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Abstract

The increased frequency of the adoption of service-based business models by manufacturers, such as solution provision, has given rise to service triads. While there is consensus that actors in service triads are relationally and performatively interdependent, less is understood about how service triads are controlled *and* coordinated. In this study, we use an inductive case-based approach to build an understanding about the roles, approaches, and contextual factors that influence how service triads are controlled and coordinated. We collected and analyzed data from nine companies forming three service triads, each comprising a customer, a manufacturer of an asset, and a service supplier. We synthesized our findings in a theoretical framework, where we show that; first, both, control *and* coordination are present in service triads rather than just control as previously posited. Second, controlling and coordinating service triads is not a single actor's responsibility but rather a collective effort shared by two or three actors. Third, we uncovered four contingent factors that influence the dynamics of how service triads are controlled and coordinated: the customer's risk exposure due to the offering's failure, the substitutability of the offering, the contractual safeguards, and the relationship closeness.

Keywords: control, coordination, service supply chains, triads and networks, qualitative research

INTRODUCTION

The increasing popularity of service-based business models, such as the provision of integrated solutions (cf. Tuli, Kohli, & Bharadwaj, 2007), combined with firms' increasing specialization is giving rise to a network-centric mode of solution delivery (Wynstra, Spring, & Schoenherr, 2015; Karatzas, Johnson, & Bastl, 2016). This allows firms to respond to customer demands through increasingly customized and complex offerings, often incorporating multi-vendor technologies, products, and services (Story et al., 2016). For example, IBM in industrial computing or General Electric, John Deere, and Caterpillar in complex industrial equipment strongly rely on the existence of service capabilities in their dealerships or technology suppliers to create customized solutions that address their customers' needs (Cusumano, Kahl, & Suarez, 2014).

In this arrangement, the three key actors that form a *service triad* are: a) the manufacturer of an asset who typically bundles the asset with services and sells the offering as a solution to its customer; b) the service supplier that supplies the service capability of the solution directly to the manufacturer's customer; and c) the manufacturer's customer, which buys the solution (Wynstra et al., 2015; Karatzas et al., 2016). In service triads, all three actors are performance and relationship interdependent (Choi et al., 2002; Wu & Choi, 2005; Lazzarini, Miller, & Zenger, 2008; Li & Choi 2009; Choi & Wu, 2009a; b), which in consequence means that the effectiveness of the provision of services, and ultimately the customer's satisfaction, is dependent upon how effectively the three actors and the relationships between them are controlled (Li & Choi, 2009; Van der Valk & Van Iwaarden, 2011). In addition to relationships being formally controlled by governance apparatus such as contracts and performance measures, relationships can also be managed informally (Poppo and Zenger, 2002) through coordination

via “*information sharing, decision-making, and feedback mechanisms*” (Gulati, Wohlgezogen, & Zhelyazkov, 2011, p. 543).

Managerial practice is replete with challenges to the delivery of services and solutions (Kreye, 2017), such as the deservitization of customer offerings (Valtakoski, 2017), to termination of service contracts, such as Intel’s \$150 million web-based service unit shut down (Sawhney, Balasubramanian, & Krishnan, 2004). In many cases, the difficulties are rooted in the naiveté of the complexity of the control and coordination of the activities of the three actors in a service triad. Thus, how service triads are controlled and coordinated is of interest to scholars and practitioners alike.

With few notable exceptions, the extant research on how to control and coordinate service triads is limited (cf. Wynstra et al., 2015). It has been argued that the responsibility for the control and coordination of the triad lies, depending on the context, with the prime contractor (e.g., Karatzas et al., 2016) outsourcer of services (Li & Choi, 2009; Van der Valk & Van Iwaarden, 2011), or the seller of the solution (Windahl & Lakemond, 2006; Bastl et al., 2012; Karatzas et al., 2016). Structurally, these are the same actor, whose key role is to retain control and visibility over the triadic interactions with the aim of facilitating the effective delivery of the offering to the customer.

Contrary to the extant literature, we argue that the manufacturer of an asset (later on referred to as ‘manufacturer’ for brevity) is likely not the only actor in a service triad that has an interest in the coordination and control of triadic interactions. Customers, for example, are not only the providers of inputs in the service production process (Sampson, 2000), but they also have to develop a range of capabilities around the internal and external integration and management of risks associated with dependence on service suppliers to effectively participate in

the provision of solutions (Story et al., 2016). Due to performance interdependence in service triads, the failure of the customer offering or a conflict in the relationship between the manufacturer and its customer can have negative implications for the service supplier, such as difficulties in service delivery, a decrease in revenues, and reputational damage (Karatzas et al., 2016). Furthermore, we posit that in order to advance our understanding of control and coordination in service triads, we need to move beyond some of the limited methodological choices of the extant triadic research, such as the focus on a single actor (e.g. Van der Valk & Van Iwaarden, 2011, Li and Choi, 2009) or a single dyad (e.g. Karatzas et al., 2016) within a triad.

In this research we aim to *understand how and why activities and relationships are controlled and coordinated within service triads*. We do this, by using an inductive theory generation approach. We collected and analyzed data from nine companies forming three service triads. We captured our findings in nine propositions and synthesized them in a theoretical framework, which constitutes the theoretical contribution of this work. While the extant literature on ‘managing’ triads focuses almost exclusively on control in service triads (e.g. Li & Choi, 2009; Van der Valk & Van Iwaarden, 2011), we show that for the effective functioning of a service triad, both control and coordination should be present. Related to this, we explicate the role of the ‘mediator’, which displays behavioral traits unique to the context of service triads. Second and contrary to the extant literature, which focuses only on one actor managing service triads (e.g., Li & Choi, 2009, Karatzas et al., 2016), the control and coordination of service triads is performed by at least two actors. Third and finally, we uncovered four contextual factors that influence the dynamics of the control and coordination of service triads: a) risk exposure due to

the customer offering's failure, b) the substitutability of the customer offering, c) contractual safeguards, and d) relationship closeness.

The remainder of the paper is structured as follows. Firstly, we present a theoretical background on service triads, interdependence within those and their control and coordination. We then introduce the methodology explaining our empirical setting, case sampling logic, data collection and data analysis processes. Following this is the within-case analysis and cross-case analysis, where we formulate our propositions and synthesize them in a theoretical framework. We continue with the discussion of our findings and close with limitations and recommendations for further research.

THEORETICAL BACKGROUND

In this section, we review the literature that defines the characteristics of service triads and summarizes the extant theoretical understanding on how to manage them.

Service Triads

Service triads have become an important topic in the supply chain management discipline (Wynstra et al., 2015). In comparison to manufacturing triads, service triads typically involve three distinct actors—a manufacturer, a service supplier, and a customer (Karatzas et al., 2016)—as opposed to manufacturing triads, where one manufacturer interacts with two suppliers (Wu & Choi, 2005; Wu, Choi, & Rungtusanatham, 2010) or with a supplier and a customer (Rossetti & Choi, 2005, 2008). While we acknowledge that multiple suppliers may provide service to a manufacturer, similar to how multiple suppliers may supply components or parts in a manufacturing context, our focus is on a service supplier-manufacturer-customer triad.

In the manufacturing triad, the component supplier normally does not have to interact with the manufacturer's customer, as there is no relationship between them. In contrast, the service supplier has to have a direct interaction—that is, a relationship—with the manufacturer's customer. The service supplier's *direct interaction with the manufacturer's customer* is a key characteristic that defines service triads and distinguishes them from manufacturing triads (Li & Choi, 2009; Wynstra et al., 2015).

The direct interaction between the customer and the service supplier exists due to the inseparability of services and the bi-directionality of service exchanges (Sampson, 2000; Sampson & Froehle, 2006), where “*service cannot be divorced from an exchange relationship between specific counterparts*” (Wynstra et al., 2015, p. 7). As Sampson and Froehle (2006) posit, the customer and the service supplier are engaged in a bi-directional service production flow, where the customer is simultaneously the supplier of significant inputs in service co-production. Thus, we distinguish the focus of our study from other types of services, such as mixed services—involving a mix of face-to-face and loosely coupled back office work or quasi-manufacturing services, which entail virtually no face-to-face contact (Chase, 1981).

While the fundamental nature of service triads is known (Choi & Wu, 2009a; b), studies that explore the control and coordination of tasks and relationships in manufacturer – service supplier – customer triads are rare. Few triadic studies have, to date, fully leveraged the unique characteristics of service triads (Wynstra et al., 2015). Thus, in the following section we provide an overview of the extant understanding of service triads, control and coordination in service triads, and conclude with the research question that led to our empirical investigation.

Interdependency in Service Triads

Service triads, as considered here, are *transitive* triads. They are structurally complete as all three actors (customer, manufacturer, and service supplier) are connected through relationships, and there are no structural holes (Madhavan, Gnyawali, & Jinyu, 2004). Consequently, all three actors are performance and relationship interdependent (Li & Choi, 2009; Mena, Humphries, & Choi, 2013). The reason for this is that in a triad (Choi & Wu, 2009a):

- a) A node can affect an indirect link—for instance, the manufacturer's behavior affects the relationship between the service supplier and the manufacturer's customer; and
- b) A link can affect another link or a node—for example, the relationship between the manufacturer and the service supplier can affect the service supplier and/or the relationship between the service supplier and the customer.

This interdependence was demonstrated in the work of Karatzas et al. (2016), where the authors showed that the customer's (third-party logistics provider) satisfaction with a service supplier's (service garage) service performance is influenced by the manufacturer's (commercial vehicle manufacturer) management of the relationship with the service supplier across multiple relationship dimensions.

As the actors within service triads are interdependent, the relationships within the triad should be maintained. Simmel (1950) posits that actors within triads can adopt one of two roles to maintain the triad, 1) the mediator, and 2) the arbitrator. These roles are similar to those of a *Tertius Iungens* (cf. Obstfeld, 2005) – or the third that joins. Both the arbiter and the mediator are interested in the unity of the triad, not the interests of the individual. Conversely, actors that adopt the role of *Tertius Gaudens* (or the one that enjoys) wish to create discord and separation between the other two actors. However, while the mediator is non-partisan, either through no

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interest or equal interest in the other two actors, the arbitrator is partisan and favors one actor over another (Simmel, 1950). We suggest that within service triads, actors will adopt a role more in line with the non-partisan mediator as favoring one actor over another would lead to adverse tensions in the inter-organizational relationships between actors, leading to a decay of relationships within the triad, reducing interdependence and hence reductions in the overall performance of the triad.

Control and coordination in service triads

As a customer's satisfaction within service triads is dependent upon the relationship between the customer and the focal firm's supplier (cf. Karatzas et al. 2016) the focal firm has to be able to control and coordinate the relationships and tasks between the two remaining actors. However, control and coordination have occasionally been conflated (cf. Fugate, Sahin, & Mentzer, 2006; Xu & Beamon, 2006; Holweg & Pil, 2008) with little equivocality about their relationship nor any distinct definitional clarity. In fact, coordination is viewed as a component of control. Here, we posit that they are related but distinct in the mechanisms through which they are exerted.

Control is exerted through the managing actor's ability to maintain communication and monitor the behavior and performance of the other two actors. In the work of Li & Choi (2009) and Van der Valk & Van Iwaarden, (2011), this managing actor is a firm – referred to as the buyer, that subcontracts the provision of services to its customers to a service supplier. However, to achieve control, the best position in a network is to be in the position of the bridge (Burt, 1992); this is the actor that is positioned between two isolated agents that are not directly connected with each other. For example, a manufacturer is a bridge if it has relationships with

two suppliers who are not connected to each other via a relationship. The absence of a connection between the isolated agents creates a structural hole, which in turn grants the bridge informational and control benefits as it can negotiate and exploit information to its benefit (Burt, 2000; Zaheer & Bell, 2005). However, in transitive service triads, structural holes do not exist as all actors need to be connected to ensure the effective delivery of services (Bastl et al., 2012; Karatzas et al., 2016). Thus, there is no bridge position and control becomes more challenging.

Van der Valk and Van Iwaarden (2011) and Van Iwaarden and Van der Valk (2013) suggest that a mechanism for the effective retention of control by the buyer (which is structurally the same actor as the manufacturer in this study) is the deployment of a behavior- and outcome-based contract mix in direct links, as the buyer has no ability to influence the indirect relationship (i.e. between the customer and service supplier). Hence, in addition to control being exerted through an actor's position, it can also be achieved via formalized mechanisms. This suggests that control is a proxy of the position of an actor within a network and the actor's power¹ (cf. Simmel, 1950). Power has been shown to be a control mechanism in supply chains (Handley & Benton Jr., 2012a; 2012b), however control can be exerted through other mechanisms. These include information monitoring (Handley & Benton Jr., 2012b), operating procedures, and action and diagnostic controls (Chenhall, 2003) such as Key Performance Indicators (KPIs).

In addition to control within the dyads in the triad, it is important to understand how coordination between actors (cf. Gulati, 2007; Gulati, Wohlgezogen, & Zhelazkov, 2012) within the triad occurs as coordination is fundamental to supply chain management (Fugate et al.,

¹ Power is defined here as: "*the ability of one individual or group to control or influence the behaviour of another*" (Hunt & Nevin, 1974, p.186)

2006). Coordination is not well defined within the O&SCM literature. However, a supply chain is said to be coordinated when “*all decisions are aligned to accomplish global system objectives*” (Sahin & Robinson, 2002, p. 507). This aligns with definitions within general management where coordination is the alignment and adjustment of activities, processes, and roles (Gulati et al., 2012). Coordination is achieved through information sharing (Sahin & Robinson, 2005), mutual adjustment of activities (Nassimbeni, 1998), and decision-making and feedback mechanisms (Gulati et al. 2012). Table 1 compares the different mechanisms for exerting control and coordination in inter-organizational relationships.

----- *Insert Table 1 about here* -----

Greater interdependence and higher task and environmental uncertainty are posited to require more coordination (Xu & Beamon, 2006; Gulati et al., 2012). In service triads interdependence is high, thus task and environmental uncertainty will require differing levels of coordination. Task and environment uncertainty is also increased by greater investment in relationship-specific assets (Handley & Benton Jr., 2012b). Relationship-specific investments in assets that provide customized support and/or manufacturing processes, have little value outside of a focal relationship. Asset specificity refers to the degree to which the assets used in support of the transaction can be redeployed to alternative uses and by alternative users without sacrifice of productive value (Williamson, 1991; David & Han, 2004). Hence, the greater the asset specificity the lower the level of available substitutes.

It has been posited that task and environment uncertainty can be reduced by a dominant actor – through exertion of mediated power - by information monitoring (Handley & Benton Jr.,

2012a) and contractual safeguards (Jones, Hesterly, & Borgatti, 1997). However, we argue that if actors in a triad act for the benefit of the whole triad, information sharing (cf. Sahin & Robinson, 2005), a coordination mechanism, can be used to mitigate the uncertainty.

The mechanisms of control and coordination and what affects their deployment are well understood within a dyad. However, who does the control and coordination in service triads, and for what reason, remains unanswered. The role of coordinating and controlling activities and relationships in the triad is assigned to one actor—the manufacturer, who is in most cases also the prime contractor (cf. Bastl et al., 2012; Finne & Holmström, 2013). However, we posit that in the pursuit of the effective provision of services to the end customer, the manufacturer is not the only actor that coordinates and controls the service triad. As highlighted earlier, the customer is actively involved in service co-production with the service supplier by providing inputs to the service production process (Sampson & Froehle, 2006). All three actors are performance-interdependent due to the unique structural arrangement of service triads (Madhavan et al., 2004) and due to the complementary capabilities necessary for the service provision (Story et al., 2016). This makes the provision of services a collective effort by all three actors as well as a potential collective risk if the offering fails. Moreover, this additional actor “*may not be specifically chosen, nor be known or designated as such*” (Simmel, 1950, p.148). Hence, within a service triad an additional actor that coordinates and controls actions may emerge. Thus, there is little in the way of theoretical clarity as to whether there is only one, or two or more actors that coordinates and controls actions in a triad.

Given the nascent state of the extant literature, we argue that our understanding of managing service triads is incomplete and mostly limited to the perspective of one actor. Accordingly, we have yet to understand the roles of the customer and the service supplier. Thus,

the purpose of this study is to *understand how and why activities and relationships are controlled and coordinated within service triads*.

METHODOLOGY

Given the underexplored nature of the research phenomenon under study, we adopted an inductive case-based approach with abductive reasoning to generate theory (Eisenhardt, 1989; Meredith, 1998; Yin, 2009; Ketokivi & Choi, 2014). In line with suggestions by Edmondson & McManus (2007), case research represents a “methodological fit” when used for exploring novel questions, of *how* and *why* (as is the intent of this study), and where the primary contribution of the work is a suggestive theory, often resulting in the invitation for further work on the issue or set of issues elucidated by the study. Moreover, case research enables researchers to document managerial practices, gain greater understanding of the nature and complexity of the phenomenon under study (Voss, Tsikriktsis & Frohlich, 2002; Yin, 2009), and increase the depth of the research (Meredith, 1998).

Case Sampling

Following the theoretical sampling logic and recommendations by Eisenhardt (1989), Meredith (1998), and Patton (2002), we selected our cases based on the set of selection criteria, which we developed from the extant literature:

- *Criterion 1—Transitivity*: The actors in a service triad must form a *transitive* triad—that is, all actors are connected through relationships, hence no structural holes exist between the actors (Cartwright & Harary, 1956; Madhavan et al., 2004). Transitivity is one of the basic structural characteristics of service triads (Wynstra et al., 2015).

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- *Criterion 2—Existing relationships:* This enables the observation of longer-term relationships, which tend to mature and accumulate significant relational history (Anderson & Narus, 1990). Moreover, this criterion allows us to examine the relationships that were more stable with less exposure to the uncertainties of new relationships or ones that were at the end of their lifespan.
- *Criterion 3—Presence of different control and coordination mechanisms:* As the focus of our study is on control and coordination mechanisms within service triads, triads were chosen that used a range of control and coordination mechanisms (Van der Valk & Van Iwaarden, 2011; Gulati et al., 2012; Van Iwaarden & Van der Valk, 2013).
- *Criterion 4—Differing levels of task and environment uncertainty:* This follows from the preceding criterion. As we were examining differing levels of control and coordination, we required cases that had differing levels of task and environmental uncertainty as these are posited to require different levels of coordination (Xu & Beamon, 2006; Gulati et al., 2012). Although in each of the three cases, all three actors are connected through the provision, support, and use of the same offering, they have distinct roles, responsibilities and exposure to risk. This results in variations in environmental uncertainty to which each actor is exposed, and consequently variation in the deployment of control and coordination mechanisms. In Case 2 asset specificity was low as vehicles were interchangeable. Conversely, in Case 3 the solution was entirely specific to the customer.

Data Collection Process

Each case was comprised of three firms forming a service triad. The unit of reference was the customer-manufacturer-service supplier triad, where the units of analysis were relationships

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within the customer-manufacturer, customer-service supplier, and manufacturer-service supplier dyads.

For the purposes of data collection, a semi-structured interview guide was developed. The guide stipulated triadic relational issues by focusing on the uncovering of control and coordination mechanisms, interdependence, and how and why the mechanisms were utilized for each actor within the case service triads.

The data collection for every case started with the identification of a “gatekeeper” firm. Potential gatekeeper firms were identified on the basis of our knowledge of their involvement in the provision of solutions sourced from the business press, academic papers, and existing personal networks. We approached them, introduced the project, and among others explained the sampling criteria, ensuring they were understood and emphasized the need for all three firms in a triad to comply with them. Based on this, the gatekeeping firm’s representative first identified potential participating firms and asked for their willingness to participate. Once the preliminary agreement to participate was reached, the research team approached the other two firms, briefly explained the project again, and re-checked the firm’s compliance with the case selection criteria.

The case interviews started with the CEO or VP of the gatekeeper firms. During the interview, the CEO or VP would mention who else within their firm was involved in relationship management with the two other firms in the triad. S/he would then introduce us to a knowledgeable purchasing or key account manager familiar with the solution under study and directly involved in managing the relationship with the other actors. These interviews were used to learn further about the other managers involved in the relationship management with the other two participating firms who are their counterparts. In this way, we identified all relevant

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participants from all involved firms per triad. Prior to each interview, we sought permission to electronically record the interview for the purposes of verbatim transcribing and subsequent data analysis. Permission was granted from all participants. Details of the case companies and participants are summarized in Table 2.

----- *Insert Table 2 about here* -----

To ensure *reliability* of the study – i.e., transparency of case study execution and replication - we developed (Yin, 2009): a) a research protocol, consisting of data collection process and data collection instrument; and b) case study database for all three cases, which included interview transcripts, company documentation, and notes from site visits.

To strengthen *construct validity* - i.e. the correct conceptualization and operationalization of the relevant constructs - we employed several tactics (cf. Jick, 1979; Yin 2009): Firstly, we grounded our protocol in the extant literature. We then combined primary and secondary data that was aligned with these theoretical conceptualizations. Secondary data were collected in the form of company documents, such as organizational charts, performance reports, and descriptions of products, services, and solutions. We combined this with site visits to deepen our understanding of a particular business context. We then established a chain of evidence from the objectives of the study, from the design of the data collection protocol, to the case study database, on to data coding, to individual within case study reports. Finally, each within-case study report was verified for accuracy by case participants and subsequently corrected if necessary.

Internal validity – which is concerned with building plausible relationships between constructs (Yin, 2009), was ensured by employing pattern matching and identification of commonalities between quotes, codes and extant theory; leading to identification of common themes and generalizations across the three cases. Lastly, the generalizations were captured in propositions and enfolded with the existing body of knowledge in the cross-case analysis and proposition development section in order for internal validity to be maintained.

Given the nascence of the phenomena under study and the inductive nature of our inquiry, the pursuit of statistical generalizability of our findings was not of primary concern. Dyer and Wilkins (1991) argue that theories born from deep inquiry will be more accurate and more appropriately tentative, as researchers must take into account the particularities and qualification of specific contexts. One way to increase *external validity* of findings is through generalization to theory and use of replication logic (Yin, 2009). This is ensured in this study through a careful selection of the three cases studies based on the predetermined criteria derived from the extant literature, which allowed us to identify patterns in the data leading to generalizations across the selected cases.

Data Analysis

Given that the extant literature provides little insight into coordination and control in service triads, an inductive case research approach was used (Eisenhardt, 1989). In line with Mantere and Ketokivi's (2013) suggestions, this allowed us to move from an observation of the phenomena, to an explanation of why the phenomena occurred, to the prescription of some rules (in our case propositions) as to how the control and coordination of service triads takes place. Our analysis was comprised of four-stages (Corbin & Strauss, 1990): 1) micro-analysis of the

data corpus, 2) grouping into open codes, 3) consolidation of the open codes into focused codes, and 4) collapsing the focused codes into selective or theoretical codes. The actions taken in these stages are detailed below. While the cases were inductive, our reasoning was abductive, where we sought inference to the best explanation (Ketokivi & Mantere, 2010). When inferring, we sought to remain faithful to the meanings of the respondents to our enquiry while maintaining connections to potential theoretical explanations.

Given this study elicited responses to enquiry from multiple interviewees in nine participating firms, we paid particular attention to identify and resolve any differences in opinions. In line with field observations by John & Rene (1982) and Anderson et al. (2016), we found participants in significant agreement, due our questions focusing on the structural characteristics of relationships such as formalization (e.g. formal vs informal controls) and decision-making roles (which include coordination decisions and roles). In the few situations where we encountered differences in opinions we: a) compared our interpretations of the data between researchers; b) triangulated the conflicting interpretations with other participants that were knowledgeable about the subject matter and c). showed our findings and analysis to the informants to check for accuracy (Lincoln & Guba, 1984; Yin, 2009).

In the *first stage* of the data analysis, in vivo coding (Miles, Huberman, & Saldaña, 2014) was conducted on verbatim transcripts. The purpose of this stage was to provide us with an understanding of the data and begin to clarify whether there were emergent themes within the data.

In the *second stage* of the analysis. we generated open codes from the in vivo coding in an inductive manner. Retaining the thick descriptions allowed us to contextualize our nascent

findings more thoroughly as the data remained connected to the empirical setting (cf. Gioia, Corley, & Hamilton, 2013).

The *third stage* of our analysis involved the consolidation of the open codes into focused codes through further inductive reasoning. To fulfill the prescriptive criterion of inductive case research (cf. Mantere & Ketokivi, 2013), this stage was conducted independently by the three researchers to determine the level of inter-rater agreement. In this stage, it was 94%. Table A-1 (see Appendix A) provides insight into the focused codes.

The *fourth* and final stage involved collapsing the focused codes into selective (or theoretical) codes in an abductive manner and determining if there were linkages between the codes based on our micro-analyses of the data.

RESULTS

Within-Case Descriptions

For each case, a detailed within-case report was written. Reports are based on triangulated data collected from case participants and secondary data from firm's documentation and site visits. Special attention was being paid to provide as internally consistent and as objective descriptions as possible and to minimize subjective interpretations.

We present each within-case description in the form of a short descriptive background, two graphics, and a summary table, which are all based on original within-case *thick descriptions* (cf. Gioia et al., 2013). For each case, we open with a short background on the roles of individual actors, the type of solution being sold, and a rationale behind the adoption of a service-based business model. The first graphic in each case depicts the role of an individual actor, flows, and contractual agreements between the actors of service triads. Followed by the within-case summary table, we explicate contextual factors that shaped dynamics between the triadic actors,

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indirect influences, and key performance implications for each service triad. The last graphic for each case is a summary of influences between the actors in a service triad. The title of each case refers to the orientation of the actors based on Simmel's (1950) theorizing of whether actors focus is on self-interest or the well-being of the triad. For example, the first case is named 'All for One and One for All' as all of the actors were concerned with the triad.

Case 1: "All for One and One for all"

The service triad in Case 1 was comprised of a customer who manufactured durable consumer goods (Processor), an industrial equipment manufacturer (Industrializer), and a specialized service supplier (Repairer) - see Figure 1. Processor employed around 1500 people, Industrializer 2220, and Repairer 45. The companies were bound to each other with long-lasting contracts and had been trading for several years. Processor was buying a solution from Repairer for optimizing manufacturing processes and improving the utilization of manufacturing equipment.

----- *Insert Figure 1 about here* -----

The solution was crucial for maximizing the uptime of the equipment used in Processor's production. The solution was comprised of production equipment manufactured by the Industrializer and associated services and spare parts. Processor needed to sign two contracts, one with Repairer and another with Industrializer. Repairer was contractually responsible for ensuring negotiated levels of Industrializer's equipment availability for Processor. Services delivered as part of the solution included preventive and reactive maintenance and associated

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spare parts and materials. Processer required Industrializer to supply industrial equipment and spare parts, while the service provision was performed by Repairer. Industrializer provided Repairer with field engineer training and technical data and knowledge and assisted in resolving issues that went beyond Repairer's expertise. Repairer provided training on the maintenance of Industrializer's equipment for Processer's service engineers. Repairer was the only service supplier able to service Industrializer's equipment and did not provide services for other manufacturers. This was due to the equipment's technological complexity and the need for significant expertise to facilitate effective service provisions.

Table 3, summarizes contextual factors that shaped control and coordination dynamics between the triadic actors in Case 1, and provides examples of control and coordination in direct and indirect links. Figure 2 depicts control and coordination paths between the actors in Case 1.

----- *Insert Table 3 about here* -----

----- *Insert Figure 2 about here* -----

Case 2: “All for One (Sometimes) - and One for Themselves (Most of the Time)”

The triad in Case 2 consisted of a large third-party logistics provider as the customer (Freighter), a commercial vehicle manufacturer (Truck), and an independent workshop as the service supplier (Mechanic)—see Figure 3. Freighter employed 2040 people, Truck 975 and Mechanic 52. All three companies are engaged in long-term relationships with each other. Freighter started buying solutions from Truck as a result of a shift in two strategic priorities: a) re-focus from the purchase price to the total cost of ownership over the asset's lifecycle and b)

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focus on the core competences—the provision of logistics services—and, therefore, a subsequent closure of many of Freightier’s maintenance facilities.

----- *Insert Figure 3 about here* -----

The solution or vehicle up-time package was comprised of a commercial vehicle and associated services (maintenance, upgrades, and spare parts) provided by Mechanic to Freightier on behalf of Truck. The solution, as a package, is designed and configured by Truck and provides Freightier with a contractually agreed level of commercial vehicles available. In this arrangement, the manufacturer was the prime contractor and had contractual relationships with the customer, while with the service supplier it had a franchise agreement which was mainly prescribing infrastructural matters such as the visual identity and cleanliness of the workshop. There was no contract between the service supplier and the customer.

Table 4, summarizes contextual factors that shaped control and coordination dynamics between the triadic actors in Case 2, and provides examples of control and coordination in direct and indirect links. Figure 4 depicts control and coordination paths between the actors in Case 2.

----- *Insert Table 4 about here* -----

----- *Insert Figure 4 about here* -----

Case 3: “All for (No)One - One for All”

Case 3 was comprised of a government department responsible for defense as the customer (Defender), a service supplier of capital assets (MR&O), and a manufacturer and installer of subsystems and equipment (Subsystem)—see Figure 5. The subdivision of Defender

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that interacted with MR&O and Subsystem employed 435 people, MR&O employed 1100 people and Subsystem 400. All three firms have been engaged in an exchange for over 15 years. In the past, there were long-term, collaborative agreements in place between all three members of the triad. However, in the two years preceding the case, MR&O let a long-term agreement lapse with Subsystem.

----- *Insert Figure 5 about here* -----

The move toward a solution in this triad was due to a cut in defense spending by the national government of Defender. This meant that Defender outsourced the management of its maintenance bases and heavily incentivized suppliers to reduce costs and shorten lead-times. Subsystem had become an approved supplier to Defender by developing a solution that significantly reduced the through-life costs of maintenance. The contractual arrangements existed between Defender and M&RO, but there were no contractual agreements in place between Subsystem and Defender and Subsystem and M&RO.

Table 5, summarizes contextual factors that shaped control and coordination dynamics between the triadic actors in Case 3, and provides examples of control and coordination in direct and indirect links. Figure 6 depicts control and coordination paths between the actors in Case 3.

----- *Insert Table 5 about here* -----

----- *Insert Figure 6 about here* -----

Cross-Case Analysis and Proposition Development

Each case was systematically scrutinized and then compared (Miles et al., 2014). In the cross-case analysis, we searched for common patterns to formulate propositions. We organized propositions around three themes common to all three cases: mediator role and interaction paths, the customer as a mediator, and the contextual factors.

Mediator role and interaction paths. To understand how interactions occurred in the triad we focused on how control and coordination occurred, directly, and indirectly, through other actors. We also discovered that service triads function because two or more actors adopt a coordinating role. This is an extension and refinement of extant theory that posits that triads have one actor who takes the role of mediator (e.g., Simmel, 1950; Li & Choi, 2009). To complete the theorizing, we generated propositions from the cross-case analysis.

All actors directly *coordinated* each other, except for Industrializer in Case 1. This is due to the need to align resources and approaches for effective service delivery, which is central to service production (cf. Sampson, 2000; Sampson & Froehle, 2006). Resource alignment took place in the cases through all customers agreeing on the terms of delivery together with the service suppliers—even in Case 2 where the manufacturer was the integrator of the offering. In Cases 1 and 2, the customers and service suppliers planned maintenance together and redesigned the maintenance procedures and/or policies to better fit their particular needs. The use of mutual adjustment and feedback mechanisms is common to coordination in interorganizational relationships (cf. Nassimbeni, 1998; Sahin & Robinson, 2005). We also witnessed the exertion of control mechanisms. In Cases 1 and 3, the customers monitored the service supplier's delivery performance, this is a form of information monitoring (cf. Handley & Benton Jr., 2012b). If equipment failure was identified, the customers requested their service suppliers to fix the issues.

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These interactions between customer and service supplier took place over an extended period of time.

In all three case triads, we observed two or more actors who adopted a mediating (cf. Simmel, 1950) or *Tertius Iungens* (cf. Obstfeld, 2005) orientation. These mediators controlled and coordinated activities and relationships between actors within the triad. Mediators have access to all of the actors and links (through the actors) in a triad. For example, in all three cases, customers sought access to information about the interaction between the manufacturers and the service suppliers via proactive review meetings and performance evaluations (Case 1) or more ad-hoc approaches to resolve potential issues (Case 2 and Case 3).

Mediators acted in the interest of the triad – rather than being only self-interested - to improve performance and encourage others to coordinate action and interaction. For example, in Case 3, the service supplier (Subsystem) actively sought demand information – a form of information sharing (a coordination mechanism) - from Defender and MR&O to be able to effectively respond to Defender's requirements. However, it simultaneously encouraged both Defender and M&RO to share information with each other. Without the information exchange, both M&RO and Subsystem would lose visibility and the opportunity to react to Defender's needs. We observed two or more mediators in each triad in our work. Hence,

P₁: Service triads can have two or more mediators that act for the benefit of the triad.

Actors control and coordinate indirect links through another actors. In this study, seven out of nine actors in the triads exerted influence toward the indirect link. This occurred in the service triads where the interdependence between actors was high. Here, an actor takes action to affect the way the other actors in the triad interact to improve the performance of the triad as a whole.

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For example, the manufacturers in all triads collected performance information on the indirect relationship between the customer and service supplier. This is a control mechanism (cf. Handley & Benton Jr., 2012b) that provided the manufacturers with information they could use to tackle problems. The manufacturers also held tripartite meetings to gain further visibility of the indirect link. These interactions came from the manufacturers' desire to enhance customer satisfaction through mutual adjustments (a coordination mechanism). Monitoring the indirect relationships increased the visibility of the relational and performance status and enabled the monitoring parties to react in situations where underperformance or emerging relational issues were identified.

The indirect link was always influenced via another actor, independent of the actors involved. The manufacturers always influenced the indirect link through the service providers or customers, or in some cases through both. They used the other actor as an intermediary to influence the relationship they did not have direct access to. There was not a single instance where this influence would have occurred without going through either of the other nodes. This is in contrast to what has been previously suggested in the existing literature (cf. Choi & Wu, 2009a, b). Accordingly, we propose the following:

P₂: The control and coordination of an indirect link always occurs via a connected node because the node and the link are inseparable.

The customer as mediator in service triads. The influencing of the indirect relationship was carried out by seven out of nine actors in the case triads. Only the service suppliers in Cases 2 and 3 did not attempt to influence the indirect relationship, despite the service supplier being the integrator in Case 3. The customers in Cases 2 and 3 reacted whenever performance issues were

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identified and requested their service suppliers and manufacturers to work together. Also, the manufacturers in Cases 2 and 3 monitored their indirect links and influenced those links (i.e. control). The service suppliers' positions in Cases 2 and 3 were active only within their own dyads, while the customers and manufacturers actively controlled and coordinated the whole triad, including the indirect links. The actors collecting information and exerting control on indirect links were in an advantageous position in relation to their counterparts involved in only controlling their dyads. The advantage was derived from these actors possessing access to all links, both direct and indirect.

Customers actively took initiative in all three cases to influence their indirect links. This was an attempt to improve collaboration between the other two actors to ensure that the solution delivered benefits to the customer. In all three triads, the customers faced issues where the manufacturer and service supplier needed to collaborate. The customers in Cases 2 and 3 occasionally encountered issues where the performance of the solution deviated from the agreed performance. Processer, the customer in Case 1, once experienced a major issue with the solution causing significant production losses. All of the customers required their service suppliers to meet with the manufacturers to resolve issues.

The actors showed similarities in how they influenced the indirect link. Freightier (Case 2) exerted control and coordination on the indirect link through Truck (manufacturer), while in Case 1, Processer exerted influence through both Industrializer and Repairer. In Case 3, Defender influenced the indirect link through both MR&O and Subsystem. In all the cases, the actors influenced the indirect link through another mediator. When the actors had to exert influence on an indirect link, they selected another mediator which created a greater influence on the indirect link. From this we derive the third and the fourth proposition, that go as follows:

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P₃: In a service triad, one, of the two or three mediators, is always the customer.

P₄: To control and coordinate an indirect link, the customer will always prefer to go through another mediator.

Context and the adoption of the mediator's role. Using solutions created a risk for the customers in the three cases, because those were used in their core operations. A possible solution failure could have caused expensive downtime and the need to invest in new equipment or to repair existing equipment. These risks varied from case to case, and the customers utilized different risk mitigation techniques. In Case 2, the customer's risk exposure was limited as they had substitutable resources (i.e., other commercial vehicles) that could be accessed in case of a solution failure. By hiring a commercial vehicle in the short-term, the risk of solution failure could be effectively mitigated. The customers in Cases 1 and 3 did not have access to substitutable resources and alternative offerings, as these assets were unique and customized for them. This was the first identified means of risk mitigation—*substitutability*.

In Case 3, the customer had attempted to exert control through contractually specified sanctions (cf. van der Valk & van Iwaarden, 2011) on the system integrator that would make up for the financial losses of the customer in case of a solution failure. The second means of risk mitigation in the cases is through *control*. Finally, taking an active role in *controlling and coordinating the triadic interactions* was identified as the third type of risk mitigation, which was present when the other two means were not. This occurred in Case 3 where Subsystem actively sought out information from the other actors in the triad to proactively respond to demand.

One of the mediators was the customer. Moreover, interdependence and asset specificity required at least one other actor in the triad to become a mediator. This was to gain transparency

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on the performance and relationships within the triad for the better coordination of activities. In case 1, the other mediator was Truck (manufacturer and integrator) and in Case 3 it was Subsystem, who was MR&O's (integrator) supplier. The integrator in Case 3 was passive in managing the indirect link despite the potential contractual sanctions if the solution failed. Common to both of these triads was that other risk mitigation measures were in place—this being immediate solution substitutes (Case 2) and control through contractual safeguards (Case 3). We posit that because these mechanisms were in place, there was perceived to be less need for influencing the indirect link. Thus, two actors in Cases 2 and 3 assumed the mediator role, while in Case 1 all three served as mediators. Based on this analysis, we propose the following:

P_{5a}: When operational risk is high, there are no immediate substitutes and the exertion of control through contractual safeguards is not present, all three nodes in the triad will act as mediators.

P_{5b}: When operational risk is low, there are immediate substitutes or control through contractual safeguards can be exerted, two nodes in the triad will act as mediators.

In Cases 2 and 3, the solution integrator was a mediator. In Case 3, the integrator was not a mediator, which was a result of changes within the relationship. All companies in Case 3 were involved in the triad for a long time and had shared strategic information. However, the situation had changed within the past few years when Subsystem (manufacturer) redesigned their product. This significantly reduced service needs and reduced the sales of MR&O (integrator) to Defender for part of the solution. This reduced trust and interaction between the parties. The integrator also had employed a large number of Defender's employees as they transferred across to MR&O when the deal was signed. These employees found it difficult to adapt to the

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commercial realm of MR&O and exhibited a passive behavior toward controlling and coordinating relationships. The relationships between the parties in Case 3 were not good, and there was considerable strain between Defender and MR&O. Conversely, Subsystem had a good relationship with Defender. Because of this, it was the manufacturer (Subsystem) instead of the integrator (MR&O) who assumed responsibility for coordinating the delivery of the solution and became the other mediator in the triad. Accordingly, we propose the following:

P₆: The other mediator will be the actor with whom the customer has the closest relationship.

Control and coordination of the indirect link. There were between-case differences in the way in which the indirect links were controlled and coordinated by customers. All three customers influenced the indirect link, but some were more active than others. The customers in Cases 2 (Freighter) and 3 (Defender) were passive and only actively influenced the indirect link when matters arose (see Table 3), a control mechanism through controlling the actions of other actors within the triad (cf. Chenhall, 2003). They delegated the management of the triad to another actor, Truck (manufacturer and integrator) in Case 2 and Subsystem (manufacturer) in Case 3. In both cases, the party to whom management of the triad was delegated was also a mediator. Thus, both Truck and Subsystem also exerted relational influences on the indirect link. In contrast, the customer in Case 2 (Processor) retained coordination responsibilities to stay in control of longer-term developments. Processor saw active coordination through joint decision-making and feedback as crucial for mitigating its risk exposure, which was significant due to downtime costs and a lack of both immediate resource substitutability and contractual safeguards. Cases 2 and 3 were different as the customers had mitigated their risk exposure through different means—

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resource substitution in Case 2 and contractual safeguards in Case 3. Because of this risk mitigation, the customers felt comfortable adopting more passive roles, where another mediator performed the majority of the ongoing relationship management tasks in their triads. They did not have a similar need for proactivity as Processer and wanted to focus on their efforts. Figure 7 shows the differences in context, actors, roles, and behavior in controlling and coordinating service triads. Based upon this, we propose the following:

P_{7a}: When operational risk is low or there are either contractual safeguards in place or immediate substitutes available for the solution, the customer relies on another mediator to coordinate the triad but does not relinquish control completely.

P_{7b}: When operational risk is high and there are neither immediate substitutes nor contractual safeguards available for the solution, the customer retains the ongoing control and coordination of the triad.

DISCUSSION AND CONCLUSIONS

Mismanagement of service triads can lead to serious relationship and performance related issues for all involved actors – a manufacturer, a customer, and a service supplier. While our knowledge on control and coordination is well developed in dyads, in service triads is at best scarce and incomplete. By using an inductive theory-building approach, which relied on data from nine companies, forming three service triads, we developed a mid-range theory of control and coordination in service triads. With this we make an important theoretical and practical contribution to the network literature in OSCM. Researchers, to date, have focused almost exclusively upon control in triads (cf. Li & Choi, 2009; Van der Valk & Van Iwaarden, 2011).

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Our study uncovered, however, that while control is necessary, both, in direct and indirect links of a service triad, on its own is not enough for the ongoing effective ‘functioning’ of service triads. Both, control *and* coordination mechanisms, are necessary as there may be a passive actor within the triad that is still perceived to be powerful (i.e. Defender in Case 3) but not engaged in the control and coordination of the triad. This means that coordination is shared between multiple actors and it is context dependent. Moreover, in transitive service triads the performance of the collective is dependent on individual actors bonding together, which is why we see mediators rather than bridges, as for example in the work of Li and Choi, (2009). While the mediator displays traits of retaining individual control through interaction with and monitoring of the other two actors and the indirect relationship between them, it simultaneously uses coordination through information sharing and mutual adjustment. The main concern of the mediator is a risk of individual *and* collective failure due to the performance interdependence between the three actors.

Our mid-range theory stems from these critical observations. In Figure 7 we summate the empirical propositions from which the theoretical framework of control and coordination in service triads was developed. The theory captures control and coordination in service triads around four key areas: 1) How many mediators control and coordinates in a service triad; 2) who in a service triad acts as a mediator; 3) how control and coordination is performed, and; 4) what contextual factors affect the first three areas.

----- Insert Figure 7 about here -----

The first key area addressed is the contingent nature of control and coordination in service triads. This is an important insight as to the best of our knowledge, no studies of service

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triads to date (e.g. Li and Choi, 2009; Van der Valk & Van Iwaarden, 2011; Van Iwaarden & Van der Valk, 2013), have explored the relationship between the context and control and/or coordination in service triads. We identified four contextual factors: customer's exposure to business and operational risk due to potential failure of the offering (i.e. solution); the offering's immediate substitutability; the absence or presence of contractual safeguards, and relationship closeness with the customer. These factors affect all three remaining areas of our theory – i.e. the number of mediators in a service triad, who in a service triad acts as a mediator as well as how is control and coordination performed.

The extant literature on control and coordination in service triads focuses on one actor; a service outsourcer (e.g., Li & Choi, 2009) or solution integrator (Van der Valk & Van Iwaarden, 2011; Bastl et al., 2012; Van Iwaarden & Van der Valk, 2013; Finne & Holmström, 2013; Karatzas et al., 2016). By broadening the empirical focus in this study, from a single actor, to all three actors and their relationships in a triad, we uncovered that control and coordination is a shared responsibility of two or three actors, depending on the context, usually involving the manufacturer and the customer. For example, when the customer's exposure to risk is low, and immediate substitutability of the offering on the supply market is high, the intensity of a customer's efforts in coordinating the triad decreases, and the primary manufacturer carries a more prominent role (i.e. Case 2). However, in situations of high-risk exposure and low substitutability of the offering combined with the absence of contractual safeguards, all three actors—the customer, the manufacturer, and the service supplier—adopt the role of mediators (i.e. Case 1).

Furthermore, we uncovered that the customers' role specifically, transcends the role of providing inputs to the service production process (cf. Sampson, 2000; Sampson & Froehle,

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2006) toward a much more complex role involving coordinating the interaction with manufacturers and service suppliers as well as monitoring and mediating in direct and indirect relationships. While the customer always acts as a mediator in a service triad, it is the relationship closeness between the customer and either, the manufacturer or the service supplier, that dictates who will be the second mediator in the context of low operational risk, available alternatives and presence of contractual safeguards. Not only is the role of the customer much more complex than previously thought, we also found that customers never relinquish control in a service triad. The retention of this role allows the customer, as well as any other actor in the service triad, to maintain triad-level visibility, control and coordination over the provision of the customer offering from the two triadic actors, the early detection of potential issues in direct and indirect relationships, and the ability to influence the behavior of individual actors. In addition, we showed that in situations, when only two actors act as mediators, the customer will prefer to exert the control and coordination via another mediator.

Lastly, the extant literature on management of transitive triads frequently depicts that an actor (i.e. a node) in a triad (e.g. the manufacturer) exerts the control, (Li and Choi, 2009) or manages the indirect link (Choi & Wu, 2009a, b) by directly influencing the indirect link (e.g. the relationship between the service supplier and the customer). In this way the managing actor somewhat bypasses' the two connected actors, suggesting the nodes and the link between them are separate. We propose a refinement of this logic and posit that any indirect link is controlled and coordinated via a connected node, because the two – the node and the link are inseparable and in order to control and coordinate in the indirect link, one has to control and coordinate behavior of a node displayed in this indirect link. For example, the manufacturer has to control

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behavior and coordinate actions of the service supplier, which service supplier then displays in the relationship towards the customer.

Our study also has important practical implications. Manufacturers who are transitioning from manufacturing outsourcing models to service-based ones should adopt the role of mediators. The adoption of this role will likely require a mindset shift from the traditional self-interest role seen often in manufacturing outsourcing models to a more shared and system-oriented one, where management is not only focused on the *performance-of-self* but also on the *performance-of-all* (i.e. a *Tertius Iungens* orientation). Moreover, we indicate to managers that the effective control and coordination of service triads requires action to influence both direct and indirect relationships. Indirect relational influences matter for all actors in the triad. By understanding and influencing the indirect links, managers can reduce the amount of information asymmetry, leading to reduced risk on one side as well as improved performance on the other. Lastly, managers should be aware that the approach to the control and coordination of service triads is not contingency free. In fact, the identified contingency factors will shape the needs and expectations from all three actors—the customer, the manufacturer, and the service supplier—on how and to what extent they are going to be involved in the triadic interactions.

Limitations and Directions for Further Research

Our study is not without limitations. As we adopted a theory-building approach, there is reduced testing of external validity, leading to limited generalizability. Further research can move from theory building to theory testing as we have developed the foundations for further development (cf. Dyer & Wilkins, 1991). Next, we framed service triads and subsequently selected cases as transitive in which all three actors are connected through relationships and

where significant bi-directional exchange is taking place. In this way, we excluded service triads involving the provision of mixed services or quasi-manufacturing services (Chase, 1981). Lastly, given that we developed our mid-range theory on the smallest unit of network – i.e. a triad, a natural extension of this work would be to test and refine our propositions on a larger network. In this way we would gain important insights which key areas of our theory hold as the complexity of a supply network grows and which don't.

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TABLE 1

Mechanisms for exerting control and coordination in inter-organizational relationships

Control	Exerted through: structural position (Li & Choi, 2009), contracts (Van der Valk & Van Iwaarden, 2011; Van Iwaarden & Van der Valk, 2013), power (Handley & Benton Jr., 2012a; 2012b), information monitoring (Handley & Benton Jr., 2012b), operating procedures, action and diagnostic controls (Chenhall, 2003)
Coordination	Exerted through: information sharing (Sahin & Robinson, 2005), mutual adjustment (Nassimbeni, 1998), decision-making and feedback mechanisms (Gulati et al. 2012)

TABLE 2**Case Participants and Interview Details**

Cases	Company [confidential alias]	Participants		No. of interviews
		Business functions	Seniority	
Case 1	Customer [Processor]	Purchasing (1) Technical department (2) Repair and maintenance (2)	Top management (2) Middle management (3)	5
	Service supplier [Repairer]	Key account—sales (1) Project management (2) Service and spare parts (1)	Top management (1) Middle management (3)	4
	Manufacturer [Industrializer]	Manufacturing (1) Key account—sales (1) Customer support (1)	Top management (1) Middle management (2)	3
Case 2	Customer [Freighter]	Head office (1) Purchasing (1)	Top management (1) Middle management (1)	2
	Service Supplier [Mechanic]	Head office (1) Customer service (1) Repair and maintenance (1)	Top management (1) Middle management (1) Operations (1)	3
	Manufacturer [Truck]	Key account—sales (3) Key account—aftermarket (1) Service design (1) Repair and maintenance (1) Customer service (1)	Top management (3) Middle management (4)	7
Case 3	Customer [Defender]	Purchasing (1) Project management (1)	Middle management (2)	2
	Service supplier [MR&O]	Supply chain management (1) Project management (3)	Top management (3) Middle management (1)	4
	Manufacturer [Subsystem]	Head office (1) Key account—sales and customer support (1) Supply chain management (1)	Top management (1) Middle management (2)	3
			Total:	33

TABLE 3
Case 1 - Contextual Factors and Control and Coordination Examples in Direct and Indirect Links

	Case 1 (Processor – Customer, Industrializer – Manufacturer, Repairer – Service Supplier)						
Contextual factors that shaped control and coordination dynamics		Control and Coordination in direct links			Control and Coordination in indirect links		
		Customer's actions	Manufacturer's actions	Service supplier's actions	Customer's actions	Manufacturer's actions	Service supplier's actions
<p>1. Customer's risk exposure due to the solution failure:</p> <ul style="list-style-type: none">• High—Processor's production downtime costs ranging from \$19,500-26,000 per hour. <p>2. Immediate substitutability of the offering:</p> <ul style="list-style-type: none">• Low—due to technological complexity of the asset and specialized knowledge required from Repairer. <p>3. Contractual safeguards:</p> <ul style="list-style-type: none">• Processor did not devise explicit contractual safeguards that would have offset the potential damage of the offering failure. <p>4. Relationship closeness:</p> <ul style="list-style-type: none">• Processor-Repairer: Long-term, cooperative relationship, frequent sharing of strategic and operational information.• Processor-Industrializer: Long-term, cooperative, occasional sharing of operational and tactical information.• Industrializer-Repairer: Long-term, cooperative, frequent sharing of strategic and operational information.	Control mechanisms	<ul style="list-style-type: none">• Processor measures Industrializer's performance of spare parts delivery on the ongoing basis.• Processor measures service level performance of Repairer.• Processor and Repairer jointly agree contractual terms on solution delivery.	<ul style="list-style-type: none">• Industrializer provides training on new product functionalities and maintenance for Repairer's engineers.• Industrializer and Repairer jointly agree contractual terms on solution delivery.	<ul style="list-style-type: none">• Repairer sets performance targets to Industrializer in response to availability agreement with the Processor.• Repairer provides maintenance training for Processor service engineers.	<ul style="list-style-type: none">• Processor developed proactive and ongoing review meetings with Industrializer and Repairer to discuss past performance, future plans, and encourage continuous improvement.• Processor got involved in joint problem resolution between Industrializer and Repairer on "as-needed" basis.	<ul style="list-style-type: none">• Industrializer requested from Repairer information on customer needs and installed equipment to enable process improvements toward Processor.• Industrializer provided information on spare parts and service processes to Repairer to inform contract design between Repairer and Processor.	<ul style="list-style-type: none">• Repairer involved Industrializer in business set-up activities, such as process and infrastructure set-up as a response to Processor's requirements.
	Coordination mechanisms	<ul style="list-style-type: none">• Processor requests from Repairer resolution of malfunctioning equipment on ad-hoc basis.• Processor arranges maintenance planning meetings together with Industrializer.• Processor requests deliveries from Industrializer.	<ul style="list-style-type: none">• Industrializer seeks feedback from Repairer on service delivery performance towards Processor.• Industrializer provides expertise on its products to Repairer to help resolving equipment malfunctioning at Processor.		<ul style="list-style-type: none">• Processor developed proactive and ongoing review meetings with Industrializer and Repairer to discuss past performance, future plans, and encourage continuous improvement.	<ul style="list-style-type: none">• Industrializer participated in issue resolution between Repairer and Processor.	<ul style="list-style-type: none">• Repairer participated in joint problem resolution between Processor and Industrializer.• Repairer involved Industrializer in equipment repair at Processor's site, when knowledge required to rectify an issue exceeded Repairer's and Processor's engineering expertise.• Repairer intervenes in the relationship between Industrializer and Processor to ensure customer satisfaction.

TABLE 4:
Case 2 - Contextual Factors and Control and Coordination Examples in Direct and Indirect Links

	Case 2 (Freighter – Customer, Truck – Manufacturer, Mechanic – Service Supplier)						
Contextual factors that shaped control and coordination dynamic		Control and Coordination in direct links			Control and Coordination in indirect links		
		Customer's actions	Manufacturer's actions	Service supplier's actions	Customer's actions	Manufacturer's actions	Service supplier's actions
1. Customer's risk exposure due to the solution failure: <ul style="list-style-type: none"> • Medium—in the case of short-term issues. • Low—in the case of long-term issues. 2. Immediate substitutability of solution: <ul style="list-style-type: none"> • High—substitution possible via alternative service suppliers or from within Freighter's own fleet. 	Control mechanisms	<ul style="list-style-type: none"> • Freighter and Mechanic jointly agree performance requirements for solution delivery. • Freighter requests Mechanic to comply with requirements for maintenance processes and procedures and adjusts them accordingly. 	<ul style="list-style-type: none"> • Truck and Freighter jointly agree contractual terms on solution delivery. • Truck and Mechanic jointly agree contractual terms around solution delivery. 	<ul style="list-style-type: none"> • Mechanic is measuring its own performance on service delivery by collecting performance data internally and from the Freighter. 	<ul style="list-style-type: none"> • Freighter developed ad-hoc, reactive approach to issue resolution between Truck and Mechanic. 	<ul style="list-style-type: none"> • Truck prescribed specifications and procedures for Mechanic's service delivery toward Freighter. • Truck continuously monitored service performance of Mechanic toward Freighter. 	<ul style="list-style-type: none"> • No control or coordination exerted in the indirect link.

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<p>3. Contractual safeguards:</p> <ul style="list-style-type: none"> • Truck contractually responsible to Freighter for the achievement of Mechanic's performance targets. <p>4. Relationship closeness:</p> <ul style="list-style-type: none"> • Freighter-Truck: Long-term, cooperative relationship, occasional sharing of strategic information. • Freighter-Mechanic: Long-term, cooperative, frequent sharing of operational and tactical information. • Truck-Mechanic: Long-term, cooperative, frequent sharing of strategic and operational information. 	<p>Coordination mechanisms</p>		<ul style="list-style-type: none"> • Truck ongoingly discusses business issues with Mechanic that pertain to Truck-Mechanic dyad. 	<ul style="list-style-type: none"> • Mechanic solves problems with Freighter in case of sub-optimal service delivery. 		<ul style="list-style-type: none"> • Truck interacted with Mechanic to address occasional issues related to service delivery sub-performance. • Truck held tri-partite meetings when issues exceed Mechanic's resolution authority. 	
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TABLE 5
Case 3 - Contextual Factors and Control and Coordination Examples in Direct and Indirect Links

	Case 3 (Defender – Customer, Subsystem – Manufacturer, M&RO – Service Supplier)						
Contextual factors that shaped control and coordination dynamic		Control and Coordination in direct links			Control and Coordination in indirect links		
		Customer's actions	Manufacturer's actions	Service supplier's actions	Customer's actions	Manufacturer's actions	Service supplier's actions
1. Customer's risk exposure due to the solution failure: <ul style="list-style-type: none"> High—on the “critical path”. Liquidated damages of \$150,000 per day for late return of asset to service. 2. Immediate substitutability of offering: <ul style="list-style-type: none"> Low—due to uniqueness of Subsystem's products and MR&O's services. 3. Contractual safeguards: <ul style="list-style-type: none"> MR&O is contractually obliged for delivery of integrated solution. Significant liquidated 	Control mechanisms	<ul style="list-style-type: none"> Defender requests from M&RO to deliver service. Defender monitors M&RO performance Defender requests equipment and service delivery from Subsystem 	<ul style="list-style-type: none"> Subsystem and Defender jointly agree contractual terms on asset delivery. Subsystem talks regularly with Defender to monitor status and demand. 	<ul style="list-style-type: none"> M&RO requests from Subsystem delivery of equipment and service. M&RO orders equipment and services from Subsystem. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Subsystem encourages MR&O to request from Defender to place orders. 	<ul style="list-style-type: none"> No control or coordination exerted in the indirect link.

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<p>damages could be claimed by Defender in case of failed solution delivery.</p> <p>4. Relationship closeness:</p> <ul style="list-style-type: none"> Defender-MR&O: Long-term, strained relationship, limited sharing of strategic information. Defender-Subsystem: Long-term, somewhat cooperative, frequent sharing of strategic and operational information. Subsystem-MR&O: long-term, somewhat cooperative, frequent sharing of tactical and strategic information. 	Coordination mechanisms		<ul style="list-style-type: none"> Subsystem assists M&RO with relational or performance issues. Subsystem requires information disclosure from service supplier to gain demand visibility 	•	<ul style="list-style-type: none"> Defender adopts ad-hoc, reactive approach to issue resolution between Subsystem and MR&O. 	<ul style="list-style-type: none"> Subsystem takes over the role of the solution delivery coordination. It communicates with Defender and MR&O in order to understand the nature of demand and to ensure that information is shared between all members of the triad. 	•
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FIGURE 1
Case 1 - Flows and Contractual Agreements

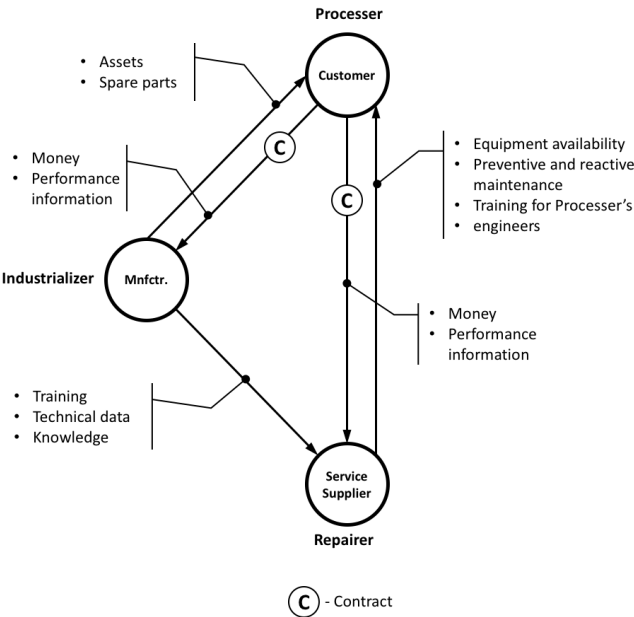


FIGURE 2

Case 1 - Control and Coordination Paths Among the Service Triad Actors

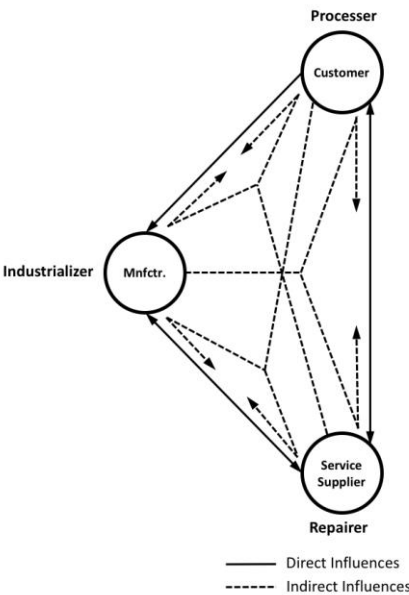


FIGURE 3

Case 2 - Flows and Contractual Agreements

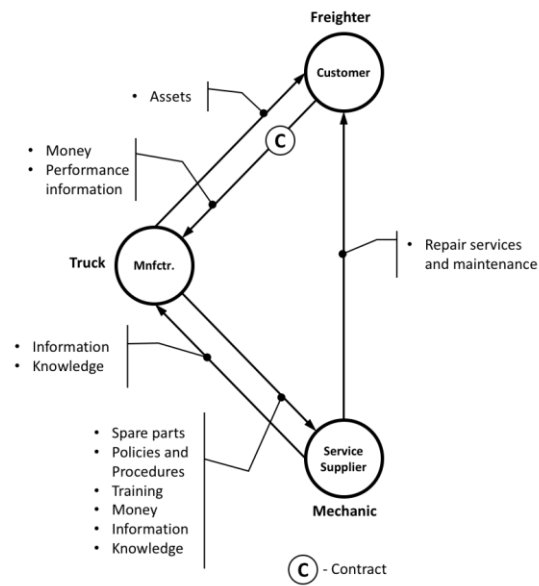


FIGURE 4

Case 2 - Control and Coordination Paths Among the Service Triad Actors

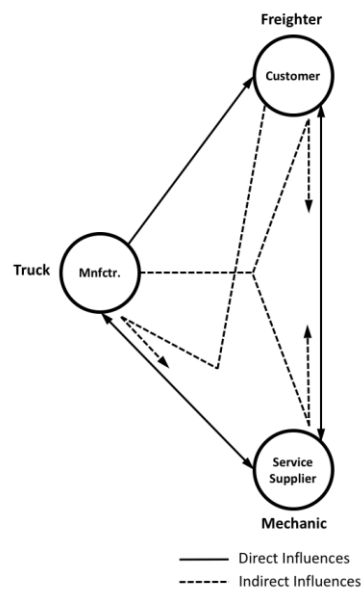


FIGURE 5

Case 3 - Flows and Contractual Agreements

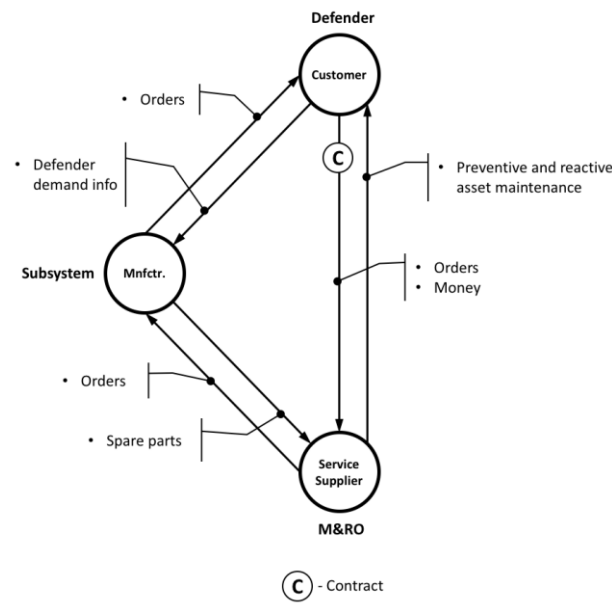


FIGURE 6

Case 3 – Control and Coordination Paths Among the Service Triad Actors

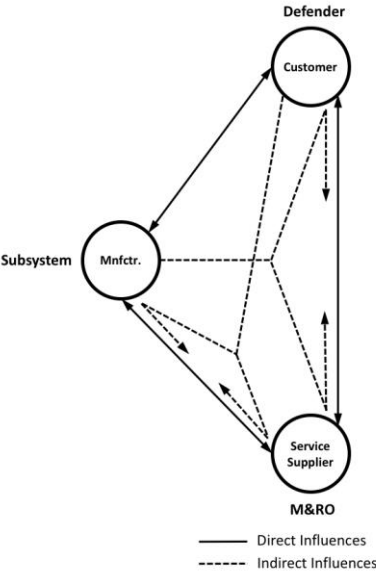


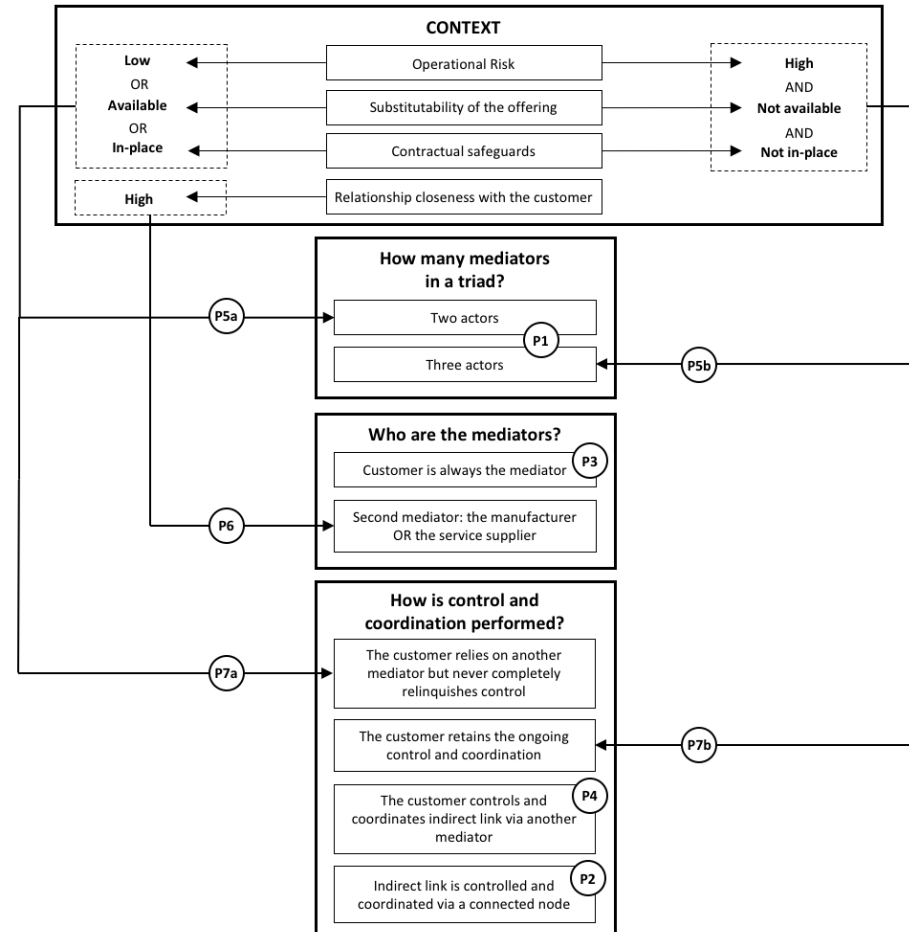
FIGURE 7

A summary of propositions and the theoretical framework of control and coordination in service triads

LIST OF PROPOSITIONS

- P1:** Service triads can have two or more mediators that act for the benefit of the triad.
- P2:** The control and coordination of an indirect link always occurs via a connected node because the node and the link are inseparable.
- P3:** In a service triad, one, of the two or three mediators, is always the customer.
- P4:** To control and coordinate an indirect link, the customer will always prefer to go through another mediator.
- P5a:** When operational risk is high, there are no immediate substitutes and the exertion of control through contractual safeguards is not present, all three nodes in the triad will act as mediators.
- P5b:** When operational risk is low, there are immediate substitutes or control through contractual safeguards can be exerted, two nodes in the triad will act as mediators.
- P6:** The other mediator will be the actor with whom the customer has the closest relationship.
- P7a:** When operational risk is low or there are either contractual safeguards in place or immediate substitutes available for the solution, the customer relies on another mediator to coordinate the triad but does not relinquish control completely.
- P7b:** When operational risk is high and there are neither immediate substitutes nor contractual safeguards available for the solution, the customer retains the ongoing control and coordination of the triad.

THEORETICAL FRAMEWORK



APPENDIX A

Exemplary Quotes and Codes

TABLE A-1

Overview of Exemplary Quotes and Their Relationship with Focused Codes

Indicative quotes →	Open codes →	Focused codes
<p>“The reason why we made this service agreement with [Repairer] was based to acknowledge that we had too often shutdowns based by [Industrializer’s equipment]. [...] And we saw after the several years that we have to do something more organized system for the [equipment]. [...] During that time when we with our own staff started to keep them running. But we didn’t have enough time [...]” (Head of Process Automation, Processer)</p> <p>“You tend to find a lot of owner/operators, they only concentrate on one thing and that’s the cost of ownership of that vehicle, what it costs and what they’re making. [...] And you find a lot of the problems with that are generated around vehicles that are not dealer maintained. You tend to find a lot of the drivers that maintain their own vehicles, they’ll only come to a dealership when they’ve got a specific problem that they can’t fix.” (Regional Manager, Freightier)</p>	Customer Strategic Objectives	Influencing Context
<p>“Service and repair support for their vehicles. [...] Yes, they offer, any customer in fact a number of different services but we need to make sure that we are, if you like, fully ready to support that product by investment in staff and training and knowledge and then really I suppose what customers’ expectations are as well, so it is very much a symbiotic relationship where we work in harmony or try to at least to provide a top level service so that the customer will buy [Truck] and continue to buy [Truck].” (Managing Director, Mechanic)</p> <p>“Annual maintenance of the [equipment]. If there’s needed only inspections we have just treated them and we have maintenance schedule. [...] There can be only an inspection or if there’s needed then we’ll change components, ageing components, predefined component sets called [preventive maintenance] kits. [...] And for the each year each [piece of equipment] has a thing that needs to be done during that year.” (Project Engineer, Repairer)</p>	Content of Exchange	
<p>“[...] we just finally found out that it’s easier to keep everything to [Repairer] and we started to negotiate with them what they can offer. [Repairer] staff came in and they introduce trade service system, what kind of system they have, what kind of planning they have, and how they can do it. [...] So [Repairer] spent here plenty of time opening all the cabinets and evaluate what kind of price there is and then they took out the serial numbers so they could nowadays evaluate exactly in which cabinet is what [piece of equipment].” (Head of Process Automation, Processer)</p> <p>“About 15 years ago [Subsystem] proactively engaged [Defender] with a view to trying to get our products specified, specifically fittings. One of the key systems that the design authorities look after is the [MR&O’s] system on [Defender’s equipment]. It’s fair to say the [Subsystem’s] system is a critical system [...]” (Business Development Manager, Subsystem)</p>	History	
<p>“We can assist them with it. We obviously can’t dictate to them, to say that you must do this, you must do more nights, because if they don’t do that facility, then... and it isn’t cost effective, they won’t do it. But hopefully we can say that look, this is what [Freightier], as a customer demand, what can you and what can’t you achieve that.” (After-market Account Manager, Truck)</p>	Information sharing – in a direct link	
<p>“Because we have this service and preventative maintenance agreement with them [Repairer], we have two meetings annually. So, the first meeting we always have in springtime where we think what kind of overhaul and preventative maintenance they are going to manage during our summer shutdown because every summer we stop production for two, three weeks.” (Head of Process Automation, Processer)</p>	Information sharing – in a direct link	Coordination mechanisms in a direct link
<p>“An example again, so now you are going to [Processer] and in this case there is [a Repairer] service engineer in [Processer], he is working in the factory, for example in the [Processer] factory. And then he says, ‘Oh I need</p>	Decision making and feedback in indirect link	

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something very quickly.' [...] He might call me directly and then he says what is the problem and what is needed. I'll check from the SAP quickly, do we have that and what solutions we could offer to him and what is the delivery time and then I can work directly with our customer service people who are handling the [local] service and then we can put the material on its way and they can handle the order later." (Head of Supply of Electrical Equipment, Industrializer) (Decision making and feedback leading to mutual adjustment (coordination))		Coordination mechanisms in an indirect link
"On day to day issues, things like that, [Mechanic] know they could speak to us [Truck] and we would support them in whichever way we needed to. Sometimes Steve [from Truck] will make a commercial decision to cover the cost of a repair because it's not really under contract and it's not ... [Freighter] don't want to be and it's certainly not [Mechanic's] problem. So sometimes Steve would step in and to support the overall relationship he would take that small problem away." (Key Account Manager, Truck)	Mutual adjustment in an indirect link	
"The only incentives are through the parts target which if we reach a purchase target from [Truck], we get a rebate and the monetary rewards through the UTP scheme which in our size dealership, that's worth about 100,000 pounds a year Sterling, which is a fair chunk of money." (Head of Service and Repair, Mechanic)	Formal contracts – in a direct link	Control mechanisms in a direct link
"[...] within that book of reference with specific regard to our kit, it says anyone undertaking work with our kit must go through a certified [Subsystem's] installer's course. So, I actually work with the [Defender] to write that specification into the BR, so typically the work package will come with that caveat, so when [MR&O] are quoting for that work package they must come to us and ask us to quote for the training aspect of it as well." (Business Development Manager, Subsystem)	Action control in indirect link	Control mechanisms in an indirect link