Opportunity	Cost Reduction/ Cost Efficiency	Effectiveness	Flexibility	Legitimacy/Political /Regulatory Benefit
CC-1	R-1	+	+	+	+	+	+
	R-2	+	+	–	+	No	+
	R-3	–	–	+	+	+	+
	R-6	–	No	+	+	+	No
CC-2	R-1	+	+	+	+	+	+
	R-2	+	+	–	+	No	+
	R-3	+	+	+	+	+	+
	R-4	–	–	–	–	+	–
	R-5	–	+	+	+	+	–
	R-6	+	No	+	+	+	No
CC-3	R-1	–	–	+	+	+	+
	R-6	–	–	+	+	+	No
CC-4	R-1	+	+	+	+	+	+
	R-2	+	+	+	+	No	+
	R-6	–	No	+	+	+	No
CC-5	R-1	+	+	+	+	+	+
	R-2	+	+	+	+	+	+
	R-3	–	–	+	+	+	+
	R-6	+	No	+	+	+	No

+: usually able to be achieved; –: difficult to achieve/observe, but possible; No: very difficult to observe or not able to be achieved

Table 1-45 Most possible advantages that can be achieved by (high-level) dyadic collaboration

	Strategic Level	Operational Level	Political Level
CC-1	<i>R-1: Sustainability, Opportunity</i> <i>R-2: Sustainability, Opportunity</i> <i>R-3: (Difficult)</i> <i>R-6: (Difficult)</i>	<i>R-1: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-2: Effectiveness</i> <i>R-3: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-3: Legitimacy</i> <i>R-6: No</i>
CC-2	<i>R-1: Sustainability, Opportunity</i> <i>R-2: Sustainability, Opportunity</i> <i>R-3: Sustainability, Opportunity</i> <i>R-4: (Difficult)</i> <i>R-5: Opportunity</i> <i>R-6: Sustainability</i>	<i>R-1: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-2: Effectiveness</i> <i>R-3: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-4: Flexibility</i> <i>R-5: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-3: Legitimacy</i> <i>R-4: (Difficult)</i> <i>R-5: (Difficult)</i> <i>R-6: (No)</i>
CC-3	<i>R-1: (Difficult)</i> <i>R-6: (Difficult)</i>	<i>R-1: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-6: (No)</i>
CC-4	<i>R-1: Sustainability, Opportunity</i> <i>R-2: Sustainability, Opportunity</i> <i>R-6: (Difficult)</i>	<i>R-1: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-2: Cost Efficiency, Effectiveness</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-6: (No)</i>
CC-5	<i>R-1: Sustainability, Opportunity</i> <i>R-2: Sustainability, Opportunity</i> <i>R-3: (Difficult)</i> <i>R-6: Sustainability</i>	<i>R-1: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-2: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-3: Cost Efficiency, Effectiveness, Flexibility</i> <i>R-6: Cost Efficiency, Effectiveness, Flexibility</i>	<i>R-1: Legitimacy</i> <i>R-2: Legitimacy</i> <i>R-3: Legitimacy</i> <i>R-6: No</i>

The results show that it is much easier for the focal company to achieve advantages at the operational level than at the strategic level. End customers cannot buy prescription medicines from the focal company directly. Choosing to collaborate with the channels is obligatory.

All the focal companies in the case studies for this research tend to collaborate with agency companies, although they may have their own sales force. The hospital is treated as a big market, which is in a strategic position; besides CC-3, CC-1, CC-2, CC-4 and CC5 have paid a lot to open up the market and to maintain the relationship to achieve sustainability and opportunity.

In collaboration with hospitals, for CC-1 and CC-2 it costs more to achieve effectiveness and flexibility. This may be due to the congeneric products of CC-1 and CC-2, which are too numerous, and the market always demands new drugs based on the progress of previous pandemics. Competition is intense in the pharmaceutical industry.

“We have to send our people to relevant hospitals regularly... for communication... for marketing... we do not directly contact the patients and we are not allowed to. To encourage doctors to use our products, we have to let them see our sincerity.” (Marketing manager, CC-2)

In informal communication with one of the doctors at the target hospital, the researcher was informed that the discount or concession that had been promised by the focal company could have some impact on the decision to prescribe that medicine. Thus, it can be seen that even when a company’s products can be accepted by the hospital, it still has to spend a certain amount of money or sacrifice partial interests to keep the relationship or stabilize the markets. It seems strange according to the results, as CC-4 and CC-5 can still benefit in cost efficiency.

“Currently our production scale is very limited due to the fact that we do not always have sufficient supplement of blood plasma (important raw materials for production). We do not really worry about the sales of products, because they are usually in short supply. Hospitals would like to collaborate with us... and when a certain collaborative relationship can be settled, we do not have to give a lot of care to relationship keeping. It’s good, we can save more money to do other things.” (CC-4)

The business system of CC-4 is very stable. CC-4 tends to produce strictly in

accordance with its capability, and its production is usually behind market requirements. This gives CC-4 more power, and enables the focal company to benefit more at the operational level. CC-5 is a special case in this situation, which is because it is co-funded by a local university with affiliated hospitals, and its featured products are Chinese patent medicines. Referring to the new GMP and GSP, it is more and more difficult for pharmaceutical companies to launch new Chinese patent medicines, as it is very difficult to identify traditional Chinese herbal medicinal ingredients and to do analysis from the perspectives of pharmacology and toxicology. Referring to regulations issued by the Chinese FDA, these are very strict on examinations and approval of new Chinese patent medicines. CC-5 does not have much sense of urgency in marketing; this may partly be due to its products having comparatively stable sales, and less competition in the short term.

Referring to Table 7-5, CC-2 is the only case company that has a comparatively complete distribution system; it is a marketing-oriented company. The other four case companies are R&D-oriented pharmaceutical companies, which invest the most in their upstream supply chain. CC-2 tends to collaborate more with agency companies for distribution downstream.

“To operate a sales force team is very expensive, and it is more convenient for us to outsource this part (sales) to agency companies... besides, we can get rid of the risks in distribution... the legal risks.” (CC-5)

When collaborating with agency companies, the focal companies can benefit at the operational and political levels. Besides CC-3, the other four companies are able to get sustainability and opportunity in collaboration with agency companies, due to being famous in the local region's market with competitive products. Size and capability (productivity) are significant to a focal company; it decides whether it can get the assistance of agency companies in market expansion, which can have a further impact on its business sustainability.

It is noticeable that CC-2 is the only case company that can directly contact OTC buyers. CC-2 benefits greatly from the authorization for e-business that it has been given. This is a new business mode of B2C (Business-to-Customer) applied in the pharmaceutical industry in China. Currently, only OTCs are sold on CC2's online platform and dispatched by itself or its affiliated agency company. Although there are

many uncertainties in issues of polity, legitimacy and operations, CC-2 treats this as an opportunity for its business, as it is able to connect directly with the end customers. Moreover, trading directly with OTC buyers can save more money in marketing and it can get to know customers' demands for the very first time; CC-2 can respond to any requirements or feedback in a short time with better performance to improve its business effectiveness.

7.3.3 Summary of impacts of dyadic collaboration on the supply chain

Referring to Table 7-9 and the discussion in the previous sections, in the upstream supply chain, the larger the company, the more benefits can be expected from collaborations in a dyadic view. Small companies may have more difficulties getting governmental support at the political level. SMEs tend to build good relationships with other parties to obtain sustainability or opportunity for their business, but it usually requires money to maintain the relationship and to achieve effectiveness or flexibility at the operational level. Particularly when they are comparatively small in scale, the advantages they can get from dyadic relationships built with their material suppliers are very limited.

In the downstream supply chain, all the focal companies have collaborations with 3PLs and refer to the proportions of the delivery function they have outsourced (CC-1: >70%, CC-2: >98%, CC-3: \approx 100%, CC-4: <30%; CC-5: >90%). It can be seen that as companies intend to allocate more resources to certain functions, the more advantages they may be able to achieve at both strategic and operational levels. However, when business connections have been established, the indicator shows that there is no big difference among different-sized companies at the operational level; while on the strategic level, the factor of size can still influence the advantages able to be obtained from dyadic collaboration; moreover, the type and quality do matter.

The results have indicated that the large-scale company with a sales force tends to have more opportunity in business with key customers; the company with popular patented products tends to obtain more sustainability.

7.4 Impacts of Triadic Collaboration on Supply Chain Performance

The research results have indicated that according to the role played by the third party involved, the bridged dyad (relationship between two bridged participants) can be at different collaborative levels and monitored by the focal company in related activities. No matter whether it is in the upstream or downstream supply chain, the focal company always has a certain decision-making authority and can have an impact on business performance not only in dyads, but also in triads.

Theoretically, building a collaborative relationship and establishing a network system involves pooling the resources required and developing the focal company's capability or managerial skills, which cannot be completed individually (Wasti et al., 2006). Therefore, this research asks whether there are more resources to be pooled and more participants to be involved, which could always bring about more advantages; and, in addition, when compared to a dyadic collaboration, whether a triadic collaboration offers greater chances for advancement. If R-y represents the existing collaborative relationship, R-x represents the pathway collaborative relationship and R-xy represents the bridged collaborative relationship, the triadic collaboration modes from the perspective of a supply chain are illustrated in Figure 7-1.

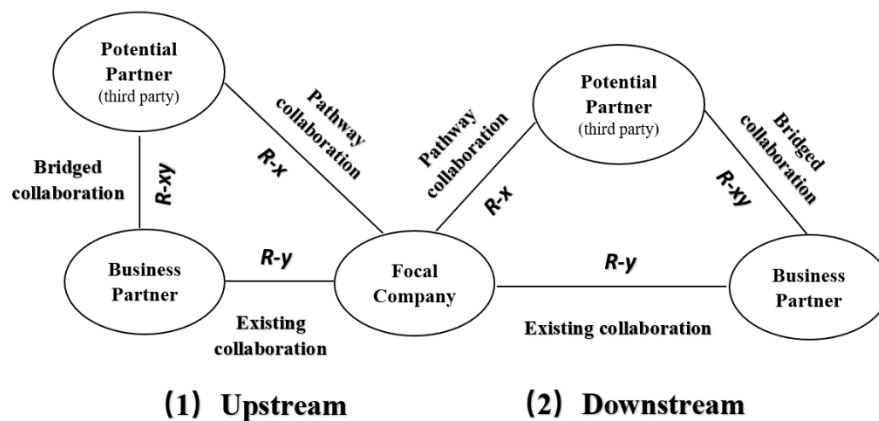


Figure 1-46 Structure of triadic collaborations

In this research, case companies were given indicators of performance measurement

at three levels. The results have indicated that the advantages they mostly would like to achieve through a triadic collaboration can be summarized as in Table 7-10.

Here the dyadic collaborations that are involved in constructing a particular triadic collaboration will be presented in the order of *Pathway Collaborative Dyad + Bridged Collaborative Dyad + Existing Collaborative Dyad* ($R-x + R-xy + R-y$).

Table 1-46 Formation of triads with dyads

Triadic Collaborative Pattern (R-x + R-xy + R-y)		CC-1	CC-2	CC-3	CC-4	CC-5	
Upstream	Directed	I (3P-Helper)	R-6 + R-67 + R-7 (cost efficiency, effectiveness) R-3 + R-31 + R-1 (opportunity, cost efficiency, effectiveness) R-3 + R-32 + R-2 (opportunity, cost efficiency, effectiveness)	R-3 + R-32 + R-2 (opportunity, cost efficiency, effectiveness) R-3 + R-31 + R-1 (opportunity, cost efficiency, effectiveness) R-6 + R-67 + R-7 (cost efficiency, effectiveness)	-	R-3 + R-31 + R-1 (opportunity, cost efficiency, effectiveness) R-3 + R-32 + R-2 (opportunity, cost efficiency, effectiveness)	R-3 + R-31 + R-1 (opportunity, cost efficiency, effectiveness) R-3 + R-32 + R-2 (opportunity, cost efficiency, effectiveness)
		II (3P-Fellow)	R-6 + R-67 + R-7 (opportunity, cost efficiency, effectiveness)	R-6 + R-67 + R-7 (opportunity, cost efficiency, effectiveness)	-	-	-
	Cultivated	I (3P-Relative)	R-2 + R-21 + R-1 (opportunity, effectiveness, flexibility) R-4 + R-41 + R-1 (opportunity, effectiveness, flexibility)	R-4 + R-41 + R-1 (opportunity, effectiveness, flexibility)	R-6 + R-61 + R-1 (opportunity, effectiveness, flexibility)	R-2 + R-21 + R-1 (opportunity, effectiveness, flexibility) R-4 + R-41 + R-1 (opportunity, effectiveness, flexibility)	-
		II (3P-Ally)	R-4 + R-41 + R-1 (sustainability*, opportunity, cost efficiency*, effectiveness, flexibility)	R-2 + R-21 + R-1 (opportunity, effectiveness, flexibility) R-4 + R-41 + R-1 (sustainability*, opportunity, cost efficiency*, effectiveness, flexibility)	R-2 + R-21 + R-1 (opportunity, effectiveness) R-3 + R-31 + R-1 (opportunity) R-3 + R-32 + R-2 (opportunity) R-4 + R-41 + R-1 (opportunity, effectiveness,	-	R-2 + R-21 + R-1 (opportunity, effectiveness, flexibility) R-4 + R-41 + R-1 (sustainability*, opportunity, cost efficiency*, effectiveness, flexibility)

					<i>flexibility)</i>		
<i>Downstream</i>	Concerted	I (3P– Fellow)	<i>R-1 + R-13 + R-3</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>)	–	–	–	–
		II (3P–Ally)	–	<i>R-1 + R-12 + R-2</i> (<i>sustainability, opportunity, cost efficiency, effectiveness, flexibility</i>) <i>R-1 + R-3</i> (<i>sustainability, opportunity, cost efficiency, effectiveness, flexibility</i>)	<i>R-1 + R-12 + R-2</i> (<i>opportunity, cost efficiency, effectiveness, flexibility</i>)	–	–
	Derived	I (3P– Helper)	<i>R-1 + R-13 + R-3</i> (<i>opportunity, cost efficiency</i>) <i>R-6 + R-62 + R-2</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-62 + R-3</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-61 + R-1</i> (<i>cost efficiency, effectiveness, flexibility</i>)	<i>R-6 + R-61 + R-1</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-62 + R-2</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-63 + R-3</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-64 + R-4</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-65 + R-5</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>)	<i>R-6 + R-61 + R-1</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-62 + R-2</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>)	<i>R-6 + R-62 + R-2</i> (<i>effectiveness, flexibility</i>) <i>R-6 + R-61 + R-1</i> (<i>sustainability, effectiveness, flexibility</i>)	<i>R-6 + R-62 + R-2</i> (<i>sustainability, cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-61 + R-1</i> (<i>cost efficiency, effectiveness, flexibility</i>) <i>R-6 + R-63 + R-3</i> (<i>cost efficiency, effectiveness, flexibility</i>)
		II (3P– Relative)	<i>R-1 + R-12 + R-2</i> (<i>cost efficiency, flexibility</i>)	–	–	<i>R-1 + R-12 + R-2</i> (<i>cost efficiency, flexibility</i>)	<i>R-1 + R-12 + R-2</i> (<i>cost efficiency, flexibility</i>)

Table 1-47 Impacts of triadic collaboration on the supply chain

Supply Chain	Focal Case Company	Strategic	Operational	Political
<i>Upstream</i>	<i>CC-1</i>	Sustainability (<i>Ally</i>) Opportunity (<i>Helper, Fellow, Relative, Ally</i>)	Cost efficiency (<i>Helper, Fellow, Ally</i>) Effectiveness (<i>Helper, Fellow, Relative, Ally</i>) Flexibility (<i>Relative, Ally</i>)	–
	<i>CC-2</i>	Sustainability (<i>Ally</i>) Opportunity (<i>Helper, Fellow, Relative, Ally</i>)	Cost-efficiency (<i>Helper, Fellow, Ally</i>) Effectiveness (<i>Helper, Fellow, Relative, Ally</i>) Flexibility (<i>Relative, Ally</i>)	–
	<i>CC-3</i>	Opportunity (<i>Relative, Ally</i>)	Effectiveness (<i>Relative, Ally</i>)	–
	<i>CC-4</i>	Opportunity (<i>Helper, Relative</i>)	Cost efficiency (<i>Helper</i>) Effectiveness (<i>Helper, Relative</i>) Flexibility (<i>Relative</i>)	–
	<i>CC-5</i>	Sustainability (<i>Ally</i>) Opportunity (<i>Helper, Ally</i>)	Cost efficiency (<i>Helper, Ally</i>) Effectiveness (<i>Helper, Ally</i>) Flexibility (<i>Ally</i>)	–
<i>Downstream</i>	<i>CC-1</i>	Sustainability (<i>Fellow</i>) Opportunity (<i>Helper</i>)	Cost efficiency (<i>Fellow, Helper, Relative</i>) Effectiveness (<i>Fellow, Helper</i>) Flexibility (<i>Fellow, Helper, Relative</i>)	–
	<i>CC-2</i>	Sustainability (<i>Ally, Helper</i>) Opportunity (<i>Ally</i>)	Cost efficiency (<i>Ally, Helper</i>) Effectiveness (<i>Ally, Helper</i>) Flexibility (<i>Ally, Helper</i>)	–
	<i>CC-3</i>	Sustainability (<i>Helper</i>) Opportunity (<i>Ally</i>)	Cost efficiency (<i>Ally, Helper</i>) Effectiveness (<i>Ally, Helper</i>) Flexibility (<i>Ally, Helper</i>)	–
	<i>CC-4</i>	Sustainability (<i>Helper</i>)	Cost efficiency (<i>Relative</i>)	–

			Effectiveness (<i>Helper</i>) Flexibility (<i>Helper, Relative</i>)	
	CC-5	Sustainability (<i>Helper</i>)	Cost efficiency (<i>Helper, Relative</i>) Effectiveness (<i>Helper</i>) Flexibility (<i>Helper, Relative</i>)	–

Referring to Tables 7-10 and 7-11, it can be seen that triadic collaboration is usually not motivated by the purpose of legitimacy or any other political/regulatory benefits; and nothing can be reflected on the political level. Compared to the impacts of dyadic collaborations, the advantages mostly to be achieved through triadic collaboration are at the operational and strategic levels in different triadic patterns. In this section, the impacts of triadic collaboration on the upstream and downstream supply chain will be discussed.

7.4.1 Impacts on the upstream supply chain

In the upstream supply chain, most triadic collaborations occur in R&D activities. Referring to Table 7-10, opportunity and effectiveness are the advantages that are most able to be achieved.

Usually, a triad is built when there is a requirement for assistance or support from a third party to complete a certain existing project. The resources or technologies held by the third party are regarded as opportunities for the focal company to increase the success rate of new drug launching. When the third party is in the role of *Helper*, *Fellow* or *Relative*, the focal company involves it and pays it to process particular work on a project; and, as has already been mentioned, most of the projects or formations of triads are temporary (Ateş et al., 2015), and most focal companies believe that at the operational level, building such triads (or even a more complicated network) can progress their effectiveness in R&D. Compared to purchasing the required facilities and arranging/hiring a necessary researcher within their group, it is much cheaper.

“There are some procedures we cannot do by ourselves because we are not qualified; and referring to the requirements of the industry and to ensure the safety of our products, we have to engage two or more qualified parties to prove us.” (CC-5)

Moreover, some companies like CC-5 do consider that collaborations are patterns to leverage resources and allocate work according to the capability of the parties involved.

Due to the fast development of generic drugs in China, in one category usually there are many pharmaceutical products with similar formulas. Their pricing should consider not only the cost of R&D, production and operations, but also customers' power of consumption and the market requirements. The focal company has to consider the price

of its competitors and their market positioning. To the group of SMEs, the pricing of generic drugs makes no big difference. When compared to a large pharmaceutical company they are less competitive, and they have to reduce price and sacrifice certain profit margins to capture the market. When compared to their peers who have usually applied the same strategy, the price change interval is very limited after deducting the basic costs.

“Innovation is important to us, and the speed of innovation is even more important to us.”
(R&D manager, CC-2)

In R&D, flexibility is in a way reflected in how quickly the focal company is able to improve certain generic drugs based on existing formulas or discover and launch new drugs to the market. Referring to Table 6-7, it is very interesting that, when the third party is paid to work (in the role of Helper, Fellow or Relative), the triads are mostly able to reach flexibility. However, if they are invited to play the role of Ally, it is possible for them to build a sustainable relationship in a certain area’s R&D, but to weaken flexibility; and this usually happens in new drug discovery. Thus, it can be seen that due to the role of the third party and projects with different purposes, the performance of the same triad can be different.

In procurement activity, referring to Table 7-10, triads constructed by two material suppliers and the focal company can be confirmed in the two comparatively larger cases that have subsidiaries, where one of their subsidiaries is the supplier involved. This does not happen very often and only in a particular project.

7.4.2 Impacts on the downstream supply chain

In the downstream supply chain, triadic collaborations are very common in distribution and logistics, due to strategic considerations and activity outsourcing.

Referring to Table 7-10, most of the collaborations in triads have significantly enhanced performance at the operational level in achieving cost efficiency, effectiveness and flexibility. To the focal company, whether to collaborate with the parties at the strategic level is largely dependent on the importance of its customers to the business. In any of the triads that involves a hospital (a very important customer),

sustainability is a crucial indicator to identify the success of collaboration (besides CC-1, CC-4). And according to cost considerations, they always try to keep their most important customers and provide them with better services in every aspect they can.

In the case of CC-1, because the 3PLs it works with are all at a comparatively high level, and due to the fact that it is currently enhancing its sales force, sustainability is said to be essential to any activity and there is no specific change in dyadic or triadic collaborations. Because CC-4's products are sensitive to temperature and humidity, it seldom invites 3PLs to send the orders; under the condition of necessity, it tends to engage 3PLs with good service quality for any customer. The sustainability of CC-4's business relationship with its customers is settled at the very beginning of collaborations, and will not change too much by the involvement of any third party, as the focal company is always trying to take everything under its control.

7.5 Performance Optimization in a Triadic Perspective

The research results have illustrated that in the formation of triadic collaborations, the existing collaboration has in a way set the tone for any further collaborations relevant to it. In other words, the main purpose of any triadic collaboration is to better fulfil the tasks set by the focal company or the existing dyadic alliance. Based on the information collected and the analysis above, the research is able to get to know the preference of the focal company in essential partner selection and the third parties with which the focal companies tend to work (Table 7-12).

Table 1-48 Performance comparison of dyadic collaboration and triadic collaboration in achieving competitive advantages

		Dyadic Mode	Frequency (in Triads)	Feature (Dyads)	Feature (Triads)
Upstream	R-y	R-1 (CC-University)	18	Usually good performance in achieving sustainability and/or opportunity ; in particular, the larger the company, the better the performance that can be expected (strategic level). Good performance in achieving effectiveness and flexibility . In R&D if certain dyads are based on long-term co-funded projects or programmes, compared to other possible dyads, there is no cost efficiency (operational level).	Good performance in achieving opportunity ; when R-x is in a close relationship, good performance in sustainability can be expected (strategic level). Good performance in achieving cost efficiency , effectiveness and flexibility ; however, when the R-x are only in a pay-to-work relationship in triads (x plays role of Helper and Fellow) but not very close to y, the flexibility may be negatively impacted (not remarkably) (operational level).
		R-2 (CC-SRI)	5		
		R-7 (CC-PS)	4		
	R-x	R-2 (CC-SRI)	5	Usually good performance in achieving sustainability and/or opportunity (strategic level); in particular, when the company is larger, then a better performance can be expected. Very good performance in achieving cost efficiency , effectiveness and flexibility (operational level).	
		R-3 (CC-Other pharma)	10		
		R-4 (CC-Hospital)	7		
		R-6 (CC-CS)	5		
Downstream	R-y	R-1 (CC-Agency company)	5	Usually very good performance in achieving sustainability and opportunity ; even better performance can be achieved when the focal company has put the customer into a very important position (strategic level). Good performance in cost efficiency , effectiveness and flexibility (operational level).	The more important y is, the better the performance in achieving sustainability and/or opportunity that can be expected (strategic level). The performance of cost efficiency , effectiveness and flexibility can be enhanced with noticeable progress, especially cost efficiency (operational level).
		R-2 (CC-Hospital)	10		
		R-3 (CC-Pharmacy)	6		
		R-4 (CC-	1		

		<i>Clinic)</i>			
		<i>R-5 (CC-OTC buyer)</i>	1		
R-x		<i>R-1 (CC-Agency company)</i>	8	Difficult to achieve sustainability, nor are there remarkable opportunities at a strategic level. Very good performance in achieving cost efficiency, effectiveness and flexibility (operational level) .	
		<i>R-6 (CC-3PL)</i>	15		

Referring to Table 7-11, the research results have indicated that in a triadic collaboration usually there could be a great improvement in overall performance compared to certain dyadic collaborations in business. However, the business performance in achieving competitive advantages at the operational level may be negatively impacted due to the third party's degree of consistency in triadic collaboration. The role played by the third party involved in relation to the focal company is significant to the supply chain performance in processing certain activities. Performance can be further enhanced at a strategic level, and it will not be negatively impacted if the established triad can complete the relevant tasks successfully.

The functions of different dyadic collaborations can be demonstrated as in Figure 7-2.

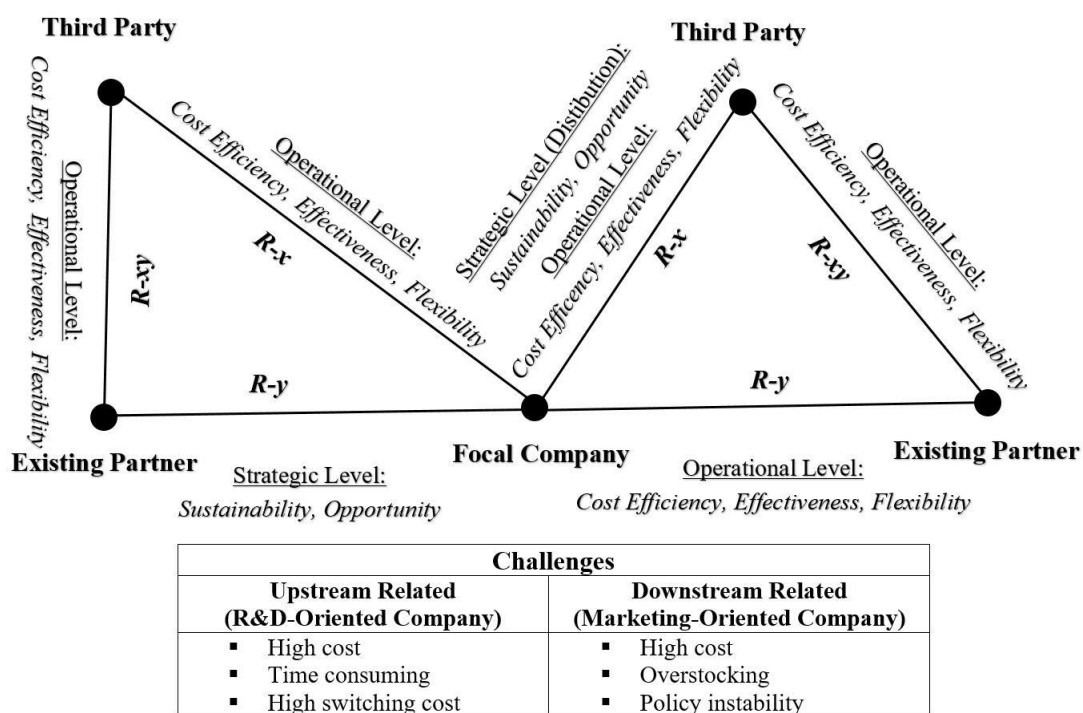


Figure 1-47 Performance optimization

In this section, the functions of each dyad in triadic collaborations in performance optimization will be discussed; the principles of performance optimization will be

illustrated to further reveal the differences between the formation of collaborations from dyads to triads in business performance.

7.5.1 Functions of existing dyadic collaboration

Existing dyadic collaboration refers to R-y shown in Figure 7-1. Upstream, this could be a relatively long-term collaborative relationship established between the focal company and a highly trusted supplier; downstream, it refers to a collaborative relationship built between the focal company and any customer (product buyer).

(1) Functions of existing dyadic collaboration in the upstream supply chain

Referring to Table 7-11, in the upstream supply chain the focal companies tend to work with universities (*R-1*) in innovation projects. In achieving sustainability and opportunity at the strategic level, universities are highly trusted institutions and regarded as potential partners who are able to provide the focal company with various kinds of support from professional talent. Collaborations with universities are encouraged by the local government with favourable policies (Guo et al., 2016). However, such collaborations could be costly and sometimes may not be that cost efficient and flexible in their work (Figures 7-3 and 7-4) due to the long R&D cycle (Rees, 2011) and the high R&D failure rate (Fiaz, 2013). To SMEs, university–industry collaboration is still the cheapest way to make practical achievements with the possibility of getting financial support from the government at the same time.

Sometimes the focal company does R&D based on a joint project with an SRI (*R-2*). Compared to universities, the work with an SRI is more targeted. Besides sustainability and opportunity, the focal company would like to obtain achievement or promote a certain subject in a comparatively short time. Cost efficiency, effectiveness and

flexibility are the factors that tend to be measured in innovation activities.

In procurement, the focal company prefers to work closely with project suppliers that it can fully or partly control. Absolute decision-making authority or high power in control is required for the focal company in the collaboration, as a high level of effectiveness and flexibility is desired. A quick response and good executive ability of collaborative suppliers to fulfil orders made are regarded as being very important for the key project of mainstream product manufacturing. A stable supply is relevant to the sustainability of production and the focal company's market supply.

(2) Function of existing dyadic collaboration in the downstream supply chain

In the downstream pharmaceutical supply chain, the customer portfolio is significant to the marketing of the focal company (Lukkari and Parvinen, 2008). Referring to the results in Table 7-9, the hospital is the biggest customer with which all case companies tend to keep a good relationship. The benefits the focal companies obtain are to enhance sustainability and increase opportunities for their business. The end consumers (patients) are directed by the hospital in purchasing, and the activities of product promotion with the hospital are the most effective means of market expansion. Once long-term collaboration can be built with the hospitals, the products of a certain focal company can be more easily shortlisted and are more likely to be recommended to patients. It could be costly to maintain such collaboration in a *guanxi* (Murray and Fu, 2016) establishment, but it is still worthwhile investing, as more value can be created across such a collaborative relationship.

In a customer portfolio, the pharmacy is the second most important partner group to the focal company, especially to the market-oriented pharmaceutical company (CC-2; refer to Chapter Four). Pharmacies are able to purchase from the focal company directly. However, the sales team of the focal company usually trades with them passively, especially in R&D-oriented pharmaceutical companies. Due to the fact that the collaboration of R-3 (DS) is normally at a comparatively low level, little sustainability and opportunity are achieved (Tables 7-6 and 7-7). The general performance of

achieving cost efficiency, effectiveness and flexibility is not bad. However, due to the unstable demand and comparatively small scale of ordering, the performance at an operational level is very limited.

In the customer portfolio of the pharmaceutical industry, the agency company should be a very special group, which has been discussed in Chapter Six. It is the choice of the customer of the focal company to purchase certain pharmaceutical products, but it also can be regarded as the outsourcer partner in sales to help further expand the market for the focal company. When R-1 downstream is set as the existing dyadic collaboration, the agency company is treated as a normal customer, and the involvement of any other third party is to enhance such a collaboration with the support of a certain value-added service (Soinio et al., 2012). The function of R-1 (DS) is to enhance performance at the strategic and operational levels. When referring to governmental regulations, some of the pharmaceutical products cannot be sold to end customers directly; having a good collaboration with an agency company is not only the best way to distribute relevant products, but is also a requirement of legitimacy.

7.5.2 Functions of pathway dyadic collaboration and bridged dyadic collaboration in performance optimization

Pathway dyadic collaboration refers to R-x, and bridged dyadic collaboration refers to R-xy (Figure 7-1). The building of pathway dyadic collaboration and bridged dyadic collaboration is based on the selection of the third party. Referring to Table 7-11, in the upstream supply chain any of the suppliers besides the existing partner can be involved as the third-party partner according to the requirements of the business; downstream, only the service provider can be the third party involved in triadic collaborations. Once the third party has been decided on, the pathway dyadic collaboration and the bridged dyadic collaboration can be settled.

(1) Functions of pathway dyadic collaboration and bridged dyadic collaboration in the upstream supply chain

In the upstream supply chain, the most popular third party is other pharma. In the research results it has been shown that to reduce costs in R&D processes, SMEs may purchase pharmaceutical patents or technologies from other pharmaceutical companies. Projects launched may need assistance from the seller for further development, and the collaboration pattern of such a triadic collaboration depends on the significance of the project and the capability of the third party in subsequent research. Therefore, it can be seen that the function of pathway dyadic collaboration is mainly to enable the focal company to access new fields or get new technologies, which is to promote its performance in opportunity and enhance its sustainability. Bridged dyadic collaboration is normally required for flexibility and effectiveness, which means that when the existing alliance has any questions or a co-work requirement, the third party should be able to respond to enhance overall performance at the operational level.

In the R&D process, the rest of the potential third-party partners are SRIs and hospitals. The research results have indicated that SRIs are mostly involved to provide the service of pharmaceutical testing, and hospitals provide the service of clinical trials. Pathway collaboration is to get essential support to complete a certain project, which is motivated by the requirements of being functional and complementary (Chapter Six). It is more cost efficient to build the pathway than for the focal company to do it by itself, due to the possibly great investment needed in facility purchasing and staff training; such collaborations are usually built on pay-to-work business, and service with effectiveness and flexibility can be provided under the condition that money is in place. When the third party gets the permission from the focal company, it can be bridged with the partner in an existing alliance; the bridged collaboration is to enhance performance at the operational level and ensure all relevant information can be delivered to project participants clearly and accurately.

In the procurement process, when conventional suppliers are involved as a third party, according to the research illustrated in the previous chapter, it is largely due to particular requirements of the co-project launched by the focal company and the subsidiary or associate. The function of pathway collaboration and bridged collaboration is to enhance overall performance at the operational level. Cost efficiency can be achieved

through single sourcing (Sajadieh and Thorstenson, 2014) or reducing material costs and the ability to negotiate better procurement conditions; effectiveness and flexibility can be promoted based on prior commitment relevant to quality control of material and service delivery obtained in negotiations. With the increase of the third parties' degree of consistency in triadic collaboration, theoretically the overall performance at the strategic level can be progressed.

(2) Functions of pathway dyadic collaboration and bridged collaboration in the downstream supply chain

In the downstream supply chain, in the distribution process, it is normal for a pharmaceutical company to collaborate with an agency company for market development (Dambrin and Robson, 2011). Although the research results have indicated that most of the SMEs tend to have their own sales teams, it is inevitable for them to seek assistance from third parties to enhance their marketing performance.

Referring to previous discussions, the agency companies are usually involved as the Ally partner or Fellow partner. Therefore, it can be argued that pathway collaboration is usually at a high level downstream when the focal company needs assistance in marketing. Pathway collaboration is to promote the overall performance of the focal company at both the strategic and operational levels. The sustainability of the focal company in a way depends on the value co-created (Chakraborty et al., 2014). When a third party is involved, there are two lines of profit making for the focal company, where one is its own sales force and the other is the agency company.

With the help of the third party, the focal company is able to focus on its main customers (effectiveness) and its pharmaceutical products can be introduced to new customers (opportunity). Due to the fact that the agency company is able to deliver feedback from relevant customers in time and the orders from the agency company can be forecasted, flexibility can be enhanced also. For R&D-oriented pharmaceutical companies that own a limited sales force or market-oriented companies that would like to develop a market in another region, pathway collaboration with a third party could

be cost efficient as well, especially at the beginning of a new product launch. Although the profit margin could be less compared to the product being directly sold by the focal company to customers like hospitals and pharmacies, the overall income could be considerable, and it is able to get rid of the risks relevant to *guanxi* building in market development, like bribery scandals.

Bridged collaboration of the agency company and its related customers is essential to the business. The operation of the supply chain in the healthcare industry is said to be unique (Chakraborty et al., 2014), and regular interactions between product/service provider and the customer are necessary (Lukkari and Parvinen, 2008) to adjust or promote certain marketing strategies and direct future R&D and production. Thus, bridged collaboration is in a strategic position in triad construction. It helps not only to enhance the overall performance of the focal company at the operational level, but also at the strategic level.

Due to the widespread outsourcing of logistics in the pharmaceutical industry, the triadic construction with the pathway built through the involvement of 3PL is normal in the downstream supply chain. The results indicate that the 3PL is mostly involved as the Helper partner; pathway collaboration and bridged collaboration are only helpful to support the smoothing of business in delivery. Once the delivery tasks have been transferred to 3PLs, the focal company tends to be hands-off and go back to other businesses. When there are problems with delivery, the focal company will contact the customer and relevant 3PLs to work out a feasible solution.

In delivery, most of the 3PLs are just responsible for the delivery and handover of goods, but not for more communication of service satisfaction and recommendations. When everything goes well in delivery, such collaboration can significantly improve the overall performance of cost efficiency and effectiveness. Flexibility can be achieved for some pharmaceutical companies when they are listed as very important customers of relevant 3PLs in pathway collaborations. However, in bridged collaborations, there is no direct evidence to confirm that more flexibility will be given to big customers.

7.5.3 Principles of performance optimization

In line with Figure 7-2, the research has indicated that in the upstream supply chain, most of the existing collaborations with a dyadic construction focus on how to improve performance at the strategic level. The continuing investments in R&D and relationship maintenance have a high cost in the upstream pharmaceutical supply chain. Most of the long-term dyadic collaborations with universities do not have clear aims in new drug development; and it usually takes a long time to make any achievements that can be applied in industry.

What is more, in ongoing collaborations with existing partners, the switching cost could be high in particular projects with high initial investment. Therefore, to improve performance in the upstream supply chain, the main tasks are to reduce R&D cost or improve cost efficiency, shorten the R&D phase and expedite the processing of existing projects, to improve performance at an operational level. Pathway collaboration and bridged collaboration are ways to make up for the shortage of existing dyadic collaboration as a target.

In the downstream supply chain, a certain number of existing collaborations serve for market maintenance and expansion, and the overall downstream performance is crucial to the focal company's business, which can have a further impact on its sustainable development. In distribution activities, high costs can be generated by staff training, *guanxi* building, after-sales service provision (including instructions, regular visits and communication) and other relevant marketing expenses. Due to certain provisions, some of the products cannot be sold to customers directly, which may cause risks of overstocking if the focal company only relies on its own sales force. Moreover, due to the fact that healthcare reforms in China brought about a series of price adjustments (Narayana et al., 2014) and the procurement policy of hospitals (the most important customer of the focal company) is changing, the possibility of poor marketing is increasing.

Thus, to improve performance in the downstream supply chain, the main tasks are to further reduce the costs of distribution and lower the risks of marketing. The focal company should consider how to improve its performance not only at the operational level, but also at the strategic level. In distribution, pathway collaboration is a sort of business that is complementary to the focal company and the agency company, where

the focal company needs a friend to share the marketing risks and the agency company needs a stable supply at a favourable price. A successful collaboration could be a win-win alliance, and the bridged collaboration could further enhance the overall performance of the focal company in the long term at an operational level, especially in the aspect of effectiveness. In logistics, pathway collaboration and bridged collaboration are purely about functional support, which contributes to improving performance at the operational level in cost reduction and effectiveness.

7.6 Summary

This chapter has illustrated how triadic collaboration has an impact on pharmaceutical supply chain performance by achieving competitive advantages upstream and downstream. The functions of each dyad in triadic collaborations in performance optimization are highlighted to further reveal the differences between dyadic collaborations and triadic collaborations in business fulfilment and achievement.

From the relevant evidence, it can be argued that from dyads to triads, supply chain performance upstream can be promoted due to the targeted project support, mainly from the third party in the characters of Fellow and Helper; supply chain performance downstream can be enhanced due to the particular functional support from the third party in the characters of Ally and Fellow (in the distribution segment) or in the character of Helper (in the logistics segment). To optimize the performance of the supply chain, a company needs to ensure that performance at the operational level is essential to the further development of any business. Only when cost efficiency and effectiveness have been improved is the focal company able to reinvest more money in innovation projects and leverage relevant resources to focus on its core business. If flexibility can be achieved in the supply chain, the supply chain can be better operated based on a virtuous cycle of supply and demand in sustainable development.

There is no clear evidence to show that there is any impact of triadic collaboration on supply chain performance at the political level. Due to the provision of product safety, all processes in the pharmaceutical supply chain have to be legitimate. Financial

support from government can be traced in particular innovation projects only; there is no direct correlation between such rewards and joint projects in R&D.

Chapter Eight : Conclusion

8.1 Introduction

This chapter mainly consists of five sections to review and further discuss the research of this thesis – *Supply Chain Collaboration: From Dyads to Triads*. The first section will briefly provide the conclusions of the study and the answers to each of the research questions. In the second section, the implications of the study will be explained. In the third section, the contribution of knowledge to theory and practice will be demonstrated. In the fourth section, the limitations of the research will be identified, before recommendations are made for future study in the fifth section. Lastly, a summary will be presented.

8.2 Conclusion of the Study

Supply chain collaboration is regarded as a value-adding activity in partnership construction to achieve mutual benefits (Jia and Lamming, 2013) and to gain competitive advantages of business flexibility (Nystén-Haarala et al., 2010), cost efficiency (Adenso-Díaz et al., 2014), sustainability (Beske and Seuring, 2014), opportunity (McKelvey et al., 2014) and legitimacy (Fiedler and Deegan, 2007). The establishment of collaboration is usually based on non-contractual exchanges and unspecified obligations over a period of time (Tanskanen, 2015). The dyadic partnership as the starting mode for value creation encourages individual parties to pool their resources and information (Gomes and Dahab, 2010) to improve supply chain performance as a whole.

However, due to the increasing complexity within the supply chain (Braziotis et al., 2013), a growing number of scholars are arguing that investigation of dyadic relationships is not sufficient to fully reflect the complex nature of a supply network (Choi and Wu, 2009; Wu et al., 2010). Moreover, due to the rise in outsourcing (Scarlett,

1996; Bhaskaran and Jenkins, 2009; Yakhlef, 2009), the supply landscape is now heavily reliant on networks. A triadic view of supply chain collaboration is said to be the “first step” (Choi and Wu, 2009) in exploring a firm’s relational behaviours of collaboration from a network perspective, which is significant to the development of supply chain management.

This research explores the configuration patterns of triadic collaboration in the upstream and downstream supply chain, which provides a practical method for further investigation of supply chain collaboration in industries.

It is exploratory research, and the methodology that has been applied is the case study (a multiple-case study). Regarding the industry background (pharmaceutical industry), firm size (small to medium-sized enterprise, SME) and region (China mainland), case companies were selected to be involved. The data was collected mainly through interviews and surveys; other resources of investigations, information online, mass media and documents have been involved as well. A protocol as the interview tool was developed in the early stage of the study. The relevant ethical issues associated with data collection were anticipated with certain solutions. Techniques of pattern matching, explanation building, logic models and cross-case synthesis were applied to generate high-quality data analysis.

The research results have indicated that a triadic collaboration is usually built on an established dyadic collaboration (usually at a high level); a third party can be involved to provide functional support or enhance a certain supply chain performance. One of the key elements of the lowest level of collaboration is the direct business connection; thus, in the identification of triadic collaborations, there must be direct business connections from one to another among the participants involved.

This research identified and mapped four types of triadic collaboration pattern in the supply chain – Directed Collaboration Triad (upstream), Cultivated Collaboration Triad (upstream), Concerted Collaboration Triad (downstream) and Derived Collaboration Triad (downstream). Referring to the mission and strategy of the focal company, third parties in various characters (Ally, Fellow, Relative and Helper) can be invited to collaborate according to the features of different triadic patterns. Meanwhile, the focal company is able to decide what type of character to get as the third party, which is based

on certain considerations made in the relevant role patterns. Moreover, the patterns of triadic collaboration in the supply chain can change dynamically; and patterns can be interconverted at the same level or cross different levels (strategic level and operational level).

The research data was collected from the pharmaceutical industry, and the results reveal that the activity of outsourcing is widely applied in the supply chain. Outsourcing can be an effective method for manufacturers to enhance their performance (Boulaksil and Fransoo, 2010; Lowman et al., 2012), which is generally necessary to the development of industry. However, outsourcing is not always good for the development of individual business. In the case studies, functions of R&D, distribution and sales can be fully outsourced to third parties; nevertheless, the power of market control of the focal company can be weakened due to the building of new collaborations and the decay of existing collaborations. What is more, evidence shows that there is a growing risk of overstocking when the company is disconnected from its customers due to the involvement of third parties.

To reveal the impact of triadic collaboration on the supply chain, the results have shown that triadic collaborations can affect performance mostly at an operational level; and the improvement of performance at the operational level (cost efficiency, effectiveness and flexibility) can be the foundation of performance progress at the strategic level (sustainability and opportunity). In particular, the research results have highlighted that supply chain performance upstream can be promoted due to targeted project support, mainly from the third party in the characters of Fellow and Helper. Supply chain performance downstream can be enhanced due to the particular functional support from the third party in the characters of Ally and Fellow (in the distribution segment) or in the character of Helper (in the logistics segment).

8.3 Implications of the Study

This research identified the possible triadic collaboration patterns in the upstream and downstream supply chain, with discussion of the roles played by certain participants in the formation of triads. Its findings will help scholars and business practitioners make relevant decisions of partner selection and relationship maintenance according to their mission and strategies (Table 8-1).

Table 1-49 Implications of the study

Stakeholder	Decision Making	Position (in SC)	Patten Selection	Role Played	Application	Benefits
<u>Focal Company</u>	Short-Term Collaboration	Upstream	Directed I	General Buyer (GB) Business Integrator (BI)	R&D Activity Procurement Activity	Operational Level (GB, BI1, BI2, PP)
			Directed II	Project Initiator (BI) Project Partner (PP1)	Procurement Activity	
		Downstream	Derived I	Product Provider (PP2) Outsourcer (O)	Logistics Activity Distribution Activity	Operational Level (PP2, O, BP, BS)
			Derived II	Business Partner (BP) Business Supporter (BS)	Distribution Activity	
	Long-Term Collaboration	Upstream	Cultivated I	General Buyer (GB)	R&D Activity	Strategic Level (BI1, BI2, PP1)
			Cultivated II	Business Integrator (BI1) Project Initiator (BI2) Project Partner (PP1)	R&D Activity	Operational Level (GB, BI1, BI2, PP1) Political Level (BI1, BI2, PP1)

		Downstream	Concerted I	Product Provider (PP2)	Distribution Activity	Strategic Level (O, BP) Operational Level (PP2, O, BP, BS) Political Level (O, BP)
			Concerted II	Outsourcer (O) Business Partner (BP) Business Supporter (BS)	Distribution Activity	
<u>Partners</u>	Short-Term Collaboration	Upstream	Directed I	Highly Trusted Strategic Partners	R&D Activity	
			Directed II		Procurement Activity	
		Downstream	Derived I		Logistics Activity	Operational Level Political Level
			Derived II		Distribution Activity	
	Long-Term Collaboration	Upstream	Cultivated I		R&D Activity	Strategic Level
			Cultivated II		R&D Activity	Operational Level Political Level
		Downstream	Concerted I		Distribution Activity	Strategic Level

			Concerted II		Distribution Activity	Operational Level
<u>Third Party</u>	Short-Term Collaboration	Upstream	Directed I	Helper	R&D Activity Procurement Activity	Operational Level (Pay-to-work business to build income Opportunity to build image for future business)
			Directed II	Relative	Procurement Activity	
		Downstream	Derived I	Helper	Logistics Activity Distribution Activity	
			Derived II	Relative	Distribution Activity	
	Long-Term Collaboration	Upstream	Cultivated I	Fellow	R&D Activity	Strategic Level Operational Level (High trust and commitment Stable business)
			Cultivated II	Ally	R&D Activity	Strategic Level Operational Level (High trust and commitment Stable business High power)

		Downstream	Concerted I	Fellow	Distribution Activity	Strategic Level Operational Level (High trust and commitment Stable business)
			Concerted II	Ally	Distribution Activity	Strategic Level Operational Level (High trust and commitment Stable business)

When the focal company intends to build a long-term relationship with certain partners, in the upstream supply chain the *Cultivated (I, II)* pattern is recommended; and in the downstream supply chain the *Concerted (I, II)* pattern will be a good choice. In this situation, the third party involved has a comparatively high consistency in triadic collaborations, which may enhance supply chain performance at the strategic level to increase the focal company's sustainability and bring about more opportunities. Depending on the role played by the focal company in the business and the decision-making authority it holds, the role of a third party can be negotiated in advance and a consensus reached; relevant details may have to be listed in the contracts (Bresnen and Marshall, 2000; Frödell, 2011). If the focal company would like to build a certain collaboration in *Pattern I*, the third party should be the one with a high willingness to collaborate and should not mind conceding its power to coordinate to the focal company; the third party can be facilitated with the character of Fellow and should be controllable in business. If the focal company would like to build a certain collaboration in *Pattern II*, it should be prepared to compromise and always try to keep regular communications (Pedroso and Nakano, 2009) with all partners in the triad due to possibly increasing interdependence (Buvik and Reve, 2001) among the triad's participants; the third party should be in a position of extreme high trust and high commitment, and this should be adequate for a particular mutual project or business.

To the focal company, when there are particular requirements (Burt, 2009; Charterina and Landeta, 2010) of specific support in technology, goods and materials, or relevant services, temporary collaborations with specific parties can be built to promote its supply chain performance at an operational level; the triads that can be built in this situation are usually in the pattern of *Directed (I, II)* upstream and *Derived (I, II)* downstream. The third party involved is normally in a pay-to-work business mode, and the focal company can decide the contract period (length of collaboration) with absolute power (Pesqueux, 2012; Caniels and Gelderman, 2007). Compared to patterns of *Cultivated* and *Concerted Collaboration*, the degree of consistency in a triadic collaboration of the third party is low; the third party only has to complete the established work, and does not have to arrange everything in line with the mission or

strategy of the focal company. If the third party is introduced or designated by the existing partner, at the beginning of the collaboration the triadic pattern is normally *Pattern II* and such a collaboration can be regarded as a business trial; based on the performance of the collaboration and the future demand of the focal company, collaborations in *Pattern II* can be converted to *Pattern I*.

When referring to the triadic collaboration patterns identified, the third parties may be able to position themselves in the strategic layout of a certain business. To strive for sustainable development and stable collaboration with the focal company, they may have to promote their trustworthiness and make clear their commitment (Singh, 2011b; Adobor, 2013; Qu and Yang, 2015). It seems that the safest way for the third party to develop is to boost its collaborations with the focal company from the operational level to the strategic level. Although the level of dependence could be higher and the associated risks of relationship breakdown will be increased, from a long-term perspective the third party can progress to be a more competent partner and benefit from the co-working relationship (Wu et al., 2010) to accumulate more capital and resources (Charterina and Landeta, 2010), and thus enhance its risk-resistance capability (Grudinschi et al., 2014b). If it is not easy for the third parties in the character of *Helper* or *Relative* that are positioned in the pattern of *Directed* or *Derived Collaboration* to be granted the character of *Fellow* or *Ally* and positioned in the pattern of *Cultivated* or *Concerted Collaboration*, they must always be prepared to concede in business if they still want to keep the collaborative relationship with the focal company; however, the third party should be able to hold the bottom line and be prepared to retreat from the current business.

The main purpose of outsourcing activities is cost reduction (Choi, 2007), and referring to this research it can be seen that the direct consequence of outsourcing is that more third parties are involved to make the supply chain more complicated. Therefore, this study suggests that all supply chain participants should make clear their roles in any potential collaborative network, and build and maintain established collaborations with systematic consideration.

8.4 Contribution to Knowledge

8.4.1 Contribution to Theory

The contribution to theory can be reflected in the theoretical development of supply chain collaboration and filling the gap in pattern configuration from a triadic view. The details of the contribution can be expressed as follows.

(1) Distinguishing kinds of collaborative relationships

Supply chain collaboration refers to a phenomenon of stakeholders engaged in the interactive process of a supply chain/network to apply shared norms, rules and structures (Li et al., 2015) to operate or make related decisions that can be allocated to levels according to different degrees of trust, commitment, power and dependence (Brown et al., 1995; Hua et al., 2009; Caniëls and Gelderman, 2007). The levels of collaboration in a way represent the closeness (Guan et al., 2016) of certain relationships between two relevant business partners. Generally speaking there are four levels of collaborative relationship (refer to Chapter Two: Literature Review). Levels one and two can be allocated to a low-level collaboration, where participants in the supply chain may build connections according to certain business goals (Tuomela and Salonen, 2005); they may share information and other resources, but only to a minimum degree. Levels three and four can be allocated to a high-level collaboration, where besides the basic requirements of business connection and goal congruence, the partners will share information to a high degree and even at a maximum level; decision synchronization may be required in mutual projects, and such a relationship can be expected for a comparatively longer period due to incentive alignment.

(2) Demonstrating the formation of triadic collaboration

The formation of triadic collaboration is usually based on an existing stable dyadic collaboration. A third party can be involved according to the requirements of a mutual project or particular business requirements; a pathway collaboration and a bridged collaboration can be built through the third party involved to support the mainstream business launched by the focal company or the existing dyadic alliance. Each dyadic

collaboration can be enhanced or decayed, which depends on the party in the central position with considerably greater decision-making authority; the triadic collaboration can be built or disintegrate, and the collaborative pattern can be changed dynamically.

(3) Identifying the patterns of possible triadic collaboration

Referring to the degree of collaboration of the dyads (existing collaboration, pathway collaboration and bridged collaboration) to build a particular triad, eight triadic collaborations can be identified in the upstream and downstream supply chain. They are *Directed I* (HLL), *Directed II* (HLH), *Cultivated I* (HHL) and *Cultivated II* (HHH) upstream; *Derived I* (LLL/HLL), *Derived II* (HLH), *Concerted I* (HHL) and *Concerted II* (HHH) downstream.

(4) Developing China-based Supply Chain Management research

China, the largest transitional economy in the world, has been regarded as “the workshop of the world” (Liu and Mckinnon, 2016). In the process of SCM theory development, Chinese SCM phenomena are investigated and further developed based on worldwide studies, which provide a valuable source of insight for international business practitioners facing challenges in collaboration (Jia and Lamming, 2013). Nowadays, scholars have relied too much on Western theories (Yong, 2008), so to further develop existing theories in China’s case and to test China-based management theory (Tsui, 2009) in a Western context could be a trend in future research. Similarly, the value of the China case-based research of Child (2008), Barney and Zhang (2008) and Bruton and Lau (2008) has confirmed that such research can contribute to global management knowledge and address local management problems better.

8.4.2 Contribution to practice

In terms of the contribution to practice (industry), this study has illustrated the current situation of developments in the pharmaceutical industry in China. China is one of the biggest emerging economies with rapid growth, and the pharmaceutical industry is in a crucial position in government strategy. This study enables China’s domestic pharmaceutical companies to better understand certain relationships with participants

in the supply chain in business; guidelines for collaboration establishment and relationship maintenance are proposed to the relevant parties. To international companies or relevant institutions that would like to build collaborative relationships with pharmaceutical companies in China, this study presents an overview of certain relational role behaviours of their potential Chinese partners in collaboration; patterns of collaboration and their impact on business performance may provide them with new methods to figure out the best way to collaborate and to obtain benefits at a maximum level.

From the perspective of pharmaceutical companies, especially small to medium-sized enterprises, collaboration with other parties within the supply chain is inevitable. Due to the high cost of R&D (Rees, 2011) and requirements of continuing investment (Ramanathan and Gunasekaran, 2014) throughout the supply chain from upstream to downstream for equipment replacement and maintenance, staff training, marketing and channel development and so on (Rees, 2011; Amaro and Barbosa-Póvoa, 2008; Narayana, Kumar Pati and Vrat, 2014), cost reduction/cost efficiency is significant to the sustainable development of the focal company. Outsourcing is widely applied to promote supply chain performance and increase cost efficiency at the same time; pharmaceutical companies can benefit from this, but the increasingly complicated supply chain and the massive number of third parties to choose from in a way challenge their business development.

This research involves a number of cases related to the activities of outsourcing in the upstream (R&D) and downstream (distribution and logistics) of the pharmaceutical industry. It is said that outsourcing is a practice that reduces costs by transferring certain functions to other parties (Fixler and Siegel, 1999; Boulaksil and Fransoo, 2010). The research results have indicated that besides the outsourcing of logistics, other outsourcing activities are not operated in a typical way referring to the definition of outsourcing. As in the pharmaceutical industry, most of time SMEs in China tend to undertake joint projects with third parties rather than fully outsourcing, so the means of collaboration can be different.

Moreover, the outsourcing of distribution in China is in the agent mechanism and follows the relevant policy granted by local government. Collaborations in the

downstream supply chain can be very complex. This study reveals the general structure of the pharmaceutical supply chain in China. With the structural mapping provided, business practitioners may be able to see the difference between pharmaceutical companies with a different business focus (R&D oriented and marketing oriented) and thus adjust their strategies to be more feasible.

8.5 Limitations of the Study

Due to the limited research time and research resources, only five cases are involved. As embedded multiple-case studies, more sub-case companies in the upstream supply chain and downstream supply chain would be desired to make this research more comprehensive.

The triadic collaboration patterns are generated based only on cases from the pharmaceutical industry in China, and different countries and cultural backgrounds might produce different research results. In addition to this, in the section on the impact of triadic collaboration on performance, due to the fact that some of the factors of sustainability, opportunity, effectiveness and flexibility are difficult to measure, the investigation of how the performance can be affected is not sufficient and is at a general level.

In this study, the qualitative method enables the research to construct certain conceptual models for business practitioners to make relevant decisions; however, when it comes to application in practice, evaluations from a qualitative perspective may be time consuming and could cause disputes if there are disagreements. Therefore, quantitative research on this study could be conducted based on the conceptual framework and models introduced.

This study explores the possible dynamic changes in triadic collaboration patterns according to various missions and strategies of a particular business in different activities in the upstream and downstream supply chain. It has been argued that triadic collaborations are usually built temporarily (Ateş et al., 2015); the research results in this study have indicated that within a contractual period, certain triads can be constant.

This research also discussed business trials that may need to be in a pattern in practice before the establishment of any long-term collaboration. However, the research is limited in explaining the exact time period that is acceptable for the focal company to hold a trial or to collaborate with the partner. A more systematic investigation is required to make this clear, and thus to further promote the applicability of this research.

In the illustration of collaborations from dyads to triads, issues related to the formation of triadic collaborations have been discussed, and this study introduced a certain number of situations in which triads can be motivated and benefits can be expected from such collaborations. However, there are some risks associated with the building of triads, like inefficiency of information processing (Ateş et al., 2015). Due to the space limits and the requirements of responding to the research questions, they can be introduced only generally.

8.6 Recommendations for Future Research

There are some recommendations for future research in line with the limitations listed above.

First of all, to polish this study and further verify the visibility of the collaboration patterns proposed, more cases are desired either as the focal company or partners within the supply chain. The pharmaceutical industry is very complex, and compared to other industries it has even higher requirements in innovation and production (Rees, 2011); a complete channel system for product distribution is essential to the sustainability of the industry. With the involvement of more cases, a comprehensive pharmaceutical supply chain structure mapping to illustrate potential collaborations can be expected; more triadic collaborations upstream and downstream may be able to be identified to enrich the samples for data analysis.

Secondly, a similar study could be generated in other regions or industries. The patterns proposed are generalized and cover the preferences of China's pharmaceutical industry. If cases in other regions or industries could be involved, relevant conclusions could be applied over a wide area and be more valuable to business practitioners.

Thirdly, quantitative research on this study could be conducted based on the conceptual framework and models introduced. In Chapter Six, in the part on the introduction of collaborative issues in the life cycle time line, there are some points that can only be illustrated as a trend, but unfortunately cannot be quantified. If in the future quantitative data could be collected to identify the relationship of sales volume and market difficulty, it could be more applicable for the focal company and the agency company in decision making related to collaborations and better balancing their business to achieve mutual benefits to the maximum extent.

Fourthly, research could be carried out on risk management associated with the formation of collaborations from dyads to triads. Due to the complexity of the pharmaceutical supply chain and the increase in outsourcing activities in the pharmaceutical industry, there could be more risks in business associated with collaborations. In relevant discussions of the formation of triadic collaboration and the interconversion of various patterns, it is actually about how the focal company intends to optimize its performance in business, and guidelines on risk management could be meaningful to its strategy making and pattern selection.

8.7 Summary

In summary, the purpose of this research was to explore the configuration patterns of triadic collaborations in the supply chain, which has been achieved. Certain dyads that contribute to the formation of triads have been identified and discussed in the context of the pharmaceutical industry. Triadic collaboration patterns have been framed and applied in the relevant conceptual models proposed. Guidelines for collaboration establishment and relationship maintenance have been provided. The research provides readers with a deeper understanding of supply chain collaboration and makes an original contribution to knowledge on multiple levels.

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Appendix One: Samples of dyadic relationship exploration

No.	Modes	Industry	Investigated activity	Interpretation/Result	Reference
1	<i>Supplier-Retailer</i>	Retail	Logistics (Distribution)	Supplier-Retailer dyad is important in operating an effective and efficient down-stream supply chain. No or only a little collaboration in four introduced cases. Difficulties in collaborative relationship estimation: lack of trust, collaborative culture, and common value; inefficient information exchange. Logistic performance is a significant aspect within collaborations.	(Forslund 2014)
2	<i>Customer-supplier</i>	Machine tool manufacture; Machine manufacture	Innovation	Customer-supplier dyad usually generated beginning from contracts, which positively impact on firm's innovativeness and economic results. Collaborative customer-supplier dyad is encouraged in both perspectives of suppliers and customers.	(Charterina & Landeta 2010)
3	<i>Focal firm-joint venture</i>	Information communication	Operation	The collaboration of joint ventures is a kind of competitors' alliance. The capability of the two firms in a way decide the benefit that can be generated individually and commonly. The weaker one usually could benefit more personally; high differential in capabilities could lead to the decreasing of overall common benefit.	(Shyam Kumar 2008)
4	<i>Firm-customer</i>	No specific	Value creation	Firm-customer dyad is said to be an effective practice of value creation. The degree of value-in-offering and value-in-use are in a way an indication of how closely the firm and customer is interrelated.	(Ngo & O'Cass 2010)
5	<i>Customer-supplier; Focal firm-stakeholder (up- stream/downstream); Non-focal firm-Non-focal firm</i>	Manufacture (no specific)	Purchasing	Dyads are various in different levels of supply chain, and could be formed by focal company and supplier (in different tiers) and customer. Supply chain is not simply linear, but a complex "network" which is constructed by inter-connected chains. The management of dyads is associated with the sustainability issues.	(Miemczyk et al. 2012)
6	<i>Manufacturer-supplier</i>	TV manufacture	Purchasing (materials and services)	Manufacturer-supplier dyad can be cooperatively associated. The types of suppliers (independent, cooperative, and affiliated) decided the level of collaboration.	(Guillot & Lincoln 2015)
7	<i>Retailer-supplier</i>	Retail	Logistics (Distribution)	Relationship-specific investment and supplier's customer orientation are crucial in the estimation of retailer-supplier dyads. The collaborations in the dyads have a positive impact on both sides of the participants. Logistic performance is a significant aspect within collaborations.	(Hofer et al. 2014)

8	<i>Buyer-supplier</i>	Manufacture (No specific)	Performance management	Compare to “customer-buyer” dyads, the collaborative level of “Buyer-supplier” is higher. There are several obstacles in collaboration of the dyad: different goals and priorities, lack of trust and parallel communication structure.	(Forslund & Jonsson 2009)
9	<i>Manufacturer-customer</i>	Plastic packaging produce	Design, production, and distribution	The manufacturer-customer collaborative dyads could provide opportunities in a product’s further specification improvement. If the interdependence level is comparatively high, the collaborative firms in a way concentrate on system efficiency, not the production and transaction cost efficiency; which tend to build a long-term relationship.	(Gomes & Dahab 2010)
10	<i>Customer-supplier</i>	Manufacture (No specific)	Logistics (Distribution)	The customer-supplier dyads are based on “order-to-delivery” process. The performance of the relationship can be measured by the performance of distributions. The higher the level of integration within the dyads, the lower the demand for the performance management.	(Forslund & Jonsson 2007)
11	<i>Logistic provider-buyer</i>	No specific	Logistics	The dyads of logistic provider-buyer is important in supply chain management. Due to the buyer’s tendency to control the charges of logistics service and compare the prices with other providers, and the service provider is kind of struggling with maintaining in-house effectiveness and profitability; both logistic provider and buyer are much more focused on the clauses interpreting it in their contract and negotiate prices and issues related to service failures rather than building, maintaining, and developing the relationships.	(Halldórsson & Skjøtt - Larsen 2006)
12	<i>Supplier-buyer (China-Western)</i>	Manufacture (No specific)	Benefit creation, performance measurement	The degree of Supplier-buyer dyadic collaborative relationship is progressively grown in the route of Exploration (Stranger) – Expansion (Acquaintance) – Commitment (Partner). Can be measured by cost-reduction, flexible adaptation, relationship effectiveness, commitment, trust, guanxi, collaboration.	(Jia & Lamming 2013)
13	<i>Client-LSP (Logistic Service Provider)</i>	Manufacture (No specific)	Logistics (Consulting, planning, and distribution)	The 3PL is currently in the suboptimal position in supply chain optimization, and the relationship is only “operational contractor”. New services (besides distribution) that are able to be provided by 3PL are difficult to operate, as SMEs tend to take the power of control in business.	(Soinio et al. 2012)
14	<i>Buyer-supplier</i>	Oil	Supplying (upstream)	There are two periods of the collaboration between buyer-supplier: Non-sanction period and sanctions period. In this industry, the supplier is in “dominance” position.	(Tantoush et al. 2009)
15	<i>Buyer-supplier</i>	No specific	All process of exchanges	The dyadic relationship of buyer and supplier is bidirectional, when customers are selecting suppliers; the supplies are a way of trying to	(Ellegaard et al. 2003)

				decide whether to provide required products/service to the buyer. The buyer should be attractive and active as well.	
16	<i>Manufacturer-retailer</i>	Toy manufacture	Supplying (downstream)	Retailers have to collaborative with other parties in supply chain (i.e. the manufacturer), due to the inadequate knowledge holding of the business. The collaborations (cooperation and coordination) require the goal coal configuration (joint objectives) with derive solutions for firms' conflicts. The effective information exchange (feedback) is important.	(Wong & Johansen 2008)
17	<i>Supplier-customer (shipper-carrier)</i>	Manufacture (No specific)	Supplying (downstream)	Shipper-carrier (known as supplier-customer) is a common relationship that reveals the goods movement from one firm to another. The dyadic relationship is influenced by factors in the level of individual, organizational, and environmental. The association of higher relationship strength and value creation are expected. When one side of the dyad has stronger willingness to partnering, the other side would have more opportunities to take advantages from it.	(Golicic 2007)
18	<i>Buyer-supplier</i>	Manufacture (No specific)	Supplying (upstream)	Outsourcing in a way encouraged the alliance of buyer-supplier, and it is needed to choose the certain amount of suppliers to cope with and in a long-term partnering. The "quality management" is a significant issue in supply chain collaboration management to ensure the effectiveness and efficiency.	(Theodorakioglou et al. 2006)
19	<i>Dyads among: Manufacturers, retailers, service providers and distributions</i>	No specific	Activities possible in the entire supply chain investigated by the authors.	Dyadic relationship management in supply chain are various in different positions of supply chain. The strategic initiatives are in line with the actors' role in supply chain. Information sharing is significant in supply chain collaboration, especially in distribution network.	(Cook et al. 2011)
20	<i>Dyads within supply chain: Owned and independent suppliers, Manufacture unit, Distribution center</i>	Pharmaceutical	Planning and inventory management	The networking in supply chain management is significant for the flexibility and efficiency of manufacturing, inventory management, and service delivery. The dyadic relations of "supplier-manufacturing plants" and "manufacturing plants-distribution center" in collaboration could benefit the whole supply chain, but requires the effective information exchange to analysis when needed.	(Danese 2006)
21	<i>Service Buyer-3PL service provider</i>	Transportation	Logistics	Traditional issues in logistics like prize and quality are still the key point, while less attention have been put on environmental issues; however, there is an increasing focus of environmental consideration by the public. For 3PL, the information provided by customers is said to be insufficient. To change the current situation, the force that comes in line with regulations and legislation could be the strongest lever.	(Wolf & Seuring 2010)

				The frequent demand could in a way leverage the relationship in a certain degree as well.	
22	<i>Dyads within supply chain: no specific</i>	Retail	All activities that are possible to be investigated in case	The primary matters in supply chain relationships is said to perceive asymmetry.	(Thomas & Esper 2010)
23	<i>Dyads within supply chain: no specific (focal companies and stakeholders – profit companies, non-profit companies, government agencies.</i>	No specific	All activities that are possible to be investigated in case	Stakeholders' supportive attitudes or behaviours are featured by cooperative strategies. When the trust among the cooperation is low, the strategy tends to be "aggressive"; if there is a high interdependence, and the participants in a dyad tend to build long-term relationships, the strategies are more alike and cooperative.	(Co & Barro 2009)
24	<i>Supplier-customer</i>	Manufacture (No specific) (ranging from raw materials to equipment)	All activities that are possible to be investigated in case (Market, innovation, access)	Supplier is important to customers, and the relationship of dyads can be determined to refer to the catalogue of 3 direct functions of profit, volume and safeguard; 4 indirect functions of innovation, market, scout, and access. The dyadic supplier-customer relations could be cross-functional, and cross-boundaries; are complicated in supply network.	(Wiley et al. 2006)
25	<i>Service buyer-logistics provider</i>	Transportation	Logistics	Outsourcing as the driver of the relationships forming, the foundation of the relation is mutual trust/faith. The supplier's performance is always evaluated by the buyer. Health relationship could lead to extended outsource.	(Qureshi et al. 2007)
26	<i>Processor-distributor</i>	Food	Logistics (downstream)	If a partnering is desired, both sides of the dyads should meet the basis on the motivation of the forming in such relationships. Outsourcing in a way enables the alliance of processor and distributor to jointly work in approaching more benefit (low costs) with competitive advantages.	(Bhaskaran & Jenkins 2009)
27	<i>Buyer-supplier</i>	No specific	All activities that are possible to be investigated in case	The perceptions of buyer and supplier are different in relationships. Effective communication is desired by both sides of any dyads in collaboration.	(Ambrose et al. 2010)
28	<i>Supplier-customer</i>	No specific	Logistics	Collaborations in logistics are preferred by many business practitioners, and there is a positive impact on firm performance. The estimation of collaboration is determined by top management to a large degree. The management of collaboration in supplier and customer's perspectives are different in accordance to their own business strategies.	(Sandberg 2007)
29	<i>Dyads within supply chain: no specific</i>	No specific	All activities that are possible to be	Collaborative relationships could exist in different stages of supply chain.	(Gundlach et al. 2006)

			investigated in case		
30	<i>Logistics-sales/marketing (function-function with firm)</i>	No specific	No specific	The function of logistics within a firm is limited in the relationships with other functional departments.	(Hoek et al. 2008)
31	<i>Mainly Dyads (little review of triads) (No specific)</i>	Mixed industry (No specific)	All activities that are possible to be investigated.	Collaborative relationships in different industries and countries could be various. It is a complex research, and needs to be investigated in different portfolios based on related theories. The positive impact of firm performance or supply chain performance could be limited in some cases.	(Fabbe-Costes & Jahre 2008)
32	<i>Supplier-buyer</i>	No specific	Supplying, and purchasing	The dyadic relationships of supplier-buyer could be different in the views of supplier and buyer; The author suggested to investigated from different point of views and differentiate the supply chain into: supply chain and demand chain.	(Cambra - Fierro & Polo - Redondo 2008)
33	<i>Supplier-buyer</i>	No specific	All activities that are possible to be investigated.	The dyadic supplier-buyer could be transactional or partnership relationship is the critical task in mitigating behavioural uncertainties in supply chain (network). All relationship-incentive activities should be in a high level of task delegation of authorities (focal company).	(Fayezi et al. 2012)
34	<i>Customer-supplier (Firm-customer; Firm-supplier)</i>	Manufacture (No specific)	Purchasing, and supplying	The customer-supplier dyadic relationship could be the collaborative relationship in pursuing mutual benefits. However, the investigation of collaboration should be divided into two perspectives of supply-side collaboration and demand-side collaboration. The collaborative relationships could be various based on different level of trust and commitment. If possible, the investigation should go beyond one to one dyads.	(Singh & Power 2009)
35	<i>Buyer-supplier</i>	Manufacture (No specific)	The whole supply chain (All activities can be investigated)	In dyadic relationship, the function could be measured by volume, quality, and safeguarding. In different stages, the buyer-supplier (Chinese) are various. In value creation, the dependence/power balance plays a significant role. Firms would only prefer to maintain close relationship with some the suppliers (several).	(Song et al. 2012)
36	<i>Supplier-distributor</i>	Manufacture	Logistics (Downstream)	Flexibility and trust in alignment are important. The performance of distributor in service providing is significant in trust building in dyadic relations. The goal fulfilment could be negatively impacted by the inflexibility of distributors.	(Hua et al. 2009)
37	<i>Manufacturer-supplier;</i>	Apparel	Purchasing, and	Suppliers and customers should be further divided into more detailed	(Chen & Fung 2013)

	<i>Manufacturer-customer</i>		supplying	catalogues based on the level of interference and flexibility. The views of customers and suppliers in collaboration are different.	
38	<i>Buyer-supplier</i>	No specific	Governance	Social and environmental issues in a way impact on the collaborative relationships and the performance.	(Gimenez & Tachizawa 2012)
39	<i>Seller-Buyer</i>	No specific	Supplying	The perceptions of participants in collaborative relationship are an important sector, and would have impact on the performance of the relationship.	(Giannakis 2007)
40	<i>Supplier-customer</i>	Manufacture (No specific)	Supplying (Downstream)	Customer focus positively impact on supply chain rational capabilities and customer services. The close relationship of supplier and customer could lead to a good result of financial performance.	(Lado et al. 2011)
41	<i>Focal company-distribution channel</i>	Manufacture (No specific)	Distribution (Downstream)	Through process integration, activities outsourcing could lead to the creation and development of relational capabilities. Relational process could be: Planning and governance, information, logistics, sales, knowledge transfer, new product launch, product innovation, and manufacturing.	(Rodríguez - Díaz & Espino - Rodríguez 2006)
42	<i>Focal firm-distribution channel</i>	Manufacture	Distribution	Switching motivator can be mediated by customer's satisfaction in comparing the current and anticipated performance.	(Ellis 2006)
43	<i>Buyer-supplier</i>	Manufacture	R&D, knowledge transfer	There are different types of suppliers, and the collaboration with suppliers could be a strong and useful tool for resource leverage in supply chain.	(Møller et al. 2003)
44	<i>Supplier-wholesaler (buyer)</i>	Finish Technical trade industry	Supplying	The building of IOS asks the collaborations of supplier and buyer. IOS (Inter-organizational system) could help to estimate effective information exchanges, and lead to better supply chain collaboration, and thus bring about the improvement of operational performance in long-term perspectives.	(Hinkka 2013)
45	<i>Shipper-logistic service provider</i>	No specific	Distribution	With various purpose and focus, the relationships are various. Severn purposes: (1) Meet customer demand, (2) meet authority demand, (3) external reporting, (4) cost reduction, (5) assess potential changes, (6) Target setting, (7) guide operational staffs	(Björklund & Forslund 2013)
46	<i>Supplier-buyer</i>	Manufacture	No specific	The collaboration could have impacts on the relationship formed between external capabilities and internal performance. Collaborations are in levels; the close relationship should only build with some of the partners, and not all relationships should be progressed towards collaboration in the high level. Suppliers' capabilities of flexibility, responsiveness and modularity can impact the responsiveness of buyers directly. Collaboration (in different level) will act to strengthen it in a certain degree.	(Squire et al. 2009)
47	<i>Supplier-buyer</i>	Automotive	Sourcing	The buyer-supplier dyads could be in three types of relationships: captive	(Wasti et al. 2006)

				supplier, market exchange, and strategic partnership. The relationship's building and maintaining can be affected by various factors (the characteristics of buyer and supplier or the products, how they tend to cooperate, the exchanges of information, the mutual understanding, and satisfaction of the relationship).	
48	<i>Supplier-buyer</i>	Automotive	Sourcing	The responsiveness of supplier is affected by the factors within the supplier firm itself and factors associated with partners upstream or downstream. The first-tier supplier in the demanding relationships are kind of "squeezed". The material supplying directly impact on the manufacturers (buyers)' capability in responding to the changing market.	(Holweg 2005)
49	<i>Dyadic relationship (upstream-downstream) (purchaser-supplier)</i>	No specific	No specific (Plan, source, make, and deliver)	In supply chain management, the dyadic supplier-buyer relationship is in different perspectives. Buyer-supplier relationship in upstream structure is said to be based on the selection of suppliers and supplier development and related processes. The upstream perspective of the relationships taking the BUYER's perspective. The downstream perspectives are the supplier's perspectives that focus on the distribution network with retailers and thus the end customers.	(Mills et al. 2004)
50	<i>Constructor-supplier (Buyer-supplier)</i>	Construction	Buying	In order to increase the efficiency in value creation, the collaboration and development should be put in the first place. The willingness and capability of collaboration should be aligned with cost focus and core values of business. The collaborations of the dyads should be built towards the relationship with suppliers based on a long-term orientation.	(Frödell 2011)
51	<i>Manufacturer-reseller</i>	Retail	Supplying (downstream)	Reseller purchasing considered both organizational factors (i.e. brand) and end-customer's need. Manufacturer is the supplier of goods to reseller (buyer). Resellers' performance in a way will influence the manufacturers' performance and positions in marketplace. And high level in cooperation is laying between manufacturers and resellers.	(Glynn et al. 2007)
52	<i>Manufacturer-salesperson (Manufacturer-sales channel)</i>	Manufacture (No specific)	Sales	Manufacturers' salespeople are like the "boundary personnel", who are expected to present the company to the end-customers and the society. They are important powers in the marketing channel.	(Zemanek & Pride 1996)
53	<i>Manufacturer-supplier</i>	Procurement	Manufacture (Foods & Refractors)	To guarantee the performance, the supplier selection and supplier performance are important. The performance dimensions of time, quality, price and quantity are	(Tawfik Mady et al. 2014)

				usually referred to assess supplier's performance.	
54	<i>Manufacturer-supplier</i>	Procurement	Manufacture	<p>At one time, the relationship between manufacturers and suppliers was solely determined by price and competitive bids. However, there is a tendency of partnering, that manufacturers are trying to collaborate with their suppliers in R&D efforts and making.</p> <p>Manufacturers tend to measure the quality of collaborated suppliers in aspect of "responsiveness" of ordering, quality of products, and the delivery performance.</p> <p>Auditing groups are involved to monitor in a way to guarantee the benefits of manufacturers.</p>	(Aleo 1992)
55	<i>Manufacturer-supplier</i>	Automobile	Sourcing, making	<p>In a specific area (Thailand), the dyadic relationship started in a type of market-exchange, and is now moving to partnering.</p> <p>The manufacturer-supplier are in close relationship, where manufacturer (large firm, international investor) provide sources, funds, trainings, technique support and solutions based on the feedbacks.</p> <p>To conquer culture difference and build trust should be the foundation of any collaboration.</p> <p>In the same time, manufacturers could benefit from suppliers as well, in the aspects of knowledge and local market factors.</p>	(Petison & Johri 2008)
56	<i>Manufacturer-retailer</i>	Manufacture, Retail	Supplying (Downstream)	<p>The changing of the trading environment has great impact on the business of manufacturer and retailer, and thus further impact on their relationships.</p> <p>Policies and economics factors drove manufacturer to select proper suppliers.</p> <p>The distribution channel in a way could be used to measure the Manufacturer/retailer relationships.</p> <p>Cooperation may help in problem solving in market expansion.</p>	(Walters 1975)
57	<i>Supplier-customer</i>	Manufacture (No specific)	Supplying (Upstream)	<p>The uncertainties of environment motivate organizations to alliance in order to gain more competitiveness.</p> <p>High degree of interdependence and specific capital (asset) are required to obtain a successful alliance.</p>	(Sambasivan et al. 2013)
58	<i>Retailer-supplier</i>	Retail	Supplying (Downstream)	<p>When trying to gain stable channel resources in guarding their individual benefits, they are competitors.</p> <p>Cooperation and competition are existing in their relationships.</p> <p>Cooperation strategies are needed to align supplier and retailer to maximize the chain benefit and individual benefits.</p> <p>There are conflicts that inevitable which may limit the further mutual development.</p>	(Kim et al. 2013)

Appendix Two: Research Protocol

A. Overview

1. Mission and goals:

To investigate existing collaborative relationships in supply chain (network) of particular industries; and to figure out possible patterns of collaborations refer to the *motivations* (Sustainability, Opportunity, Cost-reduction, Effectiveness, Flexibility, and Legitimacy) and *influence factors* (Power, Independence, Trust and Commitment).

2. Case study Questions:

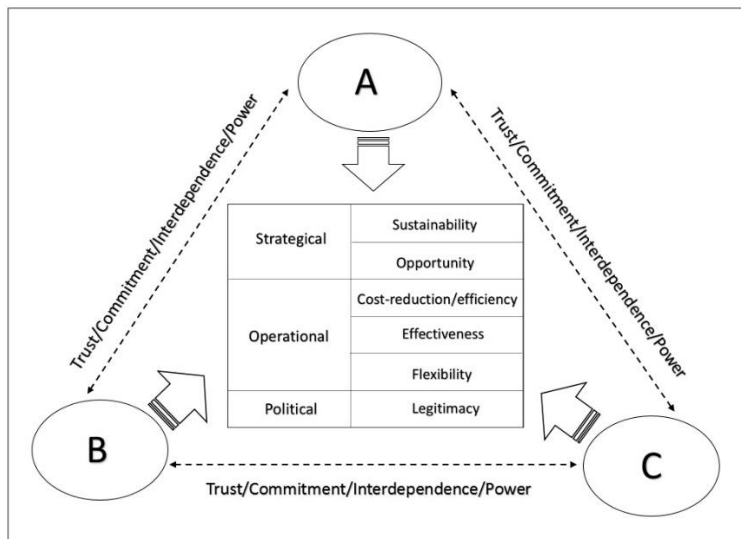
Question One: How do dyads come together into triads in supply chain collaboration?

Question Two: What are the patterns of triadic collaboration in supply chain?

Question Three: How do triadic collaborations impact on supply chain performance?

3. Theoretical Framework:

Supply chain (network) percipients tend to estimate business relations refer to different Motivations/potential advantages. Any combinations of stakeholders is possible when the participants believe they could benefit from such relationships. However, due to the distinct of the role playing, the scales, the business feature, and attitude; the forming of collaborative relationship is in a way impacted by the factors of “trust”, “commitment”, “interdependence”, and “Power”.



4. Relevant readings:

[1] Wu, Z., Choi, T. Y., 2005, Supplier-supplier Relationships in the Buyer-supplier triad:

building theories from eight case studies, *Journal of Operations Management*, Volume 24, Issue 1, Pages 27-52.

[2] Choi, T. Y., Wu, Z., 2009, Taking the Leap from Dyads to Triads: buyer-supplier relationships in supply networks, *Journal of Purchasing and Supply Management*, Volume 15, Issue 4, Pages 263-266.

[3] Choi, T. Y., Wu, Z., 2009, Triads in Supply Networks: theorizing buyer-supplier-supplier relationships, *Journal of Supply Chain Management*, Volume 45, Issue 1, Pages 8-25.

[4] Wilhelm, M. M., 2011, Managing Coopetition through Horizontal Supply Chain Relations: linking dyadic and network levels of analysis, *Journal of Operations Management*, Volume 29, Issues 7-8, Pages 663-676.

[5] Montoya-Torres, J. R.; Ortiz-Vargas, D. A., 2014, Collaboration and Information Sharing in Dyadic Supply Chains: a literature review over the period 2000-2012, *Estudios Gerenciales*, Volume 30, Issue 133, Pages 343-354.

[6] Ramanathan, U., Gunasekaran, A., 2014, Supply Chain Collaboration: impact of success in long-term partnerships, *International Journal of Production Economics*, Volume 147, Part B, Pages 252-259.

[7] Liao, S., Kuo, F., 2014, the Study of Relationships between the Collaboration for Supply Chain, Supply Chain Capabilities and Firm Performance: a case of the Taiwan's TFT-LCD industry, *International Journal of Production Economics*, Volume 156, Issue 1, Pages 295-304.

[8] Harrison, A., Hoek, R. V., Skipworth, H., 2014, *Logistics Management and Strategy: competing through the supply chain (fifth edition)*, published by Pearson Education Limited, ISBN: 978-1-292-00415-0.

B. Data Collection Procedures

1. Case companies and Contact persons

(1) Machinery and Equipment industry

Case Company One: location/products/size;

Numbers/positions (contact persons)

Case Company Two: location/products/size;

Numbers/positions (contact persons)

(To be continued)

(2) Pharmaceutical Industry

Case Company One: location/products/size;

Numbers/positions (contact persons)

Case Company Two: location/products/size;

Numbers/positions (contact persons)

(To be continued)

2. Data Collection Plan

- (1) Target Interviewee: Department/General Manager or above
- (2) Event to be observed: Manufacturing, Logistics (Stock management/distribution/...)
- (3) Documents/Source to be reviewed: Name list of logistic partners, Name list of top suppliers, other available related internal documents; factory, logistics/distribution center (if available).
- (4) Length of interview: around 30 min/person/visit or more

3. Preparations prior to fieldwork

- (1) Information: Published reports, Related government policies (published online), and Companies' official website.
- (2) Confidentiality Agreement (in case of any requirement).
- (3) Fieldwork: Personal laptop, writing pad, papers, pen, file pocket, clips ...

If there are any unexpected issue happened, i.e. emergencies in business of interviewees, uncomfortable of interviewees, or any other conditions that the interviewee would like to stop the interview; stop immediately, and enquiry about next available time or ask for recommendations to other qualified interviewees.

C. Questionnaire

Questionnaire-One (for manufacturers)

1. Dyadic relationships

- (1) In the following relationships, any of them are existed in the organization you are in, as far as you know. *(You may choose more than one option)*
 - ① Supplier (which type of supplier); ② R&D institution (what type of R&D institution? University/SRI/Pharmaceutical Company); ③ Governmental institution; ④ Channel company (Agency company, wholesaler, retailer); ⑤ Customer; ⑥ Other
- (2) Does your company/department satisfied the work with the partners you have selected in Q1? (If yes, would you mind to give the particular aspects? If no, particular aspects and would the relationship last?)
- (3) Do you and your company tend to maintain the relationships mentioned in a long-term? (Why?) How to guarantee strategic relationships? (Will this listed in contract? Or in other

measures?)

(4) For particular partners (refer to Q1), what do you expect from the collaborations/business relationship?

2. Outsource

(1) In the company you are currently serving, is there any activities (manufacturing/operational/managerial) have been outsourced? What are they, as far as you know?

(2) Why outsource those activities?

(3) Does your company/department satisfy with the performance of outsourcing?

(4) Do you agree the “outsource” is in way progress the firm’s performance? Why?

3. Third Party (refer to the answer of Section 1 & Section 2)

(1) What are the core business the company you are in tend to focus on?

(2) The third parties involved usually in which process of your business?

(3) Procurement: (*selected*)

1 Do all of suppliers your company worked with are in long term relationship? If no, what types of suppliers you tend to work strategically (closer than with others)?

2 In what situation, your company would like to stop working with current suppliers and re-select another one?

3 When to select a supplier, what are the most important issues considered by the company?

(4) Manufacturing Process: (*selected*)

1 What type of sub-contractor you tend to work with (from the view of firm size/reputation/cooperation record (historical)/location/...)

2 Have you worked with other manufacturers (competitors)? Will you accept to work with other manufacturers (from company’s view)? In what aspect you ever/will jointly work?

(5) R&D (*Selected*)

1 Does your company/department do R&D individually? If no, will you outsource this activity? Or do you collaborate with any institutions (university/commercial organizations)?

2 How much money (the approximately percentage of the profit) tend to be reinvested in R&D? (if able to disclose)

3 Have you collaborated with other manufacturers (competitors) in R&D? Or will you accept to work with them?

(6) Logistics (*Selected*)

1 Dose you company work with 3PL, and in what aspects? (Stock management, consultancy, distribution...)

- 2 The percentage of the business taken by 3PL in the total logistic business?
- 3 3PLs are mostly involved in what process of the business?
- 4 Is there any process, the 3PLs are never be trusted/the company tend to trust your own performance more.

4. Power/Interdependence

- (1) In the confirmed relationships, would that impact the company’s performance a lot if change to work with other partners? Why? And would that be easy for you to find a new partner?
- (2) Even through the changing won’t impact significantly on company’s performance, would you still would like to maintain such relationships?
- (3) Even the current relationship is stable, in what circumstance, you will insist to change the partner?

5. Government and regulatory institution interference

- (1) Dose you and your company closely pay attention to the regulations and policies issued by the governmental and related regulatory institutions?
- (2) What type of policies or regulations (if possible, to pinpoint the policies/regulations) recently have comparatively significant impacts on your business?
- (3) Does the company support by the government? (Any particular funding? Preferential policy... and how does the support be applied in which process of the business?)
- (4) Does your business and your company closely associated with the government agent and regulatory institutions? Do you have regular communications?
- (5) Any particular policy or regulations you are expected to be launched or improved?

(To be continued)

D. Guide for reporting

1. Dyadic Mode framework

Case Company + relevant participant

(R-figure represents the Relationship type shown above)

The brief framework applied in interview and report - sample

Mode	Industry:		
	<i>Case One</i>	<i>Case Two</i>	<i>Case ...</i>

<u>R-1</u>			
<u>R-2</u>			
<u>R-3</u>			
<u>R-4</u>			
<u>R-5</u>			
<u>R-6</u>			
<u>R-7</u>			
<u>R-8</u>			
<u>R-9</u>			
<u>R-10</u>			
<u>R-11</u>			
<u>R-12</u>			
<u>R-13</u>			

√: confirmed; **PO: Partly Outsourced; FO: Fully Outsourced**

2. Motivation/expected outcome from collaborations

The framework of motivation - sample

Cas e	RM	Sustainabil ity	Opportuni ty	Cost- reducti on	Effectiven ess	Flexibili ty	Legitima cy
On e	R-1						
	R-2						
	R-3						
	R-4						
	R-5						
	R-6						
	R-7						
	R-8						
	R-9						
	R- ...						
Two	R-1						
	R-2						

	R-3						
	R-4						
	R-5						
	R-6						
	R-7						
	R-8						
	R-9						
	R- ...						

RM: Relation Mode; +: Able to achieve; -: Difficult to achieve/counter-reflect; N/A: Not applicable

3. Issues associated with influence factors

The framework of influence factors – sample

Case	Mode	<i>Trust</i>	<i>Commitment</i>	<i>Dependence</i>	<i>Power</i>
Case One	R-1				
	R-2				
	R-3				
	R-4				
	R-5				
Case Two	R-...				
	R-1				
	R-2				
	R-3				
	R-4				
	R-5				
	R-6				
	R-...				

4. Outline of report

- Introduction: objectives and research background
- Methods applied
- Case overview

- results in frameworks
- Modes in Dyads and possible Modes in Triads
- Pattern identification
- Pattern impact and application
- Conclusions, limitations, and contributions
- Future work

Appendix Three: Questionnaires for Interview

For Case company

General Questions

1. How do you identify the role your company is playing in supply chain? (manufacturer/service provider/other) (Sambasivan et al. 2013; Scholten & Schilder 2015)
2. Do you agree that “organizations do not exist in isolation” (Ritter 2000)? Do you think that it is necessary of any organization to collaborate with other parties?
3. When you decide to collaborate with a party, is there any criteria in partner selection? (Hosseininasab & Ahmadi 2015; Amorim et al. 2016)
4. How do you identify the position of your partners in your business? (Zaheer & Bell 2005)
5. How do you prefer to work with your partners? (Bunger et al. 2014; Inayat & Salim 2014)
6. When you decide to upgrade the relationship with particular partner, what aspects/criteria will you refer to? (Wolf & Seuring 2010; Frödell 2011)
7. How do you define “trust” between one to another? And do you think it is important in your trading? (Jarratt & Ceric 2015)
8. How do you define your position in the market? And in what degree of power do you have in bargaining with your supplier/partner/customer? (Cook 1977; Zemanek & Pride 1996; Liu, Li & Zhang 2010)
9. In what aspects/activities/processes, you prefer to collaborate with a third party? (Wolf & Seuring 2010)
10. How do you see the sustainable relationship with business partners? (Blome et al. 2014)
11. In what degree you tend to maintain your relationship with certain partners? (High, low, other) (Banal-Estañol et al. 2015)
12. Is there any activity/function in your supply chain has been outsourced to third parties? What is it / what are they? (Baloh et al. 2008)
13. What do you see the R&D (innovation) activities in your business? (DiMasi et al. 2016)
14. How do you distribute your products? Do you work with any third party? (Azzi et al. 2013)
15. What do you see the 3PLs? How’s your relationship with them? (Soinio et al. 2012)
16. Have you worked with any foreign companies? (Authors 2013)
17. In what degree do you like to do business with a foreign company? (Authors 2013)
18. Do you mind to collaborate with your competitors? (Zhang & Frazier 2011)
19. How’s your relationship with your customers (local customers / international customers)? (Lukkari & Parvinen 2008)
20. What challenges have you met in your business collaboration? (Grudinschi et al. 2014a)

21. Will collaborative relationships have built last forever? If yes, can you tell us why you think such relationship should be permanent and what to do to maintain the relationship? If no, can you tell us when to stop certain collaborations and why? (Ateş et al. 2015)
22. You tend to build collaborative relationship with particular one party or more than one parties in certain project/programme/activity...? (Forslund & Jonsson 2009; Wu & Choi 2005; Croom et al. 2000)
23. When certain business relationship has been built, what do you particularly would like to benefit from such relationship? (Soh & Subramanian 2014; Huang et al. 2015a)
24. When you stopped collaborations with certain parties, how do you deal with the relationships with those parties? (Li and Choi, 2009)

Questions relevant to activities of procurement/production

1. Generally saying, how many types of suppliers do you have? What are they? (Wiley et al. 2006; Guillot & Lincoln 2015)
2. Are there any outsourcing activities in your upstream supply chain? (Martínez-Noya Andrea & García-Canal Esteban 2011; Rahman et al. 2014)
3. Do you always work with fixed suppliers? If Yes (Why? And is that easy for you to switch to other suppliers?); If No (Why? And how long do you usually work with certain suppliers? When to change?) (Ateş et al. 2015; Frödell 2011)
4. How do select a supplier to work with? Any particular criteria? (Wolf & Seuring 2010; Büyüközkan et al. 2008)
5. Will you share your production plan with your suppliers? (Li et al. 2015; Montoya-Torres & Ortiz-Vargas 2014)
6. Besides regular ordering, do you communicate with your suppliers often? If yes, about what? (Cambra-Fierro & Polo-Redondo 2008)
7. In procurement, will you nominate certain 3PLs for delivery? If yes, Why? (Soinio et al. 2012)
8. Is the delivery performance of supplier/3PL important to your business? In what degree? (Soinio et al. 2012)
9. In your contracts, are there any terms must be listed? What are they? (Pesqueux 2012; Coote et al. 2003)
10. When to concede in negotiations/contract-making? (Traavik 2011)
11. Do you always concede in negotiations with suppliers? (Traavik 2011)
12. When your supplier fails to supply your orders, how will you deal with the issue? Will this issue significantly impact on your continuing collaborative relationship? (Cambra-Fierro & Polo-Redondo 2008)
13. Is there any policy/regulation significantly impacted on your procurement / production? (Hendriks et al. 2015; Guo et al. 2016)
14. How will procurements impact on your production? And how do you guarantee your production? (Tawfik Mady et al. 2014; Rahman & Korn 2010)
15. How do you know how much to purchase from your suppliers? Is marketing data significant to your production / procurement? (Tawfik Mady et al. 2014; Rahman & Korn 2010)

Questions relevant to activities of R&D

(Guan et al. 2016; Teirlinck & Spithoven 2013; Zhuang et al. 1999; Brachos et al. 2007; DiMasi et al. 2016)

1. Do you have your own R&D team? And how much R&D works are completed by them?
2. Do you work with other R&D institutions? (University/SRI/Peers/Other) Do you count on them?
3. Do you tend to outsource certain functions to them, or do you prefer to co-work with them on certain project?
4. Usually, you are passive or active in R&D collaborations? When passive? When active?
5. Do R&D project associated with Governmental funding?
6. How do governmental policies/regulations impact on your R&D or Business?
7. How much money have you spent on R&D every year (weigh)?
8. Do you work with fixed R&D institutions?
9. Do you tend to work with local R&D institutions?
10. Usually, how many parties are invited into one project? And what type of information can be shared? In what degree?
11. Most of the projects been launched are the long term ones or the short term ones? (Continuing research or R&D in certain direction?)
12. In R&D project, do you care about the ownership of relevant intellectual property rights? And usually, how do you deal with it (in collaborations)?
13. In negotiations, when to concede? Or you never concede?
14. Compare to educational institutions, do you prefer to work with SRI or other commercial parties (pharmaceutical company)?
15. How do you see the high failure rate in pharmaceutical R&D?
16. Do you have any contracts with R&D partners? And what is the biggest different from the contract in ordinary trading?
17. In current stage, is R&D the main issue in your company? Are there any other important issues related to R&D in your group?
18. In pharmaceutical industry, as a SME, is there any challenge for you?
19. As a SME, is there any competitive advantages for you?
20. How do you see the collaboration in R&D project? Particularly in SME's perspective.

Questions relevant to Distribution & Logistics

1. Do you have your own sales team? (Ross et al. 2005)
2. Do you prefer to outsource your activities of sales to third parties? If Yes, why? If No, why? (Ross et al. 2005)
3. Can you identify your customer groups for us? (Wouters & Kirchberger 2015)
4. For your own sales team, which customer group are targeted?
5. Do you tend to do marketing by your own team first, or do you prefer to totally give it to third parties? (Ross et al. 2005)
6. Do you have agency problems in outsourcing? And how do you deal with it? (Bhaskaran & Jenkins 2009)
7. How do you identify your relationship with agency companies? And in what degree you trust them? (Ateş et al. 2015)

8. How do you identify your relationship with your customers (in according to different customer groups)? Which group is most important to you? Can you rank them? (Wouters & Kirchberger 2015)
 9. How often do you communicate with agency partners and your customers? And what are the main channel in your communication?
 10. What type of information can be share with your agency partners? And is there anything you prefer not to share with them? (Charterina & Landeta 2010; Gillis et al. 1998)
 11. Do you work with fixed agency partners? Is that easy for you to change to other ones? (Sojka et al. 2001)
 12. When decide to collaborate with certain agency partners, do you have any preferences? What are they?
 13. When decide to stop wording with certain patterns?
 14. In collaboration with agency partner, who has more power (in decision making, pricing, etc.)? (Cox 1999; Sheu & Gao 2014)
 15. How do you identify responsibilities been taken by different parties in your outsourcing? When there are problems with your products or the agency company find it is difficult to sell your products, what you will do? Will your company respond to that? (Hallikas et al. 2005; Grudinschi et al. 2014a; Hochbaum & Wagner 2015)
 16. Will you give any discount to agency companies and your customers? What are the differences?
-
17. Do you have your own distribution center (logistic department) to deal with delivery issues? (Murray & Fu 2016)
 18. Do work with 3PLs? (Soinio et al. 2012)
 19. How do you identify your relationship with 3PLs?
 20. In what degree you think the 3PLs are important to your business?
 21. Is there anything you prefer to deliver by yourselves?
 22. Do you have any preference in 3PL selection? (Osei-Frimpong et al. 2015; Stefansson 2006)
 23. Do you usually work with fixed 3PLs? Would that be easy for you to find other substitutes?
 24. Can you list us the criteria you may refer to in 3PL selection? And which criteria is most important to you? Can you rank the criteria? (Azzi et al. 2013; Stefansson 2006)
 25. What do you think the benefits you can get by involve 3PLs? And how does the involvement of 3PLs can further impact on your performance? (profitability? Flexibility? Effectiveness...?) (Qureshi et al. 2007; Stefansson 2006; Büyüközkan et al. 2008)
 26. Is there any reverse logistics in your business? And if Yes, how do 3PLs contribute to it? If No, why? And do you consider to apply it in the future?
 27. Besides delivery, is any other functions relevant to logistics in your group have been outsourced to 3PLs? What is it? Or What are they? (Rees, 2011)
 28. Do you consider to further collaborate with 3PLs? And in what degree?
 29. In collaboration with 3PLs, do you share any information with them? What sort of information? Do you share any information relevant to your sales or production to 3PLs? (Supply chain design/planning)

30. Can you tell us the weight of delivery in your group outsourced to 3PLs (approximately)?

For other relevant participants in supply chain

Questions for Supplier

1. Refer to the scale of your customer, can you identify your customer group for us. (SME? Large?) (Carr 1999; Singh 2011b)
2. How do you identify your relationship with your customers?
3. When do you decide to collaborate with your customer? (Motivate by project? Stable ordering? Big customer? ...) (Antikainen et al. 2010; Huang et al. 2015a)
4. Will you give any priority to your partners? (Traavik 2011)
5. Will you give any flexibility to your partners? In what degree? (Can you explain with examples?) (Chan et al. 2009)
6. In collaborative relationships, will you concede in pricing?
7. In collaborative relationships, would you like to share certain information with your partner? What sort of information can be shared? What sort of information you prefer not to share?
8. To build a collaborative relationship, do you require your partner to share any (particular) information with you?
9. Is there any possibility for you to collaborate with another (or more than one material supplier) in supplying the same customer?
10. Do you collaborate with any other peers? In what situation?
11. Do you work with any third parties in your business (3PLs, Agency companies)? Why to work with them? (Rees, 2011)
12. Any benefits you can get by outsourcing certain functions/activities to a third party? And Do you satisfy with their performance so far? (Rodríguez-Díaz & Espino-Rodríguez 2006; Fixler & Siegel 1999)
13. In your business, do you have the right to stop certain collaboration anytime you want? When to stop?
14. How do you see “vertical integration”? Do you mind to be acquired by one of your customers? (Peyrefitte, P. A. Golden, et al. 2002)
15. What challenges have you met in collaborating with certain partners?

Questions for R&D Institution

1. Are you a commercial institution? Do you make profit from R&D projects?
2. Have you worked with any pharmaceutical companies? Why to work with them?
3. Do you have to (must to) work with any pharmaceutical company? (Is that compulsory?)
4. As a R&D institution or organization able to provide R&D related services, do you receive any fund from the government? And is it easy for you to obtain governmental fund? (Guo et al. 2016)

5. How do you define your relationship with companies in pharmaceutical industry?
6. Do you have any preference in collaborations with pharmaceutical companies? Can you list the criteria for us?
7. Do you prefer to work with a larger pharmaceutical company or SMEs? Why?
8. Dose all collaborations last for a long time? (Permanent / temporary) Why? (Ateş et al. 2015)
9. How do you see “university-industry collaboration” encouraged by local government? (Soh & Subramanian 2014)
10. Is there any difficulty you have met in realize “university-industry collaboration”? (Berbegal-Mirabent et al. 2015)
11. Do you have affiliate hospitals? Do you work close with them? And when collaborate with certain pharmaceutical companies, will the hospitals join your project / programme?
12. When certain collaborative relationship has been built with a pharmaceutical company, any particular benefits you will give them? (Lee 2011)
13. Do you care about intellectual property rights? In a collaborative project / programme, usually who will take the rights? (Martínez-Noya Andrea & García-Canal Esteban 2011)
14. You prefer to work with one party only for one project, or you do not mind to work with multi relevant parties?
15. What sort of information can be shared? What sort of information do you prefer not to share?

Questions for Sales Agency

(Gillis et al. 1998; Sojka et al. 2001; Ross et al. 2005; Azzi et al. 2013; Uthayakumar & Priyan 2013)

1. Are you a single brand agent? If Yes, why? If No, how many brands you are currently work with?
2. Do you select the brands?
3. Do you select the products in particular brands?
4. Can you list the criteria of brand selection/ product selection for us?
5. How do you identify your relationship with pharmaceutical companies?
6. It's you to propose certain collaborations or usually it is the pharmaceutical companies come to ask? (You are active or passive in building certain collaborations with potential partners?)
7. Do you tend to work with fixed pharmaceutical partners? Why?
8. In marketing, how do you built your relationship with your customers? Do you need the assistance of certain pharmaceutical companies?
9. How do you tend to keep the relationship with your customers?
10. What if you are facing a poor marketing, what would you do? Will you talk to certain pharmaceutical companies? And will the pharmaceutical company respond to it?
11. How do you define the risks/challenges in your business? And how do you deal with them?

12. Do you need to be trained by certain pharmaceutical company? Do you have to communicate with them regularly?
13. When your partner decides to launch a new product, will you join them in marketing?
14. In the collaborations with pharmaceutical companies, how do you define your role in marketing?
15. Do you prefer to collaborate with large company or SMEs? Why?
16. Do you arrange all storage and other logistic issues or certain pharmaceutical company will handle that for you? (The pharmaceutical products are delivered to you first or to be delivered to the customer directly by certain pharmaceutical company?)
17. How do you define your relationship with 3PLs?
18. Do you have any preference in selecting 3PLs? Can you list the criteria for us?
19. Will the delivery performance significantly impact on your business?
20. How do you prefer to work with 3PLs? Fixed partners? Or Whatever if they are able to deliver your order as required.

Questions for 3PLs

1. As a 3PL, how do you see the logistics service industry? And how do you identify competitiveness in the industry?
2. What types of services you are able to provide? Which one is the most popular one? (Azzi et al. 2013)
3. Do you prefer to work with pharmaceutical (related) companies?
4. Is the pharmaceutical (related) companies the most important customers to you?
5. Anything you should pay more attention to compare to service provided to other industries?
6. Do you tend to build a long term collaborative relationship with certain companies? Or you don't mind? (Rahman & Korn 2010)
7. What are the basic principles of your business? (Refer to "five rights" – "right quality", "right time", "right price", and "right source") Have you realized your performance may significantly impact on your customers' business? (Handfield et al., 2009)
8. Do you provide international service?
9. Do you provide consultancy service?
10. Do you prefer to work with large companies or SMEs? Or you don't mind the scale of your customers?
11. Do you usually give discount or special care to particular customers? When to give? And why to give?
12. Will you give priority to certain customers? When to give? And Why to give?
13. In negotiation, do you mind to concede? In what degree?
14. Do you level your service in according to different prices? And will you strictly follow that or you are able to give flexibility to certain partners?
15. Do you usually work with your peers (other 3PLs)? When to work with your peers? (Bunger et al. 2014)

Appendix Four: Surveys for data collection

Survey for pharmaceutical company

- Focal manufacturer, BPC (bulk pharmaceutical chemicals) supplier

1. The products of your company

(Multiple choice):

- A. Final product (Medicine can be directly launched to market)
- B. Bulk pharmaceutical chemicals
- C. Excipient
- D. Other materials

Please select the option which fits your description the most (not important -2, not very important -1, does not matter 0, important 1, very important 2)

2. The significance of collaborating with other parties in your company's perspective:

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

3. The criteria of choosing a business partner in your company's perspective:

- (1) Business reputation (including product quality and service quality)

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (2) Effectiveness (production/Logistics)

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (3) Business performance

- A. Not important
- B. Not very important
- C. Does not matter

- D. Important

- E. Very important

- (4) Scales

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (5) Business history (ever worked together)

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (6) Willingness to collaborate

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

4. In regular business relationships, what do you think on the following aspects?

- (1) Trust

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (2) Share

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

- (3) Plan

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

5. In business project (jointly-working project), what do you think on the following aspects?

(1) Trust

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very Important

(2) Share

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

(3) Plan

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

6. The criteria you might consider when decide to upgrade your business relationships:

(1) Productivity

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

(2) Flexibility

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

(3) Control (power in business relationship)

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

(4) Reliability

- A. Not important
- B. Not very important
- C. Does not matter
- D. Important
- E. Very important

(5) Lead-time

- A. Not important
- B. Not very important
- C. Does not matter

D. Important

E. Very important

Please select the option which fits your description the most in your business relationships in the perspective of “trust” “commitment” “power” and “dependence” (Not at all 0, very low 1, low 2, so-so 3, high 4, very high 5)

7. In the perspective of “Trust”

(1) With regular supplier

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High

F. Very high

(2) With suppliers in project

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(3) With sales agents

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(4) With hospitals

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(5) With pharmacies

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(6) (*Optional*) with clinics

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

- (7) With peers (competitors in the same industry)
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (8) (*Optional*) With international peers (international customers)
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (9) With 3PLs
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
8. In the perspective of “Commitment”
- (1) With regular supplier
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (2) With suppliers in project
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (3) With sales agents
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (4) With hospitals
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (5) With pharmacies
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (6) (*Optional*) with clinics
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (7) With peers (competitors in the same industry)
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (8) (*Optional*) With international peers (international customers)
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (9) With 3PLs
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
9. In the perspective of “power” (control, bargain)
- (1) With regular supplier
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (2) With suppliers in project
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high
- (3) With sales agents
- Not at all
 - Very low
 - Low
 - So-so
 - High
 - Very high

- A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (4) With hospitals
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (5) With pharmacies
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (6) (Optional) with clinics
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (7) With peers (competitors in the same industry)
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (8) (Optional) With international peers (international customers)
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (9) With 3PLs
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
10. In the perspective of “Dependence”
- (1) With regular supplier
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (2) With suppliers in project
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (3) With sales agents
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (4) With hospitals
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (5) With pharmacies
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (6) (Optional) with clinics
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (7) With peers (competitors in the same industry)
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
 - (8) (Optional) With international peers (international customers)
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high

- E. High
 - F. Very high
- (9) With 3PLs
- A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
11. Does your company consider international business?
- A. Yes, very welcome
- B. Yes, if there are proper opportunities
 - C. Do not care
 - D. No, in current stage will only focus on domestic market
12. If your company is to launch a international business, the most possible area to develop (optional):
- A. Material supplying
 - B. Manufacturing
 - C. R&D
 - D. Sales (Market expansion)

Survey for R&D Institutions

Please select the option which fits your description the most (not important -2, not very important -1, does not matter 0, important 1, very important 2)

1. The significance of collaborating with other parties in your company's perspective:
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
2. The criteria of choosing a business partner in your company's perspective:
 - (1) Business reputation (including product quality and service quality)
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (2) Effectiveness (production/Logistics)
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (3) Business performance
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (4) Scales
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (5) Business history (ever worked together)
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (6) Willingness to collaborate
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
3. In regular business relationships, what do you think on the following aspects?
 - (1) Trust
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (2) Share
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (3) Plan
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
4. In business project (jointly-working project), what do you think on the following aspects?
 - (1) Trust
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very Important
 - (2) Share
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
 - (3) Plan
 - A. Not important
 - B. Not very important

- C. Does not matter
- D. Important
- E. Very important

5. The criteria you might consider when decide to upgrade your business relationships:

- (1) Productivity
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
- (2) Flexibility
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
- (3) Control (power in business relationship)
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
- (4) Reliability
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important
- (5) Lead-time
 - A. Not important
 - B. Not very important
 - C. Does not matter
 - D. Important
 - E. Very important

Please select the option which fits your description the most in your business relationships in the perspective of “trust” “commitment” “power” and “dependence” (Not at all 0, very low 1, low 2, so-so 3, high 4, very high 5)

6. “Trust”

- (1) Large pharmaceutical company
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High

- F. Very high
- (2) Small-to-Medium Sized Pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(3) With Peers (other R&D institutions)

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

7. “Commitment”

(1) Large pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(2) Small-to-Medium Sized Pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(3) With Peers (other R&D institutions)

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

8. “Power”

(1) Large pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(2) Small-to-Medium Sized Pharmaceutical company

- A. Not at all
- B. Very low
- C. Low

- D. So-so
- E. High
- F. Very high

(3) With Peers (other R&D institutions)

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

9. "Dependence"

(1) Large pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(2) Small-to-Medium Sized
Pharmaceutical company

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

(3) With Peers (other R&D institutions)

- A. Not at all
- B. Very low
- C. Low
- D. So-so
- E. High
- F. Very high

Survey for Sales agency

1. The products your company are selling are (multiple choice)
 - A. Biopharmaceuticals
 - B. Chemical drugs
 - C. Chinese medicine
 - D. Health care drugs
 - E. Medical equipment
 - F. Other
2. Your target group for sales (multiple choice)
 - A. Hospital
 - B. Pharmacy
 - C. Clinic
 - D. Patients
3. The main products sell to Hospitals (multiple choice)
 - A. Biopharmaceuticals
 - B. Chemical drugs
 - C. Chinese medicine
 - D. Health care drugs
 - E. Medical equipment
 - F. Other
4. The main products sell to Pharmacies (multiple choice)
 - A. Biopharmaceuticals
 - B. Chemical drugs
 - C. Chinese medicine
 - D. Health care drugs
 - E. Medical equipment
 - F. Other
5. Does your company sell products come from international markets?
 - A. Yes
 - B. No
6. The proportions of the products from domestic industry and international industry.
 - A. More domestic product
 - B. More international product
7. Sales analysis of your product
 - A. Domestic products are more popular
 - B. International products are more popular
8. For the same products, the selling is mostly determined by (multiple choice, if possible can you rank them)
 - A. Price (profit margin)
 - B. Reputation
 - C. Quality
 - D. Customer requirements
 - E. Commission
 - F. Firm strategy
 - G. Other
9. The factors impact the possible business relationship with pharmaceutical industries (multiple choice, if possible please rank them)
 - A. Scales
 - B. Market requirements
 - C. Customer requirements
10. The bargain power the organization have in business relationships with large pharmaceutical company?
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high
11. The bargain power the organization have in business relationships with large pharmaceutical company?
 - A. Not at all
 - B. Very low
 - C. Low
 - D. So-so
 - E. High
 - F. Very high

Survey for 3PLs

1. Does your company select customers?
 - A. Yes
 - B. No
 - C. Sometimes, we do our business follow the contracts and accept the feedbacks from customers
 - D. Not really, we only make sure orders are delivered
2. Does your company design the logistic plan for customers?
 - A. Yes (Almost for every customer)
 - B. Yes, when required
 - C. No
3. In the following options, please choose the industries your company serve the most. (multiple choice, if possible please rank them)
 - A. Manufacturing industry
 - B. Catering service
 - C. Retail industry
 - D. Construction industry
 - E. Agriculture industry
 - F. E-commercial
 - G. Other
4. Is there any differential treatment to customers in different scales?
 - A. Yes (_____)
 - B. Sometimes (_____)
 - C. No
5. Does your company pay attention to “customer experience”?
 - A. Yes, we are to provide customers the best service
 - B. Yes, most of time we are trying to satisfy customers; we would like to hear from our customers
6. Does your company provide other services more than logistics?
 - A. Yes
 - B. No
7. Your target customer group? (Multiple choice)
 - A. Large companies
 - B. Medium sized companies
 - C. Small sized companies
8. Does your company jointly-work with any customer?
 - A. Yes
 - B. No
9. Does your company tend to build further relationships with your customers’ customer?
 - A. Yes, we will try to build further relationship with them.
 - B. Sometimes, we select them and to further communicate with
 - C. No, we only make sure orders are delivered
10. Does your company provide cold-chain transportation? For whom?
 - A. Yes (a. Food industry, b. pharmaceutical industry, c. retail industry, d. other)
 - B. No

11. Does your company have business with any pharmaceutical company?
 - A. Yes, in a large proportion of our business
 - B. Yes, in a certain proportion of our business
 - C. Yes, in a small proportion of our business
 - D. Sometimes
 - E. No

12. What do you think of your bargain power in business relationships?
 - A. High, we do not compromise in any situation
 - B. Comparatively high, we may offer small discount to selected customers
 - C. So-so, we accept negotiation, and may compromise in a certain degree
 - D. Comparatively Low, if reasonable, we will consider to accept
 - E. Low, we eager to win more customer, we accept business with little profit margin.

13. Does your company provide international service?
 - A. Yes, parcel delivery only
 - B. Yes, Parcel delivery and cargo delivery
 - C. No

Survey for Customers

1. Which customer group are you in?
 - A. Hospital
 - B. Pharmacy
 - C. Clinic
 - D. Consumer
 - E. Other (_____)

2. For certain pharmaceutical products, where did you know about them? (multiple choice)
 - A. Direct Sales of pharmaceutical company
 - B. Pharmaceutical agency companies
 - C. Other (_____)

3. When there are problems like adverse drug reactions, whom to feedback? (multiple choice)
 - A. Pharmaceutical Company
 - B. Pharmaceutical Agency Company
 - C. Other (_____)

4. Do you receive regular assistance (instruction, check, etc.) from the seller?
 - A. Yes
 - B. No

5. Do you think the regular assistance from seller is necessary?
 - A. Yes
 - B. No

6. Do you have any particular preference in choosing pharmaceutical products?
 - A. Yes (for example _____)
 - B. No

7. You prefer to purchase from whom?
 - A. Pharmaceutical Company (direct sales)
 - B. Agency Company
 - C. Other (_____)

8. Do you mind if we contact with you for other relevant details?
 - A. Yes (email/tel.: _____)
 - B. No