# Impacts of triadic collaborations on supply chain performance

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## Abstract

In supply networks, to fulfil a common set of tasks, parties come from different industries are connected and linked functionally across multiple tiers, which can be labelled as collaborations. The efforts of collaboration have been frequently observed and discussed in various business activities like R&D, production, distribution, and delivery. The triadic collaboration is the smallest unit of network which made of connected dyads, is said essential to a successful network. In this research, a case study is adopted as the methodology to reveal how does each dyad in triadic collaborations contribute to relevant business fulfilment and achievement.

***Keywords****: triadic collaboration, supply chain, performance*

## 1. Introduction

In a supply network, to fulfil a common set of tasks, parties come from different industries are connected and linked functionally across multiple tiers, which can be labelled as collaborations. The efforts of collaboration have been frequently observed and discussed in various business activities like R&D (Bjerregaard, 2017), production (Blome et al., 2014), distribution (de Leeuw and Fransoo, 2009) and delivery (Finne and Holmström, 2013). Learning to collaborate is said essential to a successful network (Veal and Mouzas, 2010), which boosted the research on buyer-supplier relationship or supplier-supplier relationship, is regarded as a dyadic view (Wu and Choi, 2005; Pathak et al., 2014) on collaboration.

However, within a supply network, the collaboration is much more complicated, observing it only with a dyadic perspective won't reflect the complex nature of collaboration within a supply chain. As a result, there is a growing trend to investigate supply chain collaboration with a triadic view. In fact, a triad is the smallest unit of a network (Choi and Wu, 2009), and it is actually made of connected dyads. Hence, it is important to investigate collaboration with a triadic view rather than dyadic view.

Previous research has highlighted the importance of triadic perspective of collaboration. For example, the construction of triads associated with outsourcing can help to obtain the competitive advantages by combining certain internal functions with external parties (Ross et al., 2005). It is claimed that collaborations are to gain better competitive advantages through various dyadic patterns (Yakhlef, 2009).

Unfortunately, there is very limited number of research on this. The purpose of this research is to investigate the impacts of triadic collaboration on supply chain performance. This research aims to explore how each dyad existed in triadic collaborations contribute to relevant business fulfilment and achievement.

## 2. Literature Review

In many industries, collaboration is indispensable (Baloh et al., 2008). To get sustainable development (Miemczyk et al., 2012), firms applying outsourcing to get competitive advantages (Boulaskil and Fransso, 2010) which introduces more external organizations to work jointly within supply chain. The supply chain is becoming more complicated like one that is made up of linearly structured interconnected dyads (Miemczyk et al., 2012). In figure 1, a brief illustration of outsourcing and the formation of triads has been provided.

Yakhlef (2009) described outsourcing as a role transformation of a firm from a performer to a purchaser of an activity in the form of service. In manufacturing industry, traditionally, firms tend to outsource supportive services like logistics, and treat it as a non-core business (Tayles and Drury, 2001; Martínez-Noya Andrea and García-Canal Esteban, 2011). As the business practitioners believe that the non-core business is less relevant to their core business – the manufacturing and related activities like R&D, which can be costly and time-consuming due to the duplication of resources. The situation has changed recently, a certain number of activities across the multifunctional process including not only the non-core business but also the core business are outsourced to gain related competitive advantages like cost-efficiency and resource leverage (Boulaksil and Fransoo, 2010). As a strategy welcomed by many companies, the outsourcing has encouraged the establishment of many dyads formed by the manufacturer (the

focal company in this case) and the contractors. As the third parties, the contractors are assigned and directly contribute to the value creation within the supply system.

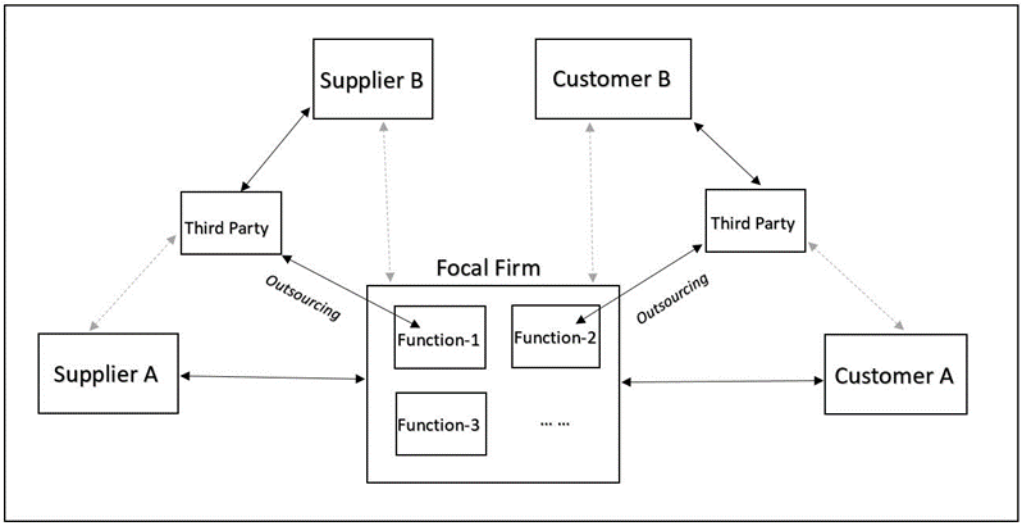


*Figure 1 Outsourcing and the formation of triads*

It is said that if the forming of a triad is due to outsourcing, the focal firm tend to take the control and the greatest benefit of information will go to them (Li and Choi, 2009). When bringing one party to join an existing dyadic collaboration, a great possibility of there being an unbalanced situation, where some dyadic relationships are closer than others. In an existing supply chain, parties stay in contact are connected to fulfil mutual tasks (Pesqueux, 2012), which can be regarded as an existing dyadic collaboration. The third party to get involved may come from different tiers across various sections (Pathak et al., 2014) to share the tasks in charged by relevant product/service providers. The tasks contract out will not change the original business target. We specify the new contracting associated with outsourcing activities as pathway collaborations paralleling the identified existing collaboration, while the third party can be bridged with the existing partner of the focal company in task fulfilment. In figure 2 shows the conceptual structure of triadic collaborations.

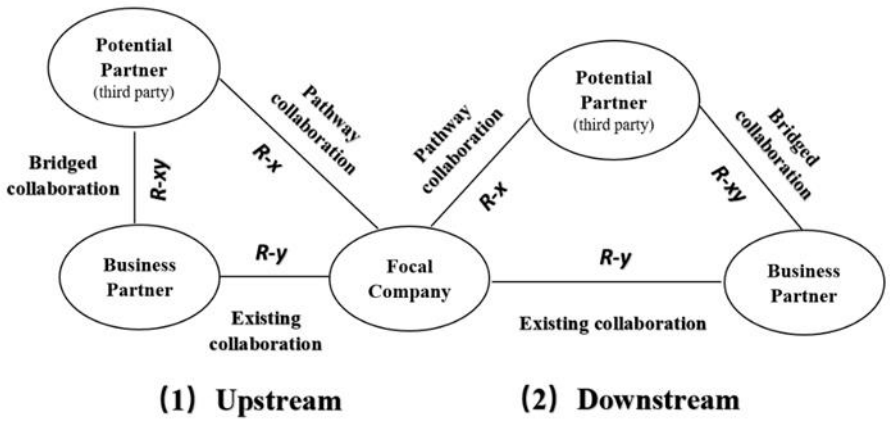


*Figure 2 Structure of triadic collaborations*

## Methodology

The case study is adopted in this research, which can be regarded as an all-encompassing and comprehensive method (Yin, 2014) for any purpose of research exploration (Voss et al., 2002). Five in-depth case studies of pharmaceutical companies in China were conducted to achieve research purpose. Multiple sources of evidence are used to address broader range of validity issues, which included data collected through field visits, semi-structural interviews, questionnaires, and secondary documentation. 47 semi-structured interviews were made in the approaches of face to face, phone call, and online communications. Relevant case details can be summarized in Table 1.

*Table 1 Case description*

| |
|---|
| Case 1 *(A medium sized bio-pharmaceutical manufacturer, has 3 subsidiaries)* (**FC-1**)<br>Focal Company 1 (FC-1) is a fast-developing bio-pharmaceutical company in China, provides bio-pharmaceuticals, chemical drugs, and even traditional Chinese medicine and synthetic drugs. The outsourcing activities can be observed in their R&D sector, production sector, and distribution sector (partially outsourced only). |
| Case 2 *(A medium sized Pharmaceutical manufacturer, has 2 subsidiaries)* (**FC-2**)<br>FC-2 mainly produce chemical drugs, traditional Chinese medicine and synthetic drugs. A significant portion of R&D has been outsourced to the third parties; the activities of distribution and delivery are partially outsourced. |
| Case 3 *(A small sized pharmaceutical manufacturer, no subsidiary)* (**FC-3**)<br>FC-3 focuses on R&D and is able to produce chemical drugs but tends to outsource the function of production. Almost 100% count on 3PLs for delivery. FC-3 is in a good relationship with pharmaceutical agency companies, a great number of activities of distribution have been outsourced. |
| Case 4 *(A small-to-medium sized bio-pharmaceutical manufacturer, no subsidiary)* (**FC-4**)<br>FC-4 provides blood plasma products for clinical treatment. A small portion of their delivery count on 3PLs (outsourcing activities can be observed in this sector only). |
| Case 5 *(A small sized bio-pharmaceutical manufacturer, no subsidiary)* (**FC-5**)<br>FC-5 mainly produces traditional Chinese medicine and synthetic drugs. The outsourcing activity can be observed in the sector of delivery only. |

The data collected was coded according to their sources and assigned with key issues of dyadic relationship and triadic relationship. A protocol was prepared to assist the coding. The technique of cross-case synthesis and explanation building were applied for data analysis.

## Findings and discussion

In upstream supply chain, the outsourcing activities can be observed are mainly in the R&D sector. Besides, the traceable dyadic collaborative relationships can be illustrated in Table 2.

*Table 2 dyadic collaborative relations in the upstream supply chain*

| **Dyadic Relation** | *R-1* | *R-2* | *R-3* | *R-4* | *R-5* | *R-6* | *R-7* | *R-8* |
|---|---|---|---|---|---|---|---|---|
| | *Service/Technology Provider* | | | | *Funding Provider* | *Pharmaceutical Material Provider* | | |

| **Mode** | University | SRI | Other Pharma | Hospital | Authority | Conventional Supplier | Project Supplier | Appointed Supplier |
|---|---|---|---|---|---|---|---|---|

The research results indicate that the focal company seeking sustainability tend to work with research institutions, especially the universities and SRIs (scientific research institution). The universities are regarded as the new force in R&D, although compare to SRI, it could be less effective and flexible in certain commercial project, which may also require sustained investment in a long term.

In downstream supply chain, the outsourcing activities are common in the sectors of distribution and delivery. The main dyadic collaborative relations can be observed are summarized in Table 3.

*Table 3 dyadic collaborative relations in the downstream supply chain*

| **Dyadic Relation Mode** | *R-1* | *R-2* | *R-3* | *R-4* | *R-5* | *R-6* |
|---|---|---|---|---|---|---|
| | Agency Company | Hospital | Pharmacy | Clinic | OTC Buyer | 3PL |

In the sector of distribution, for comparatively small companies, working with agency companies could be the fast approach to reach the target customers. But for the companies with a purpose of sustainability, it is necessary to build up the channels and maintain the relationship with the hospitals and pharmacies which actually act as the direct product introducers to the customers. In the sector of delivery, 3PLs (the third party logistic) are the indispensable participants which normally take on most of the tasks in according to our research (besides case 4, due to the nature of the products, the focal company 4 prefer to handle by themselves for quality-control).

Refer to figure 2, the formation of a triad with dyads, can be coded as *Pathway collaborative dyad (R-y) + Bridged Collaborative Dyad (R-xy) + Existing Collaborative Dyad (R-x).*

In upstream supply chain, the triads can be confirmed are (1) *R-6 + R-67 + R-7*, (2) *R-3 + R-31+ R-1*, (3) *R-3 + R-32 + R-2*, (4) *R-2 + R-21 + R-1*, (5) *R-4 + R-41 + R-1*; where in downstream supply chain are (1) *R-1+ R-12 + R-2*, (2) *R-1 + R-13 + R-3*, (3) *R-6 + R-61 + R-1*, (4) *R-6 + R-62 + R-2*, (5) *R-6 + R-63 + R-3*, (6) *R-6 + R-64 + R-4*, (7) *R-6 + R-65 + R-5*.

### *Performance impacted by dyads*

In upstream supply chain, universities are favoured by many companies. Although scholars argued that such collaborations could be costly, inefficient, and inflexible due to the long R&D cycle (Rees, 2011) and the high R&D failure rate (Fiaz, 2013). To SMEs, collaborations with university is still the cheapest way to make practical achievements, as it is usually encouraged by the local government with favourable policies (Guo et al., 2016). For specific commercial tasks, the companies prefer to work with SRIs, as it is more goal-oriented and thus more effective.

In the downstream, the hospital is treated as the biggest customer and all case companies tend to keep a good relationship with. As the intermediator of the pharmaceutical products providers and the end-customers (the patients), the hospital is sometimes treated as an essential partner in business. Even though some people argued that it could be costly in establishing and maintaining the guanxi (Murray and Fu, 2016) in order to get sustainability and opportunity in market, companies we have interviewed states that it is still worthwhile investing. The agency company is another important intermediator, which is widely welcomed by the case companies. One the one hand, they order products from the focal company, which act as the customers; on the other hand, they can help to sell the products and further expand the market for the focal company.

Based on the results, the construction of dyads in the mainstream are normally motivated by the competitive advantages of sustainability and/or opportunity on strategic level, which can be referred to the abilities of a company in maintaining certain contributions to relevant business and to access new fields/ resources/ markets. In the downstream, the focal companies confirmed that, with dyadic collaborations, they are more likely to focus on the core businesses and thus make progress in a comparatively short time (effectiveness); moreover, in general, they saved more money in project processing (cost-efficiency) and are able to respond to changes internally or externally quickly (flexibility).

### *Performance impacted by triads*

The third parties can be traced in the upstream are in the sectors of R&D; in most of time, they could be SRIs or other pharmaceutical companies. The companies may need to purchase pharmaceutical patents or technologies or services from a third party to shorten the R&D period. The pathway can be in short-term or long-term, which depends on the requirements of relevant project. Moreover, the Bridged dyadic collaboration is normally required for effectiveness and only existed when needed (should be flexible).

In downstream supply chain, the pharmaceutical companies are closely associated with the healthcare industry. Healthcare professionals can refer to doctors and pharmacists, that serve patients and applied medicines on patients or recommend patients to buy pharmaceutical products. Chakraborty et al. (2014) ever argued that the healthcare industry is unique, it requires regular interactions between product/service providers and the customers (Lukkari and Parvinen, 2008) to direct future R&D and production, to adjust or promote marketing strategies. Therefore, although the companies may have their own sales force, they still tend to collaborate with agency companies to better serve the healthcare industry and further develop the market (Dambrin and Robson, 2011). The formation of triadic collaboration may bring about more opportunities. However, the sustainability really depends on the value co-created (Chakraborty et al., 2014), it is a two-way choice. The pharmaceutical company can work with more than one agency companies, and the agency company can sell products in different brands.

The 3PLs contribute a lot to the formation of triadic collaborations. In practice, most 3PLs are just responsible for hand-over the orders; the cost-efficiency, effectiveness, and flexibility can be traced in most cases. However, the results indicate that the pathway built are only helpful on operational level in smoothing the deliveries but a tactic action on strategic level.

## Conclusion

The research results shown that the impacts of both individual dyads and overall triads on supply chain performance is highly associated with the involvement of third parties. The third party plays an important role of bridging with the existing partners of the focal company in task fulfilment. The research also highlighted that the performance in operational level is more alike to be affected. It was found that the operational performance will have direct impact on strategic performance, however, it has no significant impact on political level performance. This research is believed to contribute to the understandings on supply chain collaboration with a triadic view. The expected results will provide pharmaceutical SMEs with management implications to enhance their collaboration and improve their supply chain performance.

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