NETWORK DYNAMICS IN SOLUTION BUSINESS: STAGES OF RELATIONSHIP AMONG FIRMS

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Abstract
Integrated solutions (Davies el al, 2006; Windahl et al, 2004) can be described as a customized and integrated combination of goods and services for meeting a customer's business needs. Some demonstrate, however, that it is necessary to go beyond the dyads/focal networks perspective to incorporate a market-based approach to marketing solutions: "A solution situation is not a buyer-seller dyadic 'island'. It is multi-partite and not isolated from the 'rest' of the market" (Spencer and Cova, 2012, p.12). The aim of this paper is to investigate the network dynamics in solution business and to propose a phase model for the stages of relationship among firms for the provision of solutions over time. Considering a triad as the smallest unit that captures the essence of a network (Choi and Wu, 2009), we develop in this paper the analysis of solution triads in the aerospace industry resulting from a solution selling approach. We consider triads of actors involved as the buyer, the supplier and the buyer's customer. The dynamics at play are not those of a triad taken individually, but

rather those *between* triads, taken from the perspective of a solution business integrated approach and that form what we name here a "solution triad set". An aircraft Manufacturer was selected as common triadic actor in all cases, while serving as key informant, to facilitate comparison of the dynamics across the triads identified. A total of ten solution triads were identified. Qualitative and exploratory research was developed and data were collected through visits and in-depth interviews with managers. For the evolution of relationships in solution business, five-phases were identified: 1) Preliminary development of dyadic relationships; 2) Establishment of the triad; 3) Development of Basic Relations; 4) Relationship for value co-creation; and 5) Dissolution. Concepts of power, trust and commitment are discussed for understanding the relationship dynamics. The notion of a continuum of levels of interest for value co-creation, commitment and trust are presented as factors of influence conditioning the evolution and sequencing of relations for the provision of solutions over time.

Keywords: Network dynamics; Solution business, Solution triad; aerospace industry; complex engineering service system.

INTRODUCTION

The evolution on the goods-services continuum is particularly true for complex engineering products that require complex engineering capabilities to support their design, construction, operation and maintenance, i.e. complex engineering service systems which provide integrated systems, as solutions, for the customer (Davies et al, 2007). However, considering that a solution is a multi-partite and not isolated from the 'rest' of the market" situation (Spencer and Cova, 2012, p.12), in the context of complex engineering product, some questions emerge: How is the network dynamics among firms for the provision of solution over time? Can phases of evolution for the relationships among these firms in a network be identified? What relationship dynamics are at play for the provision of solutions in complex engineering service systems? In an effort to provide answers to these questions the aim of the research presented here is to investigate the network dynamics in solution business and to propose a phase model for the stages of relationship among firms for the provision of solutions over time, partly building on previous literature which focused on the dyad i.e. Buyer-Seller relationships (Dwyer et al 1987; Ford 1982). A qualitative and exploratory research process was adopted using a multiple case study approach, considering the triadic interface between firms in the aerospace industry as the unit of analysis. A total of ten service triads were identified, covering a diversity of cases: new and recent triads, mature and old triads, terminated triads, problematic triads, and successful triads. Data were collected through visits and in-depth interviews with managers of all members of each triad, allowing the perceptions of the different members of the triad to be taken into account. Secondary documentary elements, such as technical publications and company reports, were also analyzed.

The paper first of all presents a theoretical review on solutions in complex engineering service systems. This is followed by a review of the literature demonstrating the pertinence of a triadic perspective for a better understanding of the complexity of relationships between firms in complex engineering service systems. This is completed by a rundown on existing literature about inter-firm relationships processes between firms with a focus on triads. The results of the case studies are then presented and discussed collectively,

with preliminary findings being discussed. Subsequent content analysis of the cases is then performed with a phase model perspective in view. Proposals are subsequently made regarding the nature and characteristics of triad dynamics: in this instance, the notion of phase model – given the number of actors and relationships involved – rather evokes changes in state than some sort of inevitable linear progression. The article hence contributes to the growing body of literature on empirical and practical aspects about the provision of solutions in business to business networks from a dynamic perspective.

2. SOLUTIONS IN BUSINESS TO BUSINESS NETWORKS

Aerospace and defence systems (Kapletia and Probert, 2010), transportation systems, medical equipment, power plants and office buildings are typical examples of complex engineering service systems which provide integrated systems (as solutions) for the customer (Davies et al, 2007). According to Kapletia and Probert (2010), the concept of solution can be used to describe product-service complex offerings. Solutions refer essentially (Nordin and Kowalkowski, 2010) to an offering that incorporates a number of integrated services into the customer's value chain and that forms a non-dissociable whole. In addition, Kapletia and Probert (2010) research suggests that the effectiveness of a solution or a "solutioning system" depends not only on supplier variables but also on several customer variables. Supplier variables include contingent hierarchy, documentation emphasis, incentive externality, customer interaction stability, and process articulation. Customer variables include adaptiveness to supplier offerings and political and operational counselling that a customer provides to a supplier (Kapletia and Probert, 2010). As a consequence, we acknowledge the idea that solutions are co-created by a customer and a supplier and cover all aspects of the relationship (commercial, operational and financial). For Cornet et al. (2000, p. 2) solutions "are customized in one or more of the following aspects: design, assembly, delivery, operation or pricing (….) solutions involve the supplier taking managed risks and therefore often include performance and/or risk based contracts".

Thus, solutions represent the type of value proposition which best marries the evolution towards improved integration into the value chain and increased coordination among the elements which go to make up the offering. The first point is related to the content of offerings and more particularly the service dimension of offerings. This point stresses the degree of integration of the offering within the customer's value chain. Customers expect a solution to include processes directed at understanding their requirements, customizing and integrating products, deploying them, and supporting them on an ongoing basis (Oliva and Kallenberg, 2003; Tuli et al, 2007). The latter point deals with the combination of the elements which make up these offerings. This point concerns more specifically the degree of coordination of these elements with each other, giving rise to a unique and non-dissociable whole (Davies et al, 2007). However, Spencer and Cova (2012) argue that the literature about solutions still neglects issues related to longer-term and broader-scope market dynamics. For the authors, it's necessary to go beyond the dyads/focal networks perspective to incorporate a market-based approach to solutions marketing. Solution marketing is a process of co-creation involving multiple actors, who indeed veritably shape, and are themselves in return shaped by the markets and the networks that they engage in. For Ferreira et al (2013), in the case of solutions, there is an intricate real-time intertwining of business models between all actors directly involved in the solution network.

Work by Helander and Möller (2007) and Cova and Salle (2008a, 2008b) place the emphasis on the fact that value co-creation for complex engineering systems can only be understood via consideration of network mobilization. Helander and Möller (2007) affirm that a system supplier's customer strategy is closely related to its roles for the customer. The

key activities are described as links between supplier and customer, and the coordination mechanisms are presented as a horizontal continuum across activity links. Moreover, both suppliers and customers may actively use the resources and capabilities of third parties, called "network". The solution provider often needs partners for creating and maintaining the system. According to Helander and Möller (2007), the partner network enables the supplier to focus on activities which are both difficult to standardize and require highly specialized expertise, for instance application and business consulting. "The consistent performance for the customer seems to require from the supplier excellent network management capabilities, both at corporate and account team level (Helander and Möller, 2007, p. 725).

Cova and Salle (2008a, 2008b) contend that creating superior value for customers means mobilizing and servicing actors far beyond the boundaries of the buying center, supply chain, and customer solution net. Drawing on their experience of project marketing and solution selling (Cova et al, 2002) demonstrate the importance for the supplier of combining both upstream and downstream approaches when developing an offering that creates superior value for the customer. Through an upstream approach, the supplier identifies all the actors in the customer network who could be involved in the customer's decision-making process and tries to understand what is at stake for them. Through a downstream approach, the supplier designs the content and the perimeter of an offering in such a way as to customize it according to the stakes for these customer network actors (Cova and Salle, 2008a). But the challenge still is about how to consider the network dynamicity in the provision of solutions among firms. In the next section, we present a discussion about the role of triads for this understanding, as the smallest unit that captures the essence of a network (Choi and Wu, 2009).

3. FOCUSING ON TRIADS FOR THE UNDERSTANDING OF SOLUTIONS

> "A dyad shows how a node affects another node, but it is not able to address how a link may affect another link (…) A triad can be understood as the smallest unit of a network where this occurs." (Choi and Wu, 2009a, p. 263).

The triad is the component that captures the basic essence of a network (Choi and Wu, 2009a,b) and allows us to study the behavior of a network to understand the complexity of business realities. Once the triad is formed, complexities multiply and take on network characteristics. In a triad, we have a network configuration where a node affects a node (e.g A affecting B or C) and a link affecting a link (AB affecting AC or BC). Certain authors (Wu et al, 2010; Choi and Kim, 2008; Dubois and Fredriksson, 2008; Rossetti and Choi, 2005, 2008; Wu and Choi, 2005) have performed studies presenting different triadic conditions: 1) one buyer interacting with two suppliers; 2) a supplier interacting with an intermediary and an end user; and 3) one supplier interacting with two buyers. Wu and Choi (2005) and Dubois and Fredriksson (2008) considered triads across two tiers of the supply chain. Wu and Choi (2005) have studied supplier–supplier relationships in the triadic context of the buyer–supplier relationship. Dubois and Fredriksson (2008) identified a particular type of sourcing called ''triadic sourcing.'' This sourcing strategy occurs when a buyer works with two suppliers with overlapping capabilities. Rather than imposing a sourcing strategy separately for each supplier, a buyer creates a bundled strategy for two closely-coupled suppliers.

Rossetti and Choi (2005, 2008) investigated a phenomenon that occurs across three tiers of the supply chain (when A is the buyer and B represents the buyer's customer and C the buyer's supplier). In a traditional relationship arrangement, there would be no link between B and C, and A would be in control of the materials and information flow between B

and C. This lack of connection forms a structural hole that can be defined as the lack of connections between agents or groups that are not directly linked together (Burt, 1992). The structural hole concept is closely related to the concept of a bridge (Li and Choi, 2009, p. 29), and agent A spans the structural hole between agent B and agent C and it is in the bridge position, reaping the benefits that come with this position. In a services context, however, the buyer has no choice but to allow a supplier to directly interface with its customer. The loss of the bridge position is called "supply chain disintermediation" (Rossetti and Choi 2005). In this context, the buyer sits between its customer and its supplier, and supply chain disintermediation occurs between the customer and the supplier.

In this paper, as we are considering solutions related to complex engineering products, we decided to focus on triads developed by a supplier (a manufacturer) interacting with an intermediary (a service provider) and an end user (customer), as is called as a service triad (Li and Choi, 2009; Niranjan and Metri, 2008). The dynamics of relationships in service triads has been discussed by Li and Choi (2009). For Li and Choi (2009) a triad of actors is involved in any outsourcing situation. In services, the relationship structures among the three actors change before, during and after the outsourcing. Before outsourcing (i.e., during the contract negotiation stage), the buyer is the ''bridge'' between its supplier and its customer. During implementation, this bridge position begins to ''decay'' as its supplier comes in direct contact with the buyer's customer. After implementation, the bridge position is intended to be ''transferred'' to the supplier. However, if left unmanaged, this state of transferred bridge position has serious performance implications for the buyer. Li and Choi (2009) argue that the buyer should continue to actively interact with its customer and closely monitor the supplier in order to prevent the supplier from solidifying its bridge position.

Triads have received attention, then, including some consideration of dynamics. Very few studies however contribute to an improved understanding of the evolution phases of service triads (Li and Choi, 2009) i.e. a gap in the literature exists regarding possible phases of evolution for relations involving three actors in triads around the provision of solutions. The dynamics of dyadic buyer-seller relationships has been discussed by several authors: Möller and Wilson (1995), Håkansson and Snehota (1993), Dwyer et al (1987) and Ford (1982). Anderson et al (1994) argue, however, that the development of business practices has suggested the need to expand the study of the connections of relationships between companies with their environment. For Anderson et al (1994), a business network is constituted by dyadic business relationships and these, in turn, are reflections of the business network they belong to.

Focusing on the models developed to understand the dynamics of the dyadic relationship development process between buyer and seller, Dwyer et al (1987) presented a five-phase model of relationships evolution: 1) awareness, 2) exploration; 3) expansion; 4) commitment and 5) dissolution. Each phase represents a major transition in how parties consider one another. Ford (1982) characterizes the process of establishment and development of supplier-customer relationships over time based on the variables of experience, uncertainty, distance (including aspects of social, geographical, cultural, technical and time distance), commitment and adaptation. By considering the extent to which each of these variables is present in a supplier-customer relationship, it is suggested that such relationships follow a five-stage evolution process: pre-relationship stage; the early stage; the development stage; the long-term stage; and the final stage/rupture. Thus the development of supplier-customer relationships can be seen as an evolutionary process in terms of the increasing experience of both partners; the reduction in uncertainty and the various kinds of distance in the relationship; the growth of both actual and perceived commitment; formal and informal adaptations, and investment and savings made by both parties (Ford, 1982).

According to both Dwyer et al (1987) and Ford (1982), a buyer-seller relationship seems unlikely to be formed without bilateral communication of wants, issues, inputs and priorities. The buyer and seller assess their mutual investment in the relationship, and consideration of such issues as power and dependency between actors involved inevitably a factor conditioning relationship evolution. Power is the ability to achieve intended effects or goals (Dahl, 1957). The dependence of a party on another is determined, for example, by the dependence on value resources (Emerson, 1962; Thibaut and Kelley, 1959). This dependence can be real or perceived. Exercise of a just power source implies voluntary compliance and behaviors for the promotion of collective goals and may be a crucial distinction for locating a relationship on a continuum between phases. Concerning to expectations development, relational expectations are related to conflicts of interest and the prospects for unity and trouble. In addition, trust is another important concept in understanding expectations for cooperation and planning in a relational contract (Zhang et al, 2011). Trust can be understood as the belief that a party's word or promise is reliable and a party will fulfill its obligations in an exchange relationship (Schurr and Ozanne, 1985; Blau, 1964). These expectations may either enhance or diminish contractual solidarity. The resulting perceptions of goal congruence and cooperativeness lead to levels of satisfaction with the other`s role performance and its associated rewards. Hence, motivation to maintain the relationship increases.

The dynamics of the relationship development process of dyads described above, along with the work by authors such as Wilhelm (2011), Möller and Wilson (1995), Håkansson and Snehota (1993), can provide some clues as to understanding triadic dynamics and evolution dynamicity of a triad. But, according to Choi and Wu (2009a,b), a triadic framework offers supply chain researchers an expanded vocabulary to describe a complex relationship that is absent if they are confined within the one-to-one dyadic discussion. In a sense, "this triadic framework takes us from a two-dimensional space to a three-dimensional world, where every action can potentially take on unintended consequences and new relationship arrangements" (Choi and Wu, 2009a, p. 265). Thus, considering the complexity of relationships between firms in engineering complex service systems and a triad as the key unit of analysis in a business to business network (Van der Valk and Van Iwaarden, 2011), the study aims at contributing to a better understanding about network dynamics for the provision of solutions.

4. METHODOLOGY

Considering that a solution business is multi-partite and depends on a network perspective (Spencer and Cova, 2012), this paper focuses on the understanding about the provision of solutions among firms. This study uses an exploratory design, aimed by developing a phase model for the stages of relationships for the provision of solutions over time. As a triad is the component that captures the basic essence and the behavior of a network (Choi and Wu, 2009a,b), we applied a triadic approach in the selection of the cases for empirical data. The research was developed from the identification of triads in the aerospace industry, considering the business network of EBR, one of major aircraft manufacturing companies in the world. This company (as a focal firm) was regarded as a common point for each triad, allowing the identification of its relationships with service providers and customers. In each triad, we focused the relationship between EBR, as a Manufacturing Firm, a Customer and a Service Provider, as a third part developing mutual relationship. We considered a Service Provider (not a supplier of manufactured goods) to

allow a better illustration for the complexity of service provision in business networks (as better described below).

Considering the interplay between theory, method and empirical phenomena (Dubois and Gibbert, 2010), this article presents a case study analysis (Yin, 2003; Byrne and Ragin, 2009; Ragin, 1992). Case study research (Byrne and Ragin, 2009; Ragin, 1992; Yin, 2003) investigates contemporary phenomena within their real life context and in which multiple sources of evidence are used. For theory building purposes, the use of multiple cases is likely to create more robust and testable theory than single case research. Multiple cases can augment external validity and help guard against observer bias (Eisenhardt and Graebner, 2007; Yin, 2003). Eisenhardt (1989) specifically suggest that in the range of 4–10 cases usually works well. If less than four it may become difficult to capture the complexity of the real world and if more than 10 it may become difficult for the researchers to cognitively process the information. In a similar vein to recent research on complex engineering service systems (see Ng et al., 2012), we choose to investigate here the aerospace industry in which manufacturing companies of aircraft, helicopters, engines and other major equipment suppliers are increasingly becoming solution providers by integrating elements of product and support services.

4.1 Research context

The analysis of the aerospace industry gives access to empirical data about how Manufacturers of capital equipment use maintenance service providers to work directly with end-users for the provision of solutions. Relationships developed for the provision of aircraft are complex and can be a useful example of how solutions are developed in business networks. It is noteworthy that the aviation industry is segmented according to the type of customer, being organized in commercial aviation, executive aviation and defense. Both, the commercial aviation and the executive aviation, sell for private firms and the defense deals with government customers. For a better understanding of this sector, in this study, solution triads from the commercial and executive aviation sectors were selected.

4.2 Sampling and data collection

The survey was developed from the identification of triads in the business network of a major aircraft manufacturing company. This company was regarded as a common point for each triad, to provide focus and facilitate comparison, and sought to identify in its business network relationships with service providers and customers. We sought to identify a variety of triads that could illustrate recent and mature relationships, and also relationships that had already terminated. All service providers identified provide “component services” (Van der Valk et al., 2009) or “front-end” services (Balakrishnan et al, 2008), i.e, services provided by them become part of the buying organization’s value proposition to its customers. They are purchased by one organization from another, but delivered to a third party. Thus, the triadic relations identified are in similar “supply chain disintermediation” conditions (Rossetti and Choi 2005) and changes occur in triad configuration among the three actors before, during and after the service outsourcing (Li and Choi, 2009).

A total of 10 (ten) service triads were thus identified in all, made up of relationships involving 14 (fourteen) firms in aerospace industry, organized as: 01 (one) major manufacturing firm (as the common point in each triad, being one of the most important Manufacturers of aircraft in the world); 05 (five) service providers (being three firms of maintenance and repair services; one firm of aftermarket services, and one of on board

entertainment services) and 08 (eight) customer firms (being four airlines and four business users). Appendix 1 (at the back end of the manuscript) describes each firm investigated and Table 1 below describes the triads developed among them. For reasons of confidentiality, the names of the companies and the respondents have been disguised:

(INSERT HERE)
Table 1

At all, the ten service triads observed were divided into six triads in the area of commercial aviation and four in the area of executive aviation. Data were collected from visits and interviews with managers from each member of the triad. In each triad, at least one manager was interviewed (including within the manufacturing firm), targeting "informed" managers who had most knowledge about the relationships established in each triad. Three interview scripts were prepared: one for application to the Manufacturer, one for interviews with Service Providers and one adapted to Customer interviews. Initially, the triads were identified through interviews with managers in the Manufacturer. Based on this identification, managers of service providers and customers were contacted and visits were organized for the interviews. All scripts contained questions about the development of each dyad (Manufacturer-Customer; Manufacturer-Service Provider and Service Provider-Customer) and the triad (Manufacturer-Service Provider-Customer).

As exploratory research, the scripts contained open-ended questions on various themes: What products / services are exchanged between the parties?; How can the history of relations between companies be described?; How are contracts established between the companies?; At what stage of development is each dyad (in each triad)?; How are interactions and business processes between companies developed?; How do they perceive issues of power and dependence?; Which are the main sources of conflict between companies?, What is the importance of each part to the triad?, Which critical events can be described as an influence to the development or the decline in relations?; Which are the main factors for the dissolution of the relationship?, as well as other issues to provide details on the relationship between the three firms.

Views regarding relations were collected from all parties, i.e., Manufacturer, Service Provider and Customer managers expressed their views on the relationship of each dyad (Manufacturer-Customer; Manufacturer - Service Provider and Service Provider-Customer) and the triad itself (Manufacturer-Service Provider-Customer).

4.3 Data analysis

The triadic development was firstly identified, case by case. A case history of the evolution of each triad over time was thus established, along with characteristics and explanatory factors. A description of these is presented below. These are deliberately kept brief as each case represents a considerable amount of data in Appendix 1 (at the back end of the manuscript).

Following this, and in line with the case study analysis method recommended by Yin (1989) and Tangpong (2011), and inspired by the grounded theory approach suggested by Strauss and Corbin (1990) and Strauss (1987), the data collected through in depth interviews were systematically transcribed and subjected to content analysis (Krippendorff, 2004; Tangpong, 2011). A pre-analysis stage consisted of preparing the interview material, with the transcript of the tapes of the respondents' comments. At the analysis stage, units used for content analysis purposes were sentences, paragraphs and phrases. Selected quotes from respondents were also used to capture the reality of the situation. Open coding was conducted by noting comments in each interview, with the focus on managers describing the evolution

of relationships and critical events for this. The comments from each of the interviewee were then compared. The comments were summarized as keywords and phrases in order to be able to identify similarities and differences of ideas. Keywords and phrases constituted the basis for the identified factors for the phase characteristic and evolution. Codification and interpretation processes were made by using a software for analysis of qualitative methods, the QSR N6, a version of NUD*IST – Non-Numerical Unstructured Data Indexing, Searching and Theorizing.

5. CONTENT ANALYSIS ON THE CASES

The results of the analysis of data collected through interviews with managers of the 10 service triads are presented below. As described in the method, the respondents' answers to the open-ended questions in the research guide were transcribed and subjected to content analysis (Krippendorff, 2004; Tangpong, 2011). First, we describe the cases, identifying categories that are helpful for the understanding of the development of the business process in triads. Then, based on this analysis and on the literature in the area, we propose a phase model for the stages of relationships among firms for the provision of solutions, considering the network dynamics.

5.1 Describing the cases

Aircraft manufacturing involves high technology, high complexity and the development of a global business network able to support the operationalization of the product over time. Triads identified in this study were established to meet the needs of firms for the offer and/or access to services. When a customer decides to buy an aircraft, this decision presupposes the development of a long term relationship with the Manufacturer. The aircraft is a long-lasting product and requires constant maintenance and updates by the Manufacturer. This translates as the relationship between Manufacturer-Customer in this area being long term and usually implies high levels of interaction. The relationship with the service provider is established because the Manufacturer does not provide direct customer service (or provides it with unlimited capacity). In the relationships identified in the research here, customers are free to choose the service providers. The Manufacturer indicates qualified service suppliers for its network, but customers can choose whether or not to establish relationships with these firms. Thus, relations are established following initial business contracts signed between dyads (Manufacturer-Service Provider; Manufacturer-Customer; Service Provider-Customer), but they can be dissolved if one party perceives value in other forms of access to services to be held elsewhere. The analysis of the interviews in the ten service triads allowed the identification of reasons for the development and dissolution of relationships between firms. Tables 2 and 3 below summarize the categories identified by interviews.

(INSERT HERE)

Table 2: Categorization of reasons for interactions and dissolution of relationships between each dyad

Table 2 presents a summary of categories of reasons for interactions and for the dissolution of relationships established between each dyad (link), in a triad (Manufacturer-Service Provider; Manufacturer-Customer; Service Provider-Customer) for the provision of solutions. Then, Table 3, after, presents the data collected about the reasons for interactions and dissolution in triadic relationships (Manufacturer-Service Provider –Customer), in order to provide evidence about the mutual influence for the development of triads (firms

influencing the triad and vice versa). Results are described considering the points of view of each partner, allowing the comparison of data.

For the interviewees, in general, triads are established to meet the needs about access of resources for the provision of solutions. For the initial phase of the relationship, Table 3 presents a summary of the views for each part of the triad. For the initial phase of the relationship, we can observe similar words between the answers, such as: confidence, ability, experience and reputation. The following quotes below are examples:

> "Reference, higher performance, higher quality, capacities, skills. All this gives more security" (Manufacturer -T1)
>
> "We look for partners to establish long-term relationships. Credibility is what counts (Service Provider -T5) "
>
> "Aircraft manufacturers need to demonstrate reliability, having the ability to deliver aircraft suitable for our needs" (Customer -T2)
>
> "One thing is what is written in the business contract. Another is to feel the real service being offered. You must observe the evolution to check the supplier's ability to put into practice what had been agreed"(Manufacturer, T3)

It is important to highlight that respondents mentioned the word trust as an important aspect for the establishment of relationships, considering that the loss of trust is also an important reason for dissolutions. If one party does not fulfill what had been agreed, this loss of confidence restrains the evolution of the relationships or closes them down. Failure of the factors considered important for the establishment of relations generates serious reasons for discontinuation. A comparison of the development of relations with human relations and marriage was also mentioned by managers in many triads for the provision of solutions:

> “Indeed, it’s similar for human relations. If you have trust, you have intimacy. This confidence is gained through time” (Manufacturer, T5)
>
> “It’s like a marriage. Trust brings intimacy” (Customer, T9)
>
> “B2B (business to business) is P2P (person to person)”. It is this relationship that ends up resolving disputes. The legal side is there, but personal relationships are what help to resolve things in daily life. (Service provider, T1)

Asked about critical events, as internal or external points that can influence the development of relations, managers cited situations where partners can be seen as able to add value for the Manufacturer and/or customer. The need to expand the supply of services and the perception about new opportunities coming from interaction with partners (exchange of knowledge, capabilities, technologies, development of new services) were, mainly, mentioned. That is, triadic partners can see opportunities in developing relations together in order to obtain differentiation and competitive advantages. The partners, in each dyadic relationship, can improve relations between themselves and these can be reflected in the triad, and vice versa. Business processes involving the three companies can happen with greater intensity. On the other hand, if companies lose value with relationships, business processes if all parties can perceive value creation may change. One of the managers cited, for example, the problems regarding the price of oil, as a critical event that causes the dissolution of a triadic relationship (customer bankruptcy). Given their individual needs, firms, firstly, trade their business relationships to meet their needs. It is important that all parties in the triad perceive value in business development. If issues defined in contracts as well as commercial

reasons are met, companies will seek to intensify their relations if they perceive it to add value.

> "The manufacturer EBR is specialized in manufacturing; we are (specialized) in maintenance. It's in our "DNA". We add value to customers by this business relationship". (Service provider, T2)

> "If we develop long-term relationships we win. The manufacturer EBR is our Manufacturer. We want that our customers can be seen as our airline. We want to be seen as their maintenance area". (Service provider, T1)

> "The manufacturer EBR needs to support their fleet for their customers and therefore has a strong interest that the service provider can grow". (Manufacturer, T9)

To cater for the complexity of the service provision in the aerospace industry, business contracts in this area set up some organizational structures for frequent interaction. There is a dedicated team from the manufacturer "EBR" working together with the customer and the service provider. There is also a representative of the service provider working together with the customer. All the triads in the Commercial sector demonstrated these structures and also physical structures, such as dedicated offices for each partner inside each partner building. There are frequent meetings and the exchange of resources involving representatives from all three firms. This interaction is a condition for service provision but also allows the creation of opportunities for the development of new services:

> The manufacturer EBR has managers here, supervising the fleet maintenance for customer. They are there to support and monitor the implementation of the service. We also have a representative of the customer here on-site (Service provider, T2)

> The contact is constant. If you have a problem, we just call the service provider. We felt as if they were a part of us. (Manufacturer, T1)

> There is a customer account manager from the manufacturer EBR working inside our company (…) We have a team working together with the service provider (Customer, T1)

The managers were also asked about the history of relations between the three companies. Changes in business models, processes of mergers or acquisition, the offering of new services or changes in technical specifications are examples of factors observed for adjustments in relations. This reorganization can mean an opportunity for companies to analyze the business models that are developing and seeking new alternatives. Relations between firms may intensify as a result of this reorganization or may decrease, depending on the consequences of these adjustments for issues as trust and commitment between the partners. The analysis of the interviews about the sources of conflict found some categories: contract compliance, reliability and reasonable prices.

The analysis of data about service triads with broken relationships (T2, T3 and T4) allowed us to understand the reasons for the dissolution in triads. Dissolution of a triad can be understood as the moment when at least one partner leaves the relationship, whether the Manufacturer, Service Provider or Customer firm. As shown in Table 1, the reasons for dissolutions are generally related to: breach of contract clauses; loss of confidence; loss of quality in the provision of services; changes in pricing policy; development of partnership with an alternative exchange partner; changes in business models; non-payment of debts; merger and acquisition processes changing structures and bankruptcy of a partner. When one partner leaves the triad, different consequences for the relationship between the other two partners can be seen. The triad is in dissolution, but the other remaining two partners can

continue their dyadic relationship or not. If the Customer leaves the triad, relations between Manufacturer-Service Provider may follow and a new triad can be constituted with another customer (which often exists simultaneously with other clients of the Manufacturer). If the Service Provider leaves the triad, relations between Manufacturer-Customer can be tracked and a new supplier tends to be identified. If the Manufacturer leaves the triad (a very rare situation), the customer has to look for alternatives to operational support, maintenance and upgrade of its fleet. In this case, the relationship between Customer- Service Provider is deeply affected because of issues of dependence. However, contractual clauses protect the customers against this. That is, when one member leaves the triad, the relationship between other parts may follow, depending on the degree of dependence between firms.

As we can see in Table 3 below, a summary of the interviews about the reasons for interactions and dissolution of the triads is showed. The opinions of interviewees describing effects of a link to another link in triads were collected for comparison:

(INSERT HERE)

Table 3: Categorization of reasons for interactions and dissolution of relationships among all firms in service triads

Asked about the reasons that led to the beginning of the relationship between the three companies, managers indicated the specific needs of each company seeking access to resources, in order to provide solutions. Relations with a third party seemed timelier and companies started to interact. Different levels of trust and commitment can be observed. Relationships can evolve, stagnate or dissolve, depending on how these companies see the value creation in relationships that exist among them. After the establishment of the triad, companies continue to interact and this interaction is dynamic. This dynamicity of business relations in triads allows the development of a greater or lesser degree of commitment between the firms.

6. DISCUSSION

Analysis of the interviews demonstrated the dynamic relationships between firms in order to try to identify stages of development of relations for the provision of solutions in a network approach. The relationships studied showed formation of dyads between parties (Manufacturer-Service Provider and Manufacturer - Customer, Customer-Service Provider) prior to the development of the triads, noting that these dyadic relationships influence the relations of the triad, on the one hand, but are influenced by the triad, on the other hand, continuously. Confronting the literature presented within the data collected, we propose below a phase model for the development of relationships among firms for the provision of solutions, followed presented.

6.1 The Development Process of Triadic Service Relationships

Table 3 summarizes the reasons for interaction or dissolutions in the triads described. Confronting the data collected within the literature presented about buyer-seller relationships(Dwyer et al ,1987; Möller and Wilson, 1995; Håkansson and Snehota, 1993) and processes of business in triads (Spring and Araújo, 2013; Li and Choi, 2009; Choi and Wu, 2009a,b), we propose that the evolution of relationships among firms in triads (as the smallest unit of a network) can be understood in 5 phases: 1) Preliminary development of

dyadic relationships; 2) Establishment of the triad; 3) Development of Basic Relations; 4) Relationships for value co-creation; and 5) Dissolution. Figure 1 illustrates the model:

(INSERT HERE)
Figure 1: A phase model for the development of relationships in service triads

6.1.1 Phase 1: Development of dyadic relationships

For the establishment of triads, business relationships are previously developed between the parties. Selling products/services to customers, the Manufacturer needs to develop relationships in its business network, considering relations with diverse suppliers (Spring and Araújo, 2013). The data collected indicate that there are contractual relationships between the parties, so that the triads are formed from these dyadic relationships between partners. The relationships developed jointly between the three partners influence the relations between the parties and vice versa (Choi and Wu, 2009). The triad is constituted through the ongoing relationship between the parties, but also between the three companies.

There are business processes developed between the three companies and, simultaneously, there are interactions between partners. In the establishment phase of the triad, we can consider the relationships developed between "Manufacturer - Customer"; Manufacturer - "Service Provider" and "Service-Provider - Customer". Each of these dyads has its own dynamics that has some direct effect on the Establishment of the triad. Particularly, the development of relations between the dyad (which makes up the triad) can be understood from the phases indicated in studies of the relationships between dyads, as Dwyer et al (1987) and Ford (1982). This understanding, however, is not enough to describe the business relationships in the triad, but it helps to understand the dynamic development of business between the parties, which has in turn a direct effect on the triad. We present below a discussion of the relationships between each party making up the triad.

The relationship developed between Manufacturer - Customer is fundamental to the establishment of the triad. The customer firm buys products / services from the Manufacturer, as well as the third party (service provider). It is noteworthy that the dynamics of the triad will depend directly on the development of relations between Manufacturer-Customer. Figure 2 below highlights some important points of intersections between Manufacturer-Customer regarding the triad. The data presented indicate that there may be interactions (with exchange of resources) between both the Manufacturer-Customer and interactions involving the three companies. The interactions between the parties influence and are influenced by the relationships together, as suggested by Choi and Wu (2009a,b).

(INSERT HERE)
Figure 2: tridimensional intersections between Manufacturer-Customer in a service triad

In the case of the aviation industry, this relationship is of the long-term high dependency kind. When a customer buys an aircraft, it is known that the life span of an aircraft is approximately 25 years. The relationship between Manufacturer-Customer exists independently of the relationship established with the Service Provider, despite being able to be influenced by this. As an example for this influence, when a customer decides to buy an aircraft from the manufacturer EBR, one important point for this decision is the existence of a network of service providers geographically distributed. The Customer-Service Provider relationship was not yet established, but the Customer decision for a Manufacturer may also receive the influence of the Manufacturer's capacity for relationships with service providers.

The Manufacturer-Service Provider relationship is established from the Manufacturer's need for the provision of services by a third part. Generally, the Manufacturer seeks to identify companies that are able to provide this service in the best way, looking for partners that demonstrate credibility, quality, and reasonable prices. The development of the relationship between Manufacturer and Service Provider should be understood also from the phases indicated in studies of the relations between dyads as Dwyer et al (1987) and Ford (1982). However, Figure 3 below highlights some important points of intersections between Manufacturer-Service Provider regarding the triad.

(INSERT HERE)
Figure 3: tridimensional intersections between Manufacturer-Service Provider

The data indicate that there may be interactions (with exchange of resources) between Manufacturer-Service Provider simultaneously to interactions involving the three companies. The interactions between the parties influence and are influenced by the relationships developed in conjunction, as claimed by Choi and Wu (2009a,b). In establishing this relationship, a business contract is established between these two organizations, defining what services the service provider is able to offer. In aerospace Manufacturer, for the establishment of this contract, service provider must demonstrate its ability to provide services according to criteria of quality, being necessary, in some cases, a specific certification of quality (if the supplier is, for example, a repair and maintenance firm).

The Service Provider-Customer relationship usually marks the beginning of the triad. Figure 4 below highlights some important points of intersections for the Service Provider–Customer link:

(INSERT HERE)
Figure 4: tridimensional intersections between Service Provider-Customer

The Customer is free to choose which service provider it will hire. Factors for Customers choosing a supplier that was indicated by the Manufacturer are: reliability, expertise, capacity for the provision of services and quality. The establishment of long-term contracts between Service Provider - Customer is usually motivated by the best economic conditions and increase of value. The data presented indicate that there are interactions (with exchange of resources) between Service Provider-Customer interactions involving simultaneously the three companies. The interactions between the parties influence and are influenced by the relationships developed together, as proposed by Choi and Wu (2009a,b).

6.1.2. Phase 2: Establishment of the triad

When the Manufacturer-Customer-Service Provider relationship is established, we have the beginning of the service triad. This is the moment a business contract is signed between Service Provider - Customer, for an orientation / motivation by the Manufacturer. At this stage, the Customer firm wants to assess the capacity of the service provider to meet its needs over time. The Customer may also seek alternatives outside the business network of the Manufacturer. When the supplier displays adequate apparent performance capability, however, companies begin to interact with each other, often with exchange of resources, people, and equipment.

The development of the triad depends on the dyadic relations between the parties, but goes beyond the specific problems of each party in the dyad. The relationships established jointly between the three companies are influenced by dyadic relations, but also exert influence on them. The dynamics of relations between the Manufacturer, Customer,

Customer-Service Provider and Service Provider - Manufacturer will directly influence the further development of relations between the three companies. The ongoing benefits accruing to each partner are factors of influence for the relation continuity, such as: the certainty from mutually anticipated roles and goals, the efficiency stemming from amelioration or role or identity bargaining (McCall and Simmons, 1966), and the confidence in exchange effectiveness that comes from trust. The triad can generate differentiation, competitive advantage, developing skills that strengthen the relations between the parties and encourage the strengthening of relations together. This happens when the parties perceive value in access to resources, skills and expertise in the development of relations (Spring and Araújo, 2013).After establishment, the service triads can evolve to a deepening of relations, growing or not.

6.1.3. Phase 3: Development of Basic Relations

With the onset of the triad, firms start to interact. There are basic relations expected that meet the needs of all parties involved. In some triads, these basic relations can be maintained over time, without firms perceiving value for the increase of interactions. The basic relationships are maintained because it is advantageous for the parties to maintain them in accordance with the fulfillment of contractual and issues such as quality, delivery, price protection. When, on the other hand, firms begin to realize other opportunities from major interactions with partners of the triad, relationships may intensify, with increased investments in resource sharing, people and development of knowledge and technology. Firms are beginning to realize that conjoint action can lead them to providing value, generating competitive advantage. If this occurs, some reorganization of structures can be carried out so as to favor the development of interaction for processes of value co-creation, as described in phase 4 below.

With the increase of relations between firms, business processes can be modified. New processes can be inserted intensifying relations and leading companies to the next stage of development (phase 4 as described below). However, depending on levels of adjustment, relations between firms can also decrease in intensity and return to lower levels, taking them back to phase3. Moving from one phase to other, firms can reorganize themselves. This reorganization occurs when there are significant changes in relationships, influencing, positively or negatively, the relations between the parties. Critical events that lead to changes in structures and ways of interactions can lead firms to the next phase. In Figure 1, the arrow indicates a "continuum" connecting the phases 3 and 4. Since relationships are dynamic, companies can increase or not their interaction over time. Levels of trust and commitment may also vary, causing increase or reduction in interactions. Reorganization here represents the transitions that can happen in relationships, trying to express the stage when changes of interaction are developed, for evolution, reduction or even the dissolution of relationships.

6.1.4. Phase 4: Relationship for value co-creation

Relationships can be intensified if the firms perceive value creation through their relationships. At this stage, companies realize that business partners can bring unique skills and expertise and can help them to co-create value (Helander and Möller, 2007; Cova and Salle, 2008a, 2008b) for the provision of solutions in a very competitive way. The changing structure of service triads can lead to stronger links between provider and customer subsystem (Peng et al, 2010). All parts interact in win-win relationships, seeking to develop new business opportunities. Rather than passing through the consecutive relationships in a

service supply chain, subsystem services suppliers participate directly in the value co-creation process with the system supplier and the customer (Van der Valk and Van Iwaarden, 2011).

It is noteworthy that trade and economic issues also influence the development and deepening in this phase. Companies remain with their own goals for growth and establishment of these relations is given for being appropriate for all parties. Not all triads evolve to this stage and may remain at the stage of basic relationships, with lower levels of interaction for co-creation of value (remaining in phase 3). The firms create value together because they see in it opportunities for growth. As the dependence of one party over another is determined by the dependence for value resources (Emerson, 1962; Thibaut and Kelley, 1959), firms in this phase usually present high levels of dependence. Trust and joint satisfaction increase mutual dependence (Scanzoni, 1979). There may still be different intensities for value co-creation in each triad. Service triads in this phase can develop new services together considering an intensive exchange of resources, showing high levels of commitment. In the cases studied, there was even greater commitment in relationships as triads included older. Since time is a factor that favors the observation of confidence and fulfillment of contracts, the triads tend to have a gradual evolution for these issues over time. However, the relationships are intensified for commercial reasons and there isn't an appropriate amount of time to reach the highest level of value co-creation.

6.1.5. Phase 5: Dissolution

Dissolution can be understood in this paper when at least one party leaves the relationship for any reason. The dissolution of the triad can happen by the end of the business contract between each of the dyads involved in the relationship. It can also take place by breaking the contract on grounds of loss of reliability, price changes, changes in strategic goals, competition, entry of new suppliers, bankruptcy. If the relationship between Manufacturer-Service Provider breaks off, the contract between Customer-Service Provider may be revised. Depending on the contract terms, Customer-Service Provider may continue to interact without the interference of Manufacturer, and the dynamic business should take into account the exit of this part, with consequences for the contract between Manufacturer-Customer. As described in figure 1, the dissolution of a service triad can occur anytime. Firms developing basic relationships or relationships for value co-creation can decide to leave the relationship according to the reasons presented in table 2. Relationships are developed in order to attend commercial reasons for each part of the triad. These relationships can be broken off at any time due to noncompliance of contractual issues or due to the influence of any internal or external variable that makes at least one party feel at a loss.

7. FINAL CONSIDERATIONS

The five-phase model illustrates the dynamics of relationships among firms in triads. The idea of a continuum of levels of interest for value co-creation, commitment and trust were observed as factors of influence that leads the evolution of phases for the provision of solutions over time. The development of relations with the intensification of business processes happens by observing the business opportunities that exist in the interaction between the three parties. Some triads are developed following basic relationships, as established in initial contracts, and firms cannot perceive the need to expand their interactions. When they see the capacity to create value together, firms can expand their relations by exchanging resources and developing activities in partnership. Factors such as trust, credibility, skills, capabilities and technologies influence the development of relations,

as well as trade factors. It can also be noted that there may be specific events that alter the relationship between the parties, resulting in the need for reorganization of relations. These factors may include: mergers or acquisition of a party, political and economic changes, price changes, new technologies. When, at least, one party leaves the triadic relation, we can consider the dissolution of the triad. Depending on the importance of this party to the relationship, further negotiations between the parties that may establish relationships can be developed and new triads can be established with other partners. This leads us to envisage the notion of actual triads, with defined members, and triad "spaces" where the *raison d'être* of the triad remains, but the space can be filled by different members.

This study investigates the dynamics in service triads and presents a corresponding phase model, considering a multiple case study in the aerospace industry. We investigated the phases of evolution from a three-dimensional perspective for relations between three firms in a complex engineering service system: Manufacturer, Service Provider and Customer. Thus, relations between the parties (as links in the triad) and the influence of them for the triad (a link affecting another link) were analyzed. Dyadic relations are initially established between Manufacturer-Service Provider, Service Provider-Customer and Service Provider-Customer. These dyadic relationships in themselves present stages of evolution as described by Dwyer et al (1987), Möller and Wilson (1995), Håkansson and Snehota (1993) and Ford (1982). Triadic dynamics can thus be seen as shifting combination of multiple interacting dyads, with the whole being greater than the parts. Manufacturers, catering for the needs of their customers, need to develop relationships with a diversity of suppliers, such as service providers. The relation between Manufacturer-Service Provider is established from the need (of both partners) to access resources with competitive conditions in the provision of solutions (Van der Valk and Van Iwaarden, 2011). The firms realize the creation of value from the development of joint activities (Helander and Möller, 2007; Cova and Salle, 2008a, 2008b) with the customer and the triad is developed.

Once the triadic relationship is established, firms tend to intensify their interactions to cater for the need for increased provision of current services or new growth opportunities, by developing new services. If the clauses established in business contracts are met, the relationships tend to evolve if companies demonstrate availability for mutual growth. Since there is a triad established, relationships that occur involving the three companies also influence the processes of business between the parties, but also the evolution of these relations between the partners (as links in the service triad) has a direct impact on the evolution of the triad.

It was also observed in this multiple case study that specific tripartite business contracts, defining holistic details of the relationships between the three companies, do not exist. The contracts that exist between dyads (Manufacturer-Service Provider and Customer-Service Provider) describe in detail the relationships to be developed between two parties. Some adjustments can be added to these contracts for the development of new services, but there is no combined, mutual business contract establishing the service triad. In other words, in the absence of a specific contract guiding relationships between the three parties, firms have to honor the business contracts between the dyadic partners (links of the triad) and to develop interaction processes with this in mind. Relationships developed for the provision of services frequently generate exchange of resources and the perception of new business opportunities coming from the expertise that is developed by the three firms in conjunction. It is noteworthy that the greater the dependence between the parties, the greater the search for win-win relationships. Interpersonal issues are also seen as factors for maintaining relationships and for providing contributions to the increase of trust and commitment. Words such as intimacy and marriage were cited by respondents.

The research here, then, provides added conceptual insight into triad dynamics and evolution. It can also provide managers with help by demonstrating the characteristics of triadic development and presenting a model that characterizes the phases of development for service triads, even if as suggested earlier it is perhaps more appropriate to talk of "state of evolution" rather than phases or stages. Reaching the aim of the investigation, five phases were identified: 1) Development of dyadic relationships; 2) Establishment of the triad; 3) Development of Basic Relations; 4) Relationship for value co-creation; and 5) Dissolution. The idea of a continuum of levels of commitment and trust and interest for value co-creation were presented as a factor of influence that leads from a phase of basic relationship to a more intensive phase for value co-creation, and vice versa. Being of the case study exploratory kind, the results presented here cannot be generalized. They do however provide food for thought and indicators as to explanatory variables for triad evolution. Further research will consider triads in other sectors, with hypothesis testing using more quantitative methods.

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Appendix 1

MANUFACTURING FIRM	
EBR (as the common point in each service triad)	It is one of the largest aircraft manufacturers in the world. It develops its activities in order to compete in a global market, offering specific aircraft's three segments: commercial, defence and executive aviation. For each segment, it produces specific airplanes.
CUSTOMERS IN COMMERCIAL AREA	
AARL	AARL can be described as a young company, and a major national airlines, totalling 14% of its domestic market. AARL uses aircraft from the EBR commercial fleet. Within the framework of their relationship, EBR and AARL have developed, since 2008, an interactive interface (Araújo et al, 1999). For the supply of an aircraft to AARL, EBR has also developed an interactive interface with many suppliers, involving supplies of engines, spare parts, training etc
TARL	IRP is a customer firm of EBR commercial aircraft for fifty seats. TRP has expanded its fleet of aircraft buying more jets ERJ 175 and ERJ 190. In 2012, IRP went through a merger and relationships were reorganized, configuring the dissolution of this initial service triad. After the merge, relationships between CC2 (as a new firm) and its suppliers (as Embraer and SP1) continued to be developed, constituting a "new" service triad. This case of Triad 2 describes the moment that a service triad can be undone in case of mergers or acquisitions.
PARL	PSO is a customer firm of EBR commercial aircraft for fifty seats. Despite the fact that this aircraft was considered as an important decision to improve the PSO market needs, managers related that the ERJ 145 jet was not a good model to attend the demand of CC3 regional aviation market. The interviewees indicated that there was a low profitability due to rising price of oil and small amount of seats on the plane. In 2012, the customer CC3 decided to finish the business contract with the industry and to change to another supplier.
SERVICE PROVIDES IN COMMERCIAL AREA	
TME	is a service provider of maintenance and repair services. Controlled by a foreign group since november 2005, the company became an independent MRO (maintenance, repair and overall) firm in 2001, but it has more than 80 years of international recognition inherited from its former controller. The company's production teams perform a range of services that fullfil customers' needs in commercial area. TME is a qualified service center indicated by EBR offering in line and based maintenance. As a part of the EBR service center network for the commercial area, TME has competitors in this network (other authorized service centers of EBR) and also independent service providers that can be choosed by the customers.
SVA	SVA is a leading provider of aviation parts and services. Whether its landing gear for a commercial jet, or a critical component for the latest turbofan engine, SVA offer more than 900,000 different part numbers to our customers globally. SVA describes itself as a provider of a portfolio of solutions that address the industry's logistics, warehousing, program management, and sourcing needs, offering services related to repair management, asset management and distribution. As a leading provider in the aftermarket, SVA is an exclusive distributor of material on behalf of manufactures of aircrafts around world. As competitors, SVA has the OEM's firms and/or the MRO's (maintenance, repair and overall) firms that wants to provide the same type of services. But as an exclusive EBR OEM (EBR original equipment manufacturer), SVA has more advantages with customers of EBR.
LEV	is a major provider of airline in-flight entertainment systems. Its main product is in aircraft seat-back satellite television service, movie

	programming and also on-board wifi connectivity. The system also offers live flight trackers, for people to see where they are. Depending on the region the airline operates in, different satellite television providers are utilized. The company is one of the major fourth manufacturers of in-flight entertainment systems.
MOTORSERV	is a business unit for maintenance and repair servicer of a world-leading provider of commercial and military jet engines and components for aircraft. Motorserv operates in the market since 1976, aiming to lead the business of overhaul and repair turbine aviation in Latin America. With an extensive global service network to support its activities, Motorserv has some global competitors, as other firms that provides overhaul and repair services for engines. However, current generation engines represent highly sophisticated technologies, and it was only natural for the manufacturers to keep their know-how to themselves and try earning not only from engine production, but also from servicing their own products. With limited access to crucial technical information, other market players had little power to oppose the manufacturers' entrance into the MRO market.
CUSTOMERS IN EXECUTIVE AREA	
PXTX	Customer PTX had an old aircraft that was not from EBR and decided to change it buying a new aircraft of Embraer. Maintenance and repair services were developed for the old aircraft by TME during six years and it was important to the Customer PTX that TME can be able to provide these same services also to its new aircraft. Then, interviewees related that the Customer encouraged the supplier in order to be a qualified service center of Embraer. So, in Triad T7, there was a dyadic relationship between the customer firm and the service provider before the establishment of the service triad. In 2011, SP4 became a qualified service center of Embraer, starting the service triad.
PLER	The relationship between Embraer and Customer PLER was developed in 2011, involving the acquisition of two jets. The interviewees indicated that this service triad T8 was developed in order to ensure the provision of maintenance and repair services for Customer CE2. For this, interactions are developed following warranty terms established by business contracts.
VIPSA	The relationship between EBR and VIA was developed in 2011, involving the acquisition of two jets for executive use. Relations are developed to attend business contracts because the aircrafts are yet under warranty (for 3 years).
MIK	The relationship between EBR and Customer MIK was developed in 2011, involving the acquisition of a jet for executive use. Relations are developed to attend business contracts because the aircrafts are yet under warranty (for 3 years).
SERVICE PROVIDERS IN EXECUTIVE AREA	
AGA	operates in the market since 1976, offering solutions in executive aviation. It serves over 150 clients in our hangars and offer maintenance services, chartering and sale and purchase of aircraft. Being also a service center authorized by EBR since August, 2011, this firm has two direct competitors that are located in the same country and, also, 58 competitors in the global network. In the service network center of EBR, this firm has two direct competitors that are located in the same country and, also, 58 competitors in the global network, and also independent service providers that can be choosed by the customers.
AMA	is a company certified for executive aviation (small and medium sized aircraft). It´s operating for more than 40 years, being one of the pioneers in its country. It is a service center authorized by EBR since August, 2011, offering in line and based maintenance. In the service network center of EBR, this firm has two direct competitors that are located in the same country and, also, 58 competitors in the global network, and also independent service providers that can be choosed by the customers.

Appendix 1: describing the firms

FIGURE 1

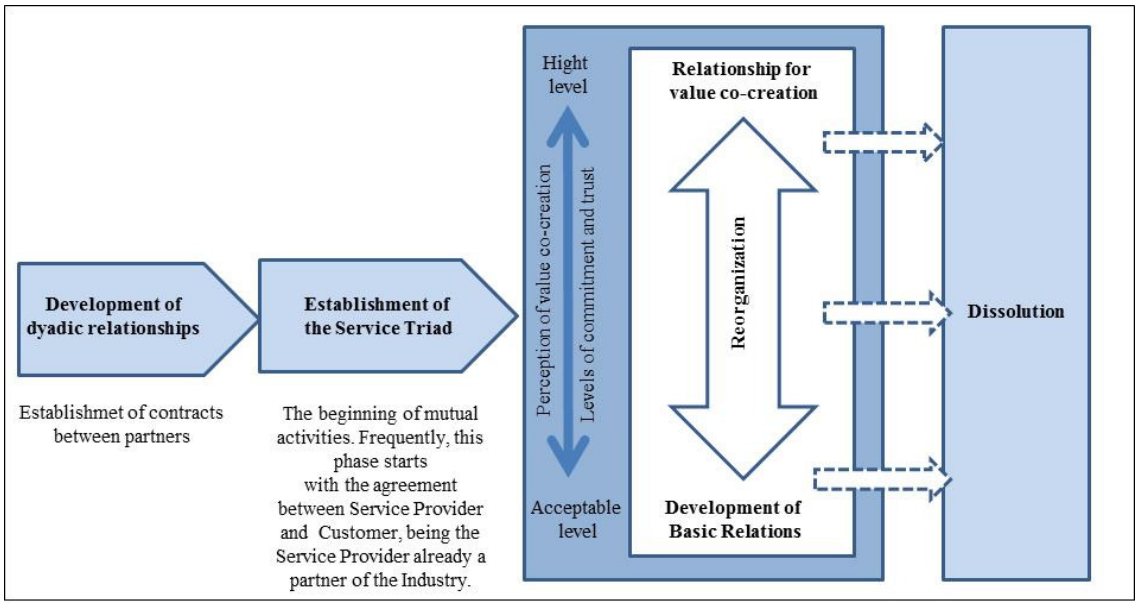
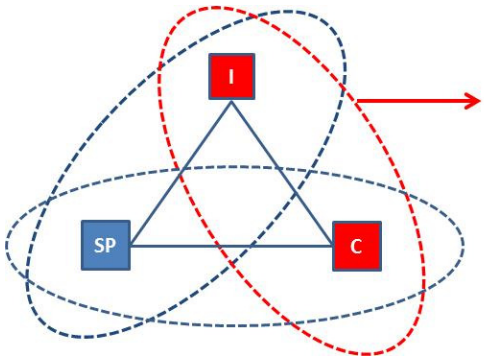


Figure 1: A phase model for the development of relationships for solution business

FIGURE 2

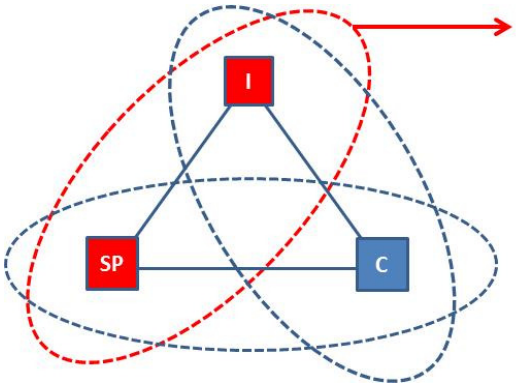


MANUFACTURER-CUSTOMER tridimensional intersections in a triad for solution business:

- A strong link in service triads, because the customer will connect to the service provider from its relationship with the Manufacturer;
- The customer can choose the service supplier indicated by the Manufacturer. The existence of relationships with service providers can be a differentiator for the Manufacturer;
-Relationships can be intensified if both parties perceive value in the relationship and this may result from relationships together with the service provider.
- The dissolution of the relationship between Manufacturer and customer can directly affect the relationship between Customer-Service Provider, causing, in most cases, its dissolution.
- There may be interactions (with exchange of resources) between Manufacturer-Customer, as well as interactions involving the three companies. The interactions between the parties influence and are influenced by the relationships jointly developed.

Figure 2: tridimensional intersections between Manufacturer-Customer in a service triad

FIGURE 3

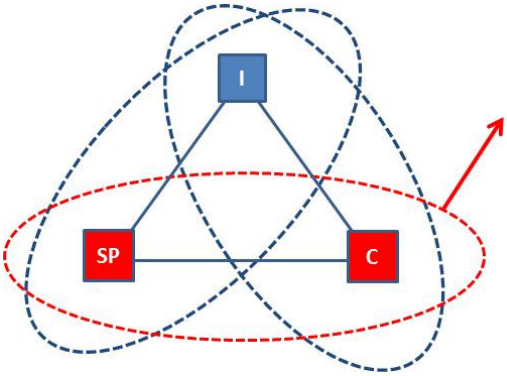


MANUFACTURER- SERVICE PROVIDER tridimensional intersections in a triad for solution business::

- This link is established from the Manufacturer's need for the provision of services by a third part.
-Relationships can be intensified if both parties perceive value in the relationship as a result of relationships developed with one or more Manufacturer's Customers.
- The dissolution of the relationship between Manufacturer and Service Provider can directly affect the relationship between Customer-Service Provider, but the Customer can continue the relationship with the Service Provider in an independent way.
- There may be interactions (with exchange of resources) between Manufacturer-Service Provider, as well as interactions involving the three companies. The interactions between the parties influence and are influenced by the relationships jointly developed.

Figure 3: tridimensional intersections between Manufacturer-Service Provider in a service triad

FIGURE 4



SERVICE PROVIDER-CUSTOMER tridimensional intersections in a triad for solution business:

- The Service Provider-Customer relationship is usually a condition marking the beginning of the service triad.
- The customer is free to choose the service provider. Reliability is a factor of influence for choosing a service provider indicated by the Manufacturer.
- Relationships can be intensified if both parties perceive value in the relationship and this may result from relationships together with the Manufacturer.
- The dissolution of the relationship between Customer and Service Provider does not imply the dissolution of Manufacturer-Customer relation.
- There may be interactions (with exchange of resources) between Service Provider-Customer, as well as interactions involving the three companies. The interactions between the parties influence and are influenced by the relationships jointly developed.

Figure 4: tridimensional intersections between Service Provider-Customer in a service triad

TABLE 1

	MANUFACTURER	SERVICE PROVIDER	CUSTOMER	STATUS OF THE TRIAD
Triad's Identification	**COMMERCIAL AVIATION**			
Triad 1 (T1)	Firm: "EBR" Manufacturer of Aircraft (Code: EBR)	Firm: "TME" (Maintenance and repair services)	Firm: "AARL" (Airline) Commercial	MATURE TRIAD
Triad 2 (T2)			Firm: "TARL" (Airline) Commercial	DISSOLVED TRIAD
Triad 3 (T3)			Firm: "PARL" (Airline) Commercial	DISSOLVED TRIAD
Triad 4 (T4)		Firm: "VSA" (Aftermarket service)	Firm: "PDO" (Airline) Commercial	DISSOLVED TRIAD
Triad 5 (T5)		Firm: "MOTORSERV" (Maintenance and repair services)	Firm: "AARL" (Airline) Commercial	MATURE TRIAD
Triad 6 (T6)		Firm: "LEV" (On board entertainment)	Firm: "AUL" (Airline) Commercial	RECENT TRIAD
Triad's Identification	**EXECUTIVE AVIATION**			
Triad 7 (T7)	Manufacturer of Aircraft Firm: "EBR" (Code: EBR)	Firm: "AGA" (maintenance and repair services)	Firm: "PXT" (Business user) Executive	DEVELOPING TRIAD
Triad 8 (T8)			Firm: "PRE" (Business user) Executive	DEVELOPING TRIAD
Triad 9 (T9)		Firm: "AMA" (maintenance and repair services)	Firm: "VSA" (Business user) Executive	DEVELOPING TRIAD
Triad 10 (T10)			Firm: "MIK" (Business user) Executive	DEVELOPING TRIAD

Table 1: Service triads investigated: an overview

TABLE 2

RELATIONSHIPS IN SERVICE TRIAD	TYPE OF AGREEMENT	REASONS FOR INTERACTION (categories identified by quotations)	REASONS FOR DISSOLUTION OF THE DYAD(categories identified by quotations)
Dyad "Manufacturer – Service provider" Relations analyzed: EBR – TME EBR – SVA EBR-MOTORSERV EBR – LEV EBR – AGA EBR – AMA	Business contract (short or long term relationships. The contract can be updated over time).	**The Manufacturer's view for this link of the triad:** - Manufacturer does not provide the service by itself or needs to have help for this provision; - Service provider's know how and specialization - Costs reasons - Trust, capacities, tradition, brand **The Service Provider's view for this link of the triad:** - Benefits of long term relations - Performance improvement - Cost reasons - Access to Manufacturer's customers	**The Manufacturer's view for this link of the triad:** - Breach of contract clauses. -Loss of confidence - Increased costs of transactions - Loss of service quality - Development of partnership with an alternative exchange partner. **The Service Provider's view for this link of the triad:** - Breach of contract clauses. -Loss of confidence - Changes in pricing policy
Dyad "Manufacturer – Customer" Relations analyzed: EBR – AARL EBR – TARL EBR – PARL EBR – PXTX EBR – PLER EBR – VOSA EBR – MIK	Business contract (long term relationship).	**The Manufacturer's view for this link of the triad:** - Customers that demand the types of aircraft - Financial conditions; - Reputation; ability to develop relationships **The Customer's view for this link of the triad:** - Mix of products that cater for customer demand (types of aircraft) - Know how, trust, reputation, brand, capabilities, structure, technologies; - Global service network	**The Manufacturer's view for this link of the triad:** - Breach of contract clauses. - Payment problems - Replacing the fleet - Bankruptcy **The Customer's view for this link of the triad:** - Breach of contract clauses. - Changes in pricing policy -Lack of support - Bankruptcy
Dyad "Service Provider – Customer" Relations analyzed: TME - AARL TME - TARL TME - PARL SVA- PARL MOTORSERV- AARL LEV - AARL AGA - PXTX AGA - PLER OMA- VOSA OMA- MIK	Business contract (short or long term relationship The contract can be updated over time)	**The Service Provider's view for this link of the triad:** - Benefits of long term relations - Performance improvement - Resource Optimization; Cost reasons; **The Customer's view for this link of the triad:** -Customer needs to access services and the Manufacturer does not supply -Customer chooses to access the service by a service provider authorized by the Manufacturer - Know how, trust, reputation, brand strength, capabilities, structure, technologies;	**The Service Provider's view for this link of the triad:** - Breach of contract clauses. - Payment problems - Replacing the fleet - Bankruptcy **The Customer's view for this link of the triad:** - Loss of confidence - Changes in pricing policy - Loss of services quality - Development of partnership with an alternative exchange partner.

Table 2: Categorization of reasons for interactions and dissolution of relationships between each dyad

TABLE 3

SERVICE TRIADIC RELATIONSHIP	TYPE OF AGREEMENT FOR THE SERVICE TRIAD	REASONS FOR INTERACTION (SERVICE TRIAD) (categories identified by quotations)	REASONS FOR DISSOLUTION OF THE TRIAD (categories identified by quotations)
Triad "Manufacturer-Service Provider – Customer" Relations analyzed: 10 service triads, according to table 1	-There is not a unique business contract for the triad. -The dyads of each triad interact and establish "the rules" for the service provision (disintermediation of the supply chain) -Business contracts between the Manufacturer and the Service Provider establish criteria to insure the quality of the service provision. -The Manufacturer continues to actively interact with its customer and closely monitor the supplier: dedicated teams, frequent meetings, development of new services.	**The Manufacturer's view about the triad** - The Manufacturer needs the service provision by a third party; -The Manufacturer qualifies the service provider and indicates it to the customer -The possibility of value co-creation among partners **The Service Provider's view about the triad:** -The service provider tries to fill Manufacturer requirements for qualification and to be attractive for the customer **The Customer's view about the triad:** -The customer is free to choose/change the service provider -The customer usually prefers to choose a service provider qualified/indicated by the Manufacturer	**The Manufacturer's view about the triad:** - Breach of contract clauses. -Loss of confidence - Increased costs of transactions - Loss of service quality - If the Manufacturer decides to offer the service by itself **The Service Provider's view about the triad:** - Breach of contract clauses. -Loss of confidence - Changes in pricing policy - Payment problems - Bankruptcy of one part **The Customer's view about the triad:** - Breach of contract clauses - Loss of confidence - Changes in pricing policy - Loss of services quality

Table 3: Categorization of reasons for interactions and dissolution of relationships among all firms in relations for solution business