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## Article

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## **The Effects of Collaboration on Logistical Performance and Transaction Costs**

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### ***Abstract***

This paper assesses the effect of supplier–retailer collaboration on logistical performance and transaction costs from the viewpoint of retail sector suppliers. The methodology consists of an empirical study conducted over nine months in the logistics department of a large Brazilian supermarket retailer and a survey of 125 representatives of 90 manufacturers. The results show collaboration contributes to an improvement in logistical performance related to urgent deliveries and deliveries that occur during periods of high demand. Interpersonal collaboration and joint actions contribute to the reduction of uncertainties among the participants. These joint actions, together with strategic collaboration, contribute to an increase in investment in specific assets, such as dedicated production lines or specialised vehicle fleets to serve partners. The study provides an analysis of logistical performance and transaction cost elements not previously investigated, including urgent deliveries and deliveries during periods of high demand, contract negotiation and renegotiation, waiting time for agreements to be reached, contingency logistics planning, and various cultural, psychosocial and geographical aspects of the supplier–retailer relationship. Managerial implications, research limitation and future research are also discussed.

**Keywords:** supplier–retailer collaboration, collaboration, logistical performance, transaction costs, psychosocial relationship

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## **1 INTRODUCTION**

Studies of collaboration and operational logistical performance have been extensively reported in literature on supplier–retailer relationships (Sheu, Yen, & Chae, 2006; Simatupang & Sridharan, 2005; Xing, Grant, McKinnon, & Fernie, 2011; Vlachos, Bourlakis, & Karalis, 2008; Vlachos & Bourlakis, 2006) and supplier–retailer–distributor–wholesaler relationships (Whipple, Lynch, & Nyaga, 2010; Nyaga, Whipple, & Lynch, 2010). Collaboration and performance in the supply chain are key topics in supply chain management (SCM) research (Kache & Seuring, 2014). Transaction-specific investments, trust, flexibility, joint actions, and business performance are also regarded as key elements in traditional buyer–supplier relationships (Rasckovic, Brencic, Fransso, & Morec, 2012).

According to Whipple et al., (2010), collaborative relationships provide greater advantages than transactional relationships; they offer improved logistical performance (e.g. fill rate, order cycle time, lead-time, on-time delivery) due to better information visibility and higher service levels. Our research confirms collaboration is positively correlated to logistical performance; collaboration positively affects asset specificity and negatively affects uncertainty. Collaboration reduces transaction costs (Cao & Zhang, 2011) because specific assets increase with contract frequency and higher levels of interdependence (Bunduchi, 2008). Negotiated volumes are greater, information exchange is more intense, and contract renegotiation is facilitated.

Previous researchers have investigated many elements related to collaborative relationships, logistical performance, and transaction costs. Our findings are in line with their qualitative results. For example, they find trust is an important determinant of the success of a relationship (Vlachos et al., 2008), and leads to improvement in logistical performance (Whipple et al., 2010). Trust is the unique element that contributes to the relationship (Vlachos & Bourlakis, 2006). Nyaga et al. (2010) examine a collaboration model from the viewpoints of both buyers and suppliers. Results show that buyers focus on relationship outcomes and suppliers focus on collaborative activities; suppliers safeguard their transaction-specific investments through information sharing and joint actions.

These studies, however, are based on conventional elements of logistical performance (Xing et al., 2011) and human and physical specific assets (Rasckovic et al., 2012; Heide & John, 1992). In our study, we turn our attention to elements of logistical performance related to ‘urgent deliveries’ and ‘deliveries that occur during periods of high demand,’ as well as transaction cost elements related to ‘contract negotiation and renegotiation,’ ‘waiting time for agreements to be reached,’ and ‘contingency logistics planning.’ It may be useful to suppliers and retailers to understand how these elements are modified by degree of collaboration (Xing et al., 2011). We expect a high level of collaboration results in less time lost to renegotiation and resolution of logistical contingencies and that it correlates positively with extra deliveries. Simatupang and Sridharan (2005) have investigated two similar non-conventional elements: ‘agreements on order changes’ and ‘delivery guarantee for a peak demand.’ We use the collaboration model developed by Vieira, Yoshizaki, and Ho (2009), based on strategic, tactical, and interpersonal collaboration, to examine the influence of collaboration on the logistical performance of suppliers serving large retailers and the transaction costs involved.

Performance depends on supply chain integration (SCI) and is strongly based on a culture rooted in teamwork, cooperation, information sharing, interdependence (Didonet, Frega, Toaldo, & Diaz, 2014), and interpersonal collaboration (Barratt, 2004). Geography and organisational culture (Hofstede & Hofstede, 2005) also exert strong influences on management practices (Pagell, Katz, & Sheu, 2005) designed to achieve high performance (Naor, Goldstein, Linderman, & Schroeder, 2008) in logistical operations. Pagell et al. (2005) find cultural differences in the manufacturing practices of countries in Europe, Asia and North America. We expect there are cultural differences not only among national and international firms, but also between regions, that affect suppliers’ logistical performances and relationships with partners. These differences may be due to large distances between partners within Brazilian territory that create difficulties in attending meetings, developing projects, and developing close relationships (De Leeuw & Fransoo, 2009). Cultural differences between local and foreign partners may also increase instability in development of collaborative business (Meschi & Riccio, 2008).

This paper aims to assess the effect of supplier–retailer collaboration on logistical performance and transaction costs. It also aims to shed light on cultural, psychosocial, and geographical aspects of the Brazilian supplier–retailer relationship. We use an in-depth case study of a retailer and its suppliers, as well as multiple regression analysis, to investigate the effects of supplier–retailer collaboration on logistical performance and transaction costs, from the viewpoint of suppliers.

We contribute to literature on supplier–retailer relationships by studying logistical performance and transaction cost elements not previously addressed. These elements include urgent deliveries, deliveries during periods of high demand, contract negotiation and renegotiation, waiting time for agreements to be reached, and contingency logistics planning.

## **2 LITERATURE REVIEW**

### **2.1 Collaboration in the supply chain**

Barratt (2004) classifies collaboration elements as strategic, cultural, and intrinsic. Strategic and cultural elements are the most important. Among these elements, the main focus of SCM research has been on collaborative culture based on trust, information exchange, and effective communication (Whipple et al., 2010). Simatupang and Sridharan (2005) and Kanter (1994) define complementary attributes and Vieira et al. (2009) sort them into three dimensions: (1) strategic elements, referring to an integral aspect of the goal of business partnerships and consisting of sharing inventory information and awareness of the partner's logistical difficulties and strategies, (2) elements of interpersonal integration, consisting of trust, reciprocity, flexibility, and interdependence, and (3) elements of tactical integration, referring to managers, an individual, or a dedicated team, working on specific projects or joint activities (e.g., working for the resolution of logistical contingencies or the establishment of information systems for automatic data exchange). Tactical integration elements also relate to sharing of logistics costs and gains and logistical and commercial information sharing.

The findings of Vieira et al. (2009) indicate elements of interpersonal integration are the most important factors in collaboration intensity. In line with these findings, our study also examines social relationships.

#### **2.1.1 Cultural, psychosocial and geographical aspects**

Cultural and psychosocial aspects are relevant to a better understanding of transactions (Barratt, 2004). According to Frankel, Goldsby, and Whipple (2002), communication skills reduce interpersonal and inter-organisational heterogeneity. Our research shows communication skills are important; contacts between suppliers and retailers happen in the same places and in frequent meetings, balancing logistical indicators in the face of differing cultures. In accordance with Dyer (1997), when cultural aspects surround the business environment, rules and operational proceedings should remain unaltered to achieve efficiency in both the exchange of information and operations (personnel and machinery).

According to Ring and Van de Ven (1994), interpersonal contact among agents establishes positive conditions for negotiations and facilitates the execution of joint actions. As noted by Zaheer, McEvily, and Perrone (1998), effective cognitive relationships get incorporated into the transaction environment over time. Therefore, psychosocial aspects of relationships are studied either at the beginning of the transaction, through cultural and interpersonal knowledge, or while the relationship is nurtured by the partners. Based on psychosocial theory, Li (2008) defends the proposition that trust is the main focus of relationships and argues it is the basis of collaboration.

Although these studies highlight the importance of cultural and psychosocial aspects in achieving collaboration in the supply chain, it is also relevant to consider the geographical aspects of collaboration, particularly when partners are located a great distance apart. Geographical proximity (Cannon & Homburg, 2001) facilitates regular meetings and technical visits among partners; it may also result in a significant increase in knowledge of systems and technology, culture, and standards (Pfohl & Buse, 2000).

### **2.2 Logistical performance elements**

Elements of logistical performance are divided into two theoretical groups: 'order-winning' and 'qualifying' (Slack, 1994). The qualifying group encompasses common elements of logistical performance, such as the need to meet high retailer standards (Slack, 1994). It represents the basics of good supplier service, such as on-time-in-full delivery, availability of products, error-free ordering and delivery, fulfilment of delivery date and time, frequent delivery, resolution of damaged orders, high order fill rate, and adequate minimum stock levels. The order-winning group encompasses distinctive logistical performance elements that, according to Slack (1994), provide a crucial advantage compared to common elements and are the main thrust of competitiveness ("urgent delivery" and "order fill rate during periods of high demand"). Typically, the order-winning group refers to deliveries ahead of predetermined delivery dates to satisfy retailer requests. Table 1 provides an overview of the key conceptual definitions of the theoretical factors and their respective elements.

**Table 1. Logistical performance elements – qualifying and order-winning**

<b>Concept</b>	<b>Measurement</b>	<b>References</b>
<b>Qualifying</b>		
On-time delivery	Percentage of all orders sent on or before the promised delivery date	Case study; Vlachos and Bourlakis (2006)
Order fill rate	Amount of an order that is filled as compared to the amount that is requested	Case study; Simatupang and Sridharan (2005)
Product availability	Amount of product available in supplier stocks or in supplier production line	Case study; Xing et al. (2011)
Error-free delivery	Number of SKU ordered and shipped out with error-free as percentage of total ordered	Case study; Vlachos and Bourlakis (2006)
Scheduled delivery fulfilment	Number of times delivery occurs within agreed-upon delivery window	Case study; Xing et al. (2011)
Damaged orders	Number of items returned due to being damaged during transport	Case study; C Xing et al. (2011)
Rupture	Amount of product available on the shelves or retail stock-out	Case study; Simatupang and Sridharan (2005)
Delivery frequency	Number of deliveries per week	Case study; Xing et al. (2011)
<b>Order-Winning</b>		
Delivery of urgent delivery	Number of deliveries designated as urgent delivery	Case study
Delivery of order during periods of high demand	Number of deliveries in the last week of the month or immediately before specific sales dates	Case study; Simatupang and Sridharan (2005)

In our research model, the order-winning group has the most important logistical performance elements, due to the low-efficiency logistics of large retail suppliers. The importance of these elements emerges when we analyse Brazilian retail characteristics (such as the large demand for products concentrated in the last week of each month), and urban logistical aspects present in large cities (such as lack of unloading areas, restricted timetable circulation for trucks, security issues, traffic congestion, large numbers of deliveries in small areas, and restricted access).

### 2.3 Transaction cost elements

In retail chains, transaction costs may represent huge costs associated with timing of renegotiation (Ellram, 1993) and rework, and costs resulting from specific asset investment (Heide & John, 1992). These costs are based on three dimensions of the transaction: uncertainty, specific assets, and frequency (Williamson, 1985). Uncertainty is studied through examination of ex-ante costs (setup costs, the period of agreement-writing and bargaining, and new contracts) and ex-post costs (contract renegotiation and waiting time required for the resolution of logistic contingency) (Ellram, 1993). Frequency is analysed through study of delivery programming for the monthly scheduling of products from suppliers to retailers. Specific assets are associated with high investment levels in specific physical assets, such as information technology machinery and equipment, and specific human assets, such as groups committed to a specific project or partner, or staff training for new logistical agreements. According to Heide and John (1992), in retailer–supplier relationships, investments made in procedures, equipment, and machines are regarded as specific assets while the transaction is occurring. Table 2 provides an overview of the theoretical elements studied in our research.

**Table 2. Transaction costs elements – uncertainty and asset specificity**

<b>Concept</b>	<b>References</b>
<b>Uncertainty</b>	
Contract negotiation and renegotiation	Case study.
Waiting time for contingency logistics planning	Case study; Ellram, (1993).
Waiting time for logistic agreements	Case study; Simatupang and Sridharan, 2002.
<b>Asset specificity</b>	
Human asset specificity	Case study; Williamson, 1985; Raskovic et al, 2012.
Physical asset specificity	Case study; Williamson, 1985; Dyer, 1997; Heide and John, 1992; Raskovic et al, 2012

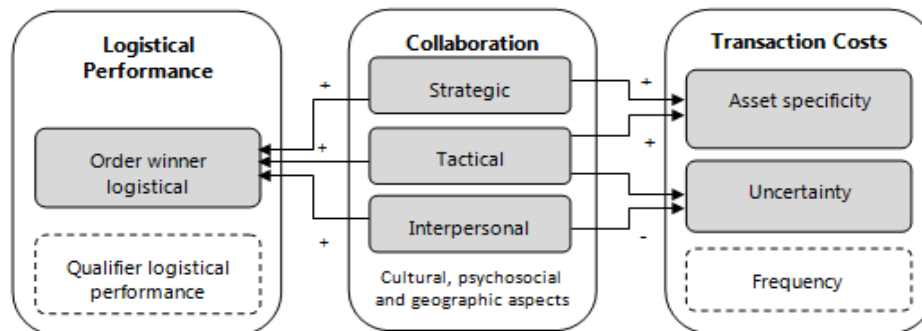
Our study focuses on the concept of uncertainty. The element of ‘contract negotiation and renegotiation’ refers to annual agreements between retailers and suppliers. Typically, large retail suppliers spend a lot of time on annual contracts and renegotiation due to bureaucratic delays in reaching agreements on prices of products, volumes, service levels, performance indicators, and cost logistics. The element of ‘waiting time for agreements’ refers to new logistics projects or joint actions to reduce logistical costs. According to Ghauri and Roxenhall (2004), bilateral negotiation between partners is facilitated by renegotiation of short-term contracts.

The element of ‘waiting time for contingency logistics planning’ refers to dyadic transactions such as damaged orders and inconsistent delivery.

### 3 CONCEPTUAL MODEL AND RESEARCH HYPOTHESES

The proposed theoretical model (Figure 1) combines previously discussed elements of collaboration (based on Vieira et al., 2009), logistical performance, and transaction costs.

**Figure 1. Conceptual model of supplier–retailer relationship**



Our model shows the effects of collaboration elements (strategic, tactical and interpersonal) on logistical performance elements. We study the effects of collaboration elements on order-winner logistics (i.e. high-level logistical performance indicators) and find collaboration is positively related to logistical performance. We further examine the effects of collaboration elements on transaction costs of asset specificity and uncertainty and find collaboration is positively related to transaction costs, with the exception of uncertainty. We analyse the elements of frequency and qualifier logistical performance in a case study. We also analyse cultural, psychosocial, and geographical proximity aspect.

#### 3.1 Collaboration and Logistical performance

Van der Vaart and van Donk (2008) have surveyed research related to dyadic buyer–supplier relationships. They conclude collaborative relationships have a positive impact on performance. According to Lambert and Pohlen (2001), logistical performance improves when partners are aligned in the search for a common strategy (Mitra & Bhardwaj, 2010), willing to share their inventory information (Simatupang & Sridharan, 2005) and plan their stock levels, and open to sharing their logistical difficulties and strategies (Pfohl & Buse, 2000). Therefore, technical visits to partners’ manufacturing plants and distribution centres are a good strategy for learning about each other’s practices, systems, cultures, and standards. Tactical collaboration focuses on providing high-quality services and reducing logistical costs (Stank, Keller, & Daugherty, 2001). Research has shown several important elements have positive impacts on logistical performance (Simatupang & Sridharan, 2005), including information sharing (Barratt, 2004), suppliers and retailers working together in the distribution channel on activities such as selection of markets, product assortment planning, promotions (Simatupang & Sridharan, 2005), sharing customer support information (Kim, 1999), joint participation of both teams in projects and dyadic logistical activities (Kim, 1999), sharing joint logistical goals (Kanter, 1994), and sharing costs and benefits of “incentive alignment” (Simatupang & Sridharan, 2002). To achieve optimal logistical performance, retailers and their suppliers must also share commercial information and information about such factors as vehicle capacity to deliver, target inventory turnover, order frequency, lead times, product availability, vehicle availability, and supplier capability in working with urgent deliveries or during peak seasons (Vieira et al., 2009). With regard to interpersonal collaboration, relationships that include trust, commitment, cooperation, common interests, and sincerity (Mentzer, Foggin, & Golicic, 2000) lead to improvements in service levels and cost reductions related to inventory, transportation, and order processing. Accordingly, we derive the following hypotheses:

*H1a: Strategic collaboration has a positive impact on high level of logistical performance.*

*H1b: Tactical collaboration has a positive impact on high level of logistical performance.*

*H1c: Interpersonal collaboration has a positive impact on high level of logistical performance.*

#### 3.2 Collaboration and transaction costs

Investments in specific assets produce a great desire for establishing closer relationships (Raskovic et al., 2012) and reducing opportunistic behaviour (Cao & Zhang, 2011); strategic collaboration is positively correlated with asset specificity. However, the transaction cost structure is based on relational norms between

partners. Consequently, in these relationships, the effect of asset specificity is not always positive when there is vertical control (Arshinder & Deshmukh, 2008). An increase in transaction asset specificity increases the negotiating power of clients and the dominance of clients' business rules over those of supplier. According to Arshinder and Deshmukh (2008), control is typically exerted by the client's dominance over the supplier.

By analysing Japanese and American automotive chains, Dyer (1997) concludes that increasing collaborative efforts through joint actions and sharing information between partners reduces transaction costs and increases specific asset investments. However, increasing specific asset investments does not always result in greater transaction costs, because partners share operational gains and costs.

According to Muckstadt, Murray, Rappold, and Collins, (2001), tactical collaboration reduces uncertainty in a relationship. Sharing information (e.g. Electronic Data Interchange - EDI) contributes to improvement of information processing capabilities and thereby reduces uncertainty and transaction costs (Tan, Kannan, & Hsu, 2010). Because there are many suppliers and few large retail chains, the purpose of joint actions (from the retailer's point of view) is to gather the players to improve logistical performance and negotiation. Many companies create a favourable environment for long-term investments and lower uncertainty when they collaborate. This long-term investment encourages commitment to successful relationships (Ghauri & Roxenhall, 2004). For example, a large retailer might invite strategic suppliers to participate in collaborative actions, form synergies, and thereby achieve operational gains. Consequently, they have created specific or even dedicated transactions. In this way, firms not only share investments and competencies but also risks, losses, and inefficiencies in the production process. They may also share monitoring of transactions, thereby increasing or decreasing transaction costs depending on the degree of the relationship among players and the reputation acquired while trust exists. Trust in a relationship is sufficiently strong to reduce safekeeping (Zaheer & Venkatraman, 1995) and negotiation costs. We derive a second set of hypotheses as follows:

*H2a: Strategic collaboration has a positive impact on high asset specificity.*

*H2b: Tactical collaboration has a positive impact on high asset specificity.*

*H2c: Tactical collaboration has negative impact on uncertainty.*

*H2d: Interpersonal collaboration has negative impact on uncertainty.*

#### **4 METHODOLOGY**

The methodology consists of a survey and a case study. Detailed qualitative analysis, combined with the rigor of quantitative analysis, allows for in-depth investigation (Voss, Tsikriktsis, & Frohlich, 2002). Our mixed-method approach helps develop the study's hypotheses and ground the constructs for empirical testing.

We use a case study as a research strategy for exploring the supplier-retailer relationship (Sheu et al., 2006). We follow well-established methodological guidelines (Voss et al., 2002; Yin, 1994) to increase the validity of our findings.

During the study, we interviewed all strategic suppliers of the largest Brazilian retailer, along with its logistics managers. Interviews were transcribed directly to notebook and then categorized according to the elements identified by our literature review (collaboration, logistical performance and transaction costs elements). The literature review also guided our construction of the interview protocol used with retailer and supplier managers during two annual seminars; to increase content validity, we transcribed the interviews and had respondents review the interview notes.

Previous studies have focused on supplier-retailer performance (Sheu et al., 2006; Simatupang & Sridharan, 2005). Raskovic et al. (2012) have investigated supply relationship performance from the supplier perspective using elements based on transaction costs, collaboration, and business performance. However, further study of a range of companies in the retail channel is required to explain in-depth relationships related to wasted time in contract renegotiation, waiting time required for the resolution of logistical contingency, and dyadic logistical problems and measures. To understand these factors, we followed more than 50 meetings and attended approximately 250 hours of visits with directors, managers, and analysts. To increase reliability of the study, we conducted interviews within the logistics department of the largest Brazilian retailer; the interviews gave us a detailed understanding of the retailer's relationships with strategic suppliers, as indicated by logistical performance measures and logistical agreements during monthly meetings. We observed discussions among the partners in relation to the logistical problems and noted the perceptions, psychosocial aspects, and important nuances revealed by their relationships.

The case study approach gave us the opportunity to collect data based on multiple methods, such as interviews, observations, logistical performance indicator reports, technical visits, and interviews with more than one informant from a different culture. This approach increased the validity and reliability of our study .

#### **4.1 Survey sample and procedures**

The survey research<sup>1</sup> was conducted with a population based on a list of 90 main suppliers to a large Brazilian retailer. The suppliers were selected because they met the criteria of having already adopted some type of collaborative logistic practice and having conducted periodic meetings with the retailer's logistics team. Therefore, the analysis unit consists of the supplier companies.

Several pre-tests were run to check the final instrument (Forza, 2002). Next, to take advantage of the retailer's fixed physical location, a questionnaire was distributed to a total of 125 respondents (supplier representatives) following on-site meetings with the retailer. To avoid bias in the study, respondents were asked to evaluate other large retailers. Opinions came directly from individuals (not from their companies). Each respondent was asked to choose one of their eight largest customers (measured by sales), and then evaluate the selected customer according to collaboration, logistical performance, and specific transaction cost elements. Retailer representatives did not participate in the survey; only supplier personnel took part.

#### **4.2 Survey data analyses**

In our model, strategic, tactical, and interpersonal collaboration elements (Vieira et al., 2009) are the independent variable; logistical performance elements associated with "order winner logistic", and transaction cost elements associated with asset specificity and uncertainty are the dependent variables. The dependent constructs are displayed in Tables I and II.

To measure collaboration and logistical performance indicators and transaction cost elements, we adopted a 0–10 Likert scale (strongly disagree to strongly agree). A 1–5 Likert scale and a 1–7 Likert scale were also tested. Test results showed interviewees felt more comfortable assessing the construct on the 0–10 scale. Also, time required to answer was much less than it was for the other scales.

We employed a factorial analysis to reduce the number of original variables of the logistical performance and transaction costs groups (Hair, Black, Babin, and Anderson, 2009). The collaboration variables resulted in a reduction of the number of factors analysed by Vieira et al. (2009). In our study, collaboration variables were comprised of five factors: strategic collaboration (CO1), joint actions (CO2), sharing of logistical costs and gains (CO3), sharing of logistical and commercial Information (CO4), and interpersonal collaboration (CO5). The dependent constructs are Higher Logistic Performance Factor (HPLPF), Uncertainty Factor (UF), and Asset Specificity Factor (ASF).

These factors allowed us to use multiple linear regression analysis to measure the effect of collaboration on logistical performance and transaction costs. Logistical performance and transaction costs were used as dependent variables, and collaboration elements as independent variables in the regression. SPSS (*Statistic Package for Social Study*, v. 20.0) software was used to obtain the regression models.

## **5 RESULTS AND DISCUSSIONS**

### **5.1 Case study results**

In this section we summarise the results of meetings between the retailer and their suppliers. Our case study follows van der Vaart and van Donk (2006) in which 'inter-organisational collaboration' is measured in six dimensions: long-term relationships, cooperative behaviour, joint improvement, information planning, physical integration, and communication.

Table 3 shows the characteristics of suppliers who revealed their perceptions of large retailers (including the retailer subject of the case study).

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<sup>1</sup> *The questionnaire is available from the authors upon request*



**Table 3. Profiles of responding firms**

Control Variables		Categories	Percentage of Firms in the Sample
Number of employees		<500	36.78%
		>500	63.22%
Client portfolio		Beauty & Health	26.40%
		Drinks	15.20%
		Electric and Electronic	5.60%
		Commodity	10.40%
		Grocery	20.00%
		Miscellaneous	20.00%
		Others	2.40%
Annual revenue (\$US)		<\$US 10 m	24.00%
		>\$US 10 m and <\$US 250 m	24.00%
		>\$US 250 m and <\$US 500 m	24.00%
		>\$US 500 m	28.00%
Delivery frequency		>Twice a week	45.60%
		<Twice a week	54.40%
Lead time to delivery		<=2 days	52.00%
		6 <days >2	31.20%
		>6 days	16.80%
Proximity among partners		Radius <=100 km	55.20%
		Radius >100 km	44.80%
Owner capital		Domestic	52.00%
		Foreign	48.00%
SKU (Volume)		>10%	26.40%
		>5% and <10%	20.80%
		<5%	52.80%
SKU (Number)	National supplier	>30 SKUs	25.60%
		<30 SKUs	26.40%
	Multinational supplier	>30 SKUs	40.00%
		<30 SKUs	8.00%
Meeting frequency	National retailer	Month	25.60%
		Year/Semester/Trimester	20.80%
	Multinational retailer	Month	12.00%
		Year/Semester/Trimester	41.60%
Technical visit (concurrency)	National retailer	Regular	21.60%
		Never	24.80%
	Multinational retailer	Regular	18.40%
		Never	35.20%

The manufacturers (suppliers) of consumer packaged goods (CPGs) are national and multinational firms; their sizes range from medium to large. Their annual revenue is drawn from medium and large retail firms, with 10% of total revenue coming from the four largest retailers. Furthermore, large retailers play an important role in allowing suppliers to show their various products. According to an industry interviewee, “The large retailers allow our products to be maintained in a showroom; it proves to be a big opportunity to increase our market share.” At the same time, according to the CEO of a large CPG firm, “The retailer has a high volume of the purchase, for which we have to provide an efficient logistic more than other channels. It represents high logistic costs.” This scenario reveals suppliers must maintain high performance logistics at lower costs, have less stock with the retailer, sustain high delivery frequency, and be able to prove that a good freight distribution system is available. Our case study reveals direct delivery to final customer has increased by high frequency of order and the use of small lots. Table 3 shows 55.2% of the distribution centres are located at an average radius of approximately 100 km from the large consumer centres of Brazil, and 54.4% of deliveries are carried out frequently (twice a week). Therefore, collaboration is necessary to maintain contact and solve logistical contingency issues.

Logistical performance can be analysed by sector. The highest numbers of SKUs are found in the health and beauty (26.4%) and grocery sectors (20%); the best indicators of logistical performance are also found in these sectors. This finding may be due to geographical proximity between partners, which allows for better interpersonal and inter-organisational integration and leads to a higher frequency of logistical meetings and technical visits. In contrast, the commodity sector, with few SKUs, is characterised by a high turnover ratio and high storage costs. In addition, commodity products generally originate from an average distance of approximately 1,000 km (in the south of the country) and are transported by road; distance adversely affects logistical performance, creating difficulties related to delivery error, delivery delay, damage of orders occurring during transport, and frequent **rescheduling** of agendas on the same day. According to a commodity supplier director, “The delivery freight costs may be over 15% for a large retailer chain due to extra costs with specialised transporters, new vehicles, and skilled drivers to fulfil the client.”

In the electronic sector, products are transported an average distance of 3,000 km from the north, by boat and truck, adversely affecting logistical performance. Great distance increases the potential for negative events such as damage, product theft, and delivery delay. In addition to transport costs, there are further demands from the large retail chain. According to a supplier, “There may be some transporter that charges more than 40% on freight costs to satisfy the large retail chain in relation to on-time delivery and to shipment without damage.”

Commodity and electronic products typically originate from long distances. There are no regular logistical meetings between the partners that involve the managers at both companies (retailer and supplier), and there are no technical visits between these mainly multinational firms (41.6% commodity and 35.2% electronic). In contrast to claims in literature that the history of the relationship involved may be important to the transactions, our research shows this may not always be the case. In our study, according to the retailer’s logistics coordinator, “The distance increases the safe stock. If the service level of the competitor is better than mine, I will look for a new alternative in order to reduce my costs with these stocks.” In this case, the commodity supplier to the retailer has had a good relationship with this retailer for approximately 20 years. Therefore, a good logistical performance can be independent of the length of the relationship because the retail chain seeks the lowest price and highest logistical efficiency available. According to the commodity supplier’s manager, trust, transparency in communication and knowledge among the partners are factors that maintain the relationship and lead to improvement in logistical performance. This result is consistent with the literature (Whipple et al., 2010).

Partner meetings provide an opportunity to develop a close relationship, or at least allow the partners to comprehend each other’s needs. The meetings offer a business environment in which partners may negotiate, discuss logistical problems and resolutions, and share region-specific logistical information such as delivery time windows, new product lines, out-of-stock products, availability of vehicle fleets, and demand levels. According to a supplier informant, “These meetings are relevant to share information, to discuss logistic problems and respective resolutions, to align objectives with our partner.” In business meetings, new projects emerge from natural environments where there is trust, previous willingness to make agreements, interdependence among partners and top management, and involvement in defining logistical agreements. Trust may be significantly improved by effective communication. In several meetings among the partners, we noted that cultural and psychosocial aspects are important in the retailer–supplier relationship. If the partners establish joint social activities, such as inviting each other to attend sporting events and seminars, and if they are open to each other, willing to hear criticism and express their opinions, their behaviour leads to increased strategic, tactical and interpersonal collaboration. It results in a streamlining of logistical transactions, transparency in communication, more information sharing, and more flexibility. Other benefits of openness include fewer costs related to searches for internal information and greater capacity among partners to solve logistical contingency issues.

We also noted that relationships based on trust between the retailer manager and different supplier managers (from the same company) produced different results. According to the retailer manager, “Responding to this supplier is tranquil, he is polite and trusts me all the time. We established a routine and we have no dyadic logistical problems. On the other hand, a lot of data that we share with other is not available because we do not have the same safety procedures.” This asymmetry in the retailer’s relationships with two or more suppliers was apparent time after time. Hence, trust based on belief and credibility among partners may improve their relationship. However, a lack of trust may result in a breakdown of the relationship among the people involved and their companies.

Another example of the importance of culture and trust is the time expended on suppliers who miss meetings. We noted that time after time, some suppliers were absent from the scheduled meetings and, in some cases, absences occurred consecutively with the same supplier. The absences increased the cost of telephone calls, necessitated the resetting of agendas, and wasted time in meeting preparation tasks such as report printing, searches for information, and team alignment. Absences decrease trust and create other barriers to business.

Our observations support the idea that cultural and psychosocial aspects are important factors in collaboration.

## 5.2 Survey research results

### 5.2.1 The effect of strategic, tactical, and interpersonal collaboration on high-level logistical performance

The results of multiple regression analysis for H1a, H1b, H1c are shown in Table 4. Standardized coefficients, adjusted R<sup>2</sup> and F-test values are provided to describe the results of the analysis.

**Table 4. Testing H1a, H1b, H1c – Regression analysis of collaboration and HLPF.**

<b>Independent Variable</b>	<b>General Results B</b>	<b>Supplier Revenue β</b>	<b>Sales Volume B</b>	<b>Delivery Frequency B</b>
CO1	0.121*	0.273**	0.249**	0.351**
CO2	0.163*	0.208*	0.257**	NS
CO3	0.119*	0.185*	NS	0.144*
CO4	0.277**	0.363**	0.364**	0.278**
CO5	0.523**	0.562**	0.676**	0.672**
<b>Adjusted R<sup>2</sup></b>	<b>0.38</b>	<b>0.48</b>	<b>0.66</b>	<b>0.70</b>
<b>F</b>	<b>15.67**</b>	<b>13.70**</b>	<b>27.23**</b>	<b>30.70**</b>

*Notes: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. Standardised coefficients are shown as β values. NS=Not significant*

We note for most results, all coefficients are positive and statistically significant. The results confirm H1a, H1b and H1c, finding that increased collaboration intensity results in improved logistical performance. In particular, the interpersonal collaboration coefficient (CO5) presents a larger coefficient than the other coefficients. It may be important for partners to maintain close relationships to avoid a lack of products due to unexpected demand (urgent requests) or a decrease in service level during periods of high demand. Table 4 also shows (based on F-tests) that the factors jointly explain the dependent variable HLPF.

The first column of Table 4 shows the general results; the other columns assess the behaviour of the effect of collaboration in situations where an improvement is expected at the service level. Three other multiple regressions are obtained using three control variables: (1) ‘supplier revenue,’ indicating quality of logistical structure, (2) retail ‘sales volume,’ indicating level of interdependence, and (3) ‘delivery frequency,’ indicating degree of operational interaction.

Comparing the general results for supplier revenue, we observe collaboration coefficients have a greater effect on logistical performance of companies with revenues greater than \$250 million USD. These producers have a better logistics constitution (assets, professionals, and software) and can abide by collaborative agreements. Therefore, when reaching a collaborative agreement with large retail chains, they can rely on a better infrastructure than smaller companies. These larger suppliers can also make extensive use of promotions, allowing their products to flood the retail chain. They are able to maintain a higher delivery frequency, guaranteeing better inventory turns for larger retailers. Therefore, large suppliers can meet the requirements of larger customers more efficiently.

With regard to sales volume to the retailer, higher volume supply by the manufacturer in special situations leads companies to establish an interdependent relationship, based on trust, reciprocity, and flexibility in meeting the partner’s urgent needs. This relationship may be more important than other collaborative practices, such as the sharing of logistical costs.

Our results also show a higher delivery frequency leads suppliers to meet deadlines more accurately. Therefore, a good logistical performance, particularly during peak periods and responding to urgent requests, depends on greater commitment to collaboration between partners. As we expected, the interpersonal collaboration factor coefficient (CO5) is high because an increased delivery frequency requires closer contact between the partners. Additionally, it verifies (at the 1% level of significance) that increase in delivery frequency (when the frequency of deliveries is greater than twice a week) during periods of urgent and high demand increases interdependence and has a positive influence on willingness and commitment to share information.

### 5.2.2 The effect of strategic and tactical collaboration on asset specificity

Asset specificity (comprised of elements of human and physical assets) is associated with the degree of investment that manufacturers have made in the relationship with their partners. Results of the multiple regression analysis for H2a and H2b are shown in Table 5.

**Table 5. Testing H2a, H2b – Regression analysis of collaboration and asset specificity**

Independent Variable	General Results		Revenue of Supplier	
	B	Adj. R <sup>2</sup> / F	B	Adj. R <sup>2</sup> / F
CO1 (strategic)	0.306**	0.21 / 14.95**	0.363**	0.26 / 7.70**
CO2 (joint actions)	0.352**		0.373**	

*Notes: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. Standardised coefficients are shown as β values*

The results in Table 5 for all coefficients are positive and statistically significant. They support the predictions of H2a and H2b that increases in strategic collaboration and joint actions contribute to an increase in investment in specific assets. Investment tends to result in closer relationships because it causes suppliers to direct products to larger retailers. Increased investment cost is compensated by increased sales volume, partner commitment, and ease in adapting to the requirements of the clients. When we use ‘revenue of supplier’ as a control variable, we see large suppliers have greater potential to make these investments because they can count on better structures and greater market competitiveness (price versus volume ratio) than small suppliers. Increased collaboration induces large suppliers to increase their investments in specific assets.

Increased information sharing (by joint actions, CO2) reduces transaction costs and increases investments in specific assets; constant information exchange and closer contact between players (exchanging of strategic information, such as inventory and production data, and knowledge of the reality of the logistical partners) hinder the entrance of new participants into the partnership. Information exchanges and direct contacts act as safeguards against opportunistic actions by the retailer, such as changing suppliers. Investments in specific and human assets encourage renegotiations with existing suppliers because the search for new suppliers generates extra costs for the retailer; it requires new negotiations, training of a new team, and scheduling of meetings with top management.

### **5.2.3 The effect of tactical and interpersonal collaboration on uncertainty**

The results of multiple regression analysis of H2c and H2d are shown in Table 6.

**Table 6. Testing H2c, H2d – Regression analysis of collaboration and uncertainty**

Independent Variables	Variable Dependent–Uncertainty Factor–CT1	
	B	Adj. R <sup>2</sup> / F
CO2 – Joint actions factor	- 0.351**	0.15 / 9.84**
CO5 – interpersonal collaboration factor	- 0.191*	

*Notes: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. Standardised coefficients are shown as β values*

Table 6 results show all coefficients are negative and statistically significant. These results confirm H2c and H2d: increased collaboration intensity results in less uncertainty. This finding is explained by the constant involvement of the partners in the resolution of logistical contingencies (e.g., delays and product returns), and by direct contact during contract negotiations and new logistical agreements. A manager of a large supplier claimed, “This constant change of information has contributed to a close approximation of other areas between both companies. It has improved our logistic performance and there has been less re-work on a daily basis.” Any delay in contract negotiations or making new logistical agreements increases transaction costs. Because it takes a long time for the parties to reach agreement, stock-outs may occur. The cost of the contract (i.e. elaboration of new rules and time spent on meetings) contributes to decreased transaction costs between the retailer and supplier. This cost also affects the logistical performance of the supplier because the lack of agreement leads to feelings of untrustworthiness and disinterest in maintaining a good service level. According to a supplier manager, “We have been dealing with the annual agreement for five months, and during this time, our key products in the sector were in a stock-out situation. Then, we had to invest in joint actions with other strategic clients”.

## **6 CONCLUSION**

Our research shows collaboration contributes to an improvement in logistical performance related to urgent deliveries and deliveries during periods of high demand. Strategic and tactical collaboration have a positive impact on asset specificity; tactical and interpersonal collaboration have a negative impact on uncertainty. Enterprise culture and psychosocial aspects are relevant to contract making and the resolution of logistical problems. Our results show collaboration produces even greater improvement in logistical performance with larger suppliers, more dedicated supply operations, availability of larger product volume, and increased frequency of order delivery to the retailer. The findings indicate a closer relationship between partners, resulting

in less uncertainty and greater commitment and interdependence, can lead to increased investment in specific assets. The cost of these investments can be compensated by increased contract volume.

The findings also lead us to conclude that increased interpersonal collaboration and joint actions contribute to reduced uncertainties among participants and that these joint actions, together with strategic collaboration, contribute to an increase in investment in specific assets such as dedicated production lines or specialised vehicle fleets. Moreover, the existence of closer relationships reveals investment in specific assets increases with contract frequency and transaction costs tend to decrease. The negotiated volumes are greater, information exchange is intense, and renegotiation of contracts is facilitated.

This research contributes to supply chain literature by studying logistical and transaction cost indicators not previously addressed, that are strongly influenced by strategic, tactical and interpersonal collaboration (Vieira et al., 2009). We also find indications that cultural, psychosocial and geographical aspects exert a strong influence on relationships among partners. Although these aspects are not tested in our research model, their indications provide a basis for further empirical and theoretical research.

Our study contributes three key managerial implications. First, it suggests good partner relationships are based on trust, flexibility, transparency in communication, and joint activities inside and outside the work environment. Second, it demonstrates Information sharing contributes to better logistical performance, by solving contingency issues, reducing waiting time for agreements, and facilitating contract negotiation and renegotiation. Third, it shows proximity among partners, more meetings and technical visits and similar cultural aspects are essential factors to foster closer relationships.

Beyond these contributions, this research contains several limitations that should be taken into consideration as well. In particular, the data collection involved only suppliers. Most of these respondents came from an existing list of informants that a single retailer used to develop collaborative agreements. In addition, though these data relate to the largest retailers, representing approximately 50% of the Brazilian supermarket industry, the findings cannot be generalised to other retail sectors. Finally, most of the questionnaires were completed by respondents from within the retailer's organization. Therefore, it was possible to draw comparisons between this retailer and competitors that the interviewer was assessing.

Further research should attempt interviews with strategic suppliers of retailers to develop a dyadic perspective and verify the nature of the close relationships. Such interviews also could include other retail sectors that were not addressed by this research, such as stationery, building materials, clothing and accessories. From a methodological perspective, this research is based on a great, in-depth case, but more observations would allow for analyses by sectors. Joint analyses of the dependent and independent variables across all constructs (collaboration, logistics performance and transaction costs) also could be applied using structural equations modelling. Further research might assess psychosocial aspects as basic antecedents of collaborative behaviour too. Aspects of organisational culture exert a strong influence on collaborative activities (Barratt, 2004), especially in modern globalised markets, and they should be better taken into account in ongoing research.

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