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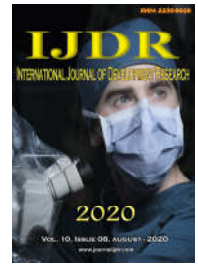
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RESEARCH ARTICLE

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## SUPPLIER STRATEGIC PARTNERSHIPS IN CONSTRUCTION SUPPLY CHAIN

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### ABSTRACT

The management of inter-organizational relationships is relevant to organizations' success, especially those linked by different products and processes to carry out an enterprise, as in civil construction. Among the strategies of this management, the development of partnerships stands out. This article aims to identify processes that contribute to forming strategic partnerships in the civil construction supply chain. An applied, descriptive and quantitative research was carried out in 100 companies (50 construction companies and 50 suppliers of materials), and the results were analyzed using descriptive and inferential statistics. The following fundamental and structuring processes were identified: operational relationship, selection and evaluation of suppliers; supply exclusivity; participation in the product development cycle; and differentiated pricing policy. The study shows that the builder-supplier relationship is based much on purely commercial intentions than on integration ideas.

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## INTRODUCTION

Civil construction is essential for the Brazilian industry due to the high participation in the Gross Domestic Product (GDP), being fundamental for national socio-economic development. On the other hand, the sector for decades has been characterized by critical aspects related to manufacturing, with high rates of inefficiency, low productivity, waste, rework, and delays in the schedule. The construction segment is characterized by fragmentation, which increases competitiveness and the lack of transparency between the companies involved and hinders trust between partners (NEVES; GUERRINI, 2010; MENG, 2012; ISATTO *et al.*, 2015; OTHMAN *et al.*, 2015). Fragmentation, instability, unique projects characterize the civil construction supply chain (CSCC). It is composed of a system of multiple companies linked commercially to carry out an undertaking (VRIJHOEF; KOSKELA, 2000; ISATTO *et al.*, 2015; JU *et al.*, 2017). The fact that the civil construction sector (SCC) is fragmented creates efficiency problems, such as the lack of coordination and integration between the various functional facets of the

supply chain, due to the separation between the project and construction of the enterprise (MENG, 2012). The sector has a complex, heterogeneous production chain, formed by a set of activities with different degrees of difficulty, interconnected by different products and varied technological processes (MELLO; AMORIN, 2009; NEVES; GUERRINI, 2010; GROVE *et al.*, 2018). Therefore, how the processes of acquisition and integration of suppliers are assumed is fundamental to obtain positive results, increase productivity, and to reduce unit costs (VRIJHOEF; KOSKELA, 2000; CHRISTOPHER, 2016). Purchasing management (supplies) assumes a vital role within the control of the CSCC. It operates with many suppliers so that inter-organizational relations are a reality and impact companies' performance in the chain (ISATTO *et al.*, 2015). Among the purchasing strategies, the formation of partnerships or strategic alliances stands out. In this regard, Santos and Jungles (2008) point out that the joint operation of the agents involved in the supply chain (partnerships) guarantees the full and correct execution of activities within the construction site.

The realization of lasting partnerships, therefore, promotes a better performance of the chain, avoiding the interruption of the supply of materials, reducing the risk of contractual delays and fines, besides making the company reliable and of quality (LI *et al.*, 2001; BANDEIRA *et al.*, 2009; ISATTO *et al.*, 2015; JU *et al.*, 2017). Thus, research focused on the inter-organizational relationship between builders and suppliers, like the present one, is justified because it contributes to developing strategies to improve the performance of both the companies involved and the supply chain to which they belong. Although interest in CSCC partnerships and integration has increased in recent years (VRIJHOEF; KOSKELA, 2000; BANDEIRA *et al.*, 2009; CRESPI-MAZET; PORTIER, 2010; SETH *et al.*, 2018), little is known about the relationship management at SCC (MENG, 2012). Most studies have even focused on the relationship between the client-contractor and the contractor or between the contractor and the subcontractors (BRISCOE *et al.*, 2001), there are few conceptual pieces of literature and comprehensive practices that allow a detailed understanding and systemic integration between construction companies and construction material suppliers. Thus, a study focused on the builder-supplier relationship (of materials) is necessary to view the subject's emptiness in the international and even national literature (SOUZA, 2014). Unlike the research already carried out, this study analyzes it through the perception that the construction company makes of the supplier and vice versa, identifying the points of dissonance and an overview of the potential problems that prevent or hinder partnerships. In this context, this research aims to identify processes that contribute to creating strategic alliances at CSCC.

**Literature review- major findings:** The construction project supply chain develops in the same way as the project, with a well-defined start and end, making it difficult to reproduce the arrangement of companies in the chain in the future, making it unique (ISATTO *et al.*, 2015). Vrijhoef and Koskela (2000) detail that the CSCC is: (i) convergent: the supplies converge to the construction site; (ii) temporary: organizations that are formed to carry out a single enterprise do not usually last for the next enterprise and may assume a different configuration from the previous one; and (iii) make-to-order: each project creates a unique product with little repetition. From what is perceived, the SCC has peculiarities and specificities that significantly differ from other sectors, since the production process takes into account the final immovable product, generally unique, with a long cycle of existence and inconsistency in the use of resources (MENG, 2012; GROVE *et al.*, 2018). The peculiar characteristics of the SCS production process generate efficiency problems in the supply chain, such as the lack of coordination and integration between the various functional faces involved, mainly due to the separation between the project and the construction of the enterprise (OTHMAN *et al.*, 2015; BONDINUBA *et al.*, 2016). The internal integration must be carried out to operate with the full potential of the CSCC management. It is necessary to improve the links with suppliers, subcontractors, and specialists (PAPADOPOULOS *et al.*, 2016). Cooperation between companies impacts the performance of the chain, as it makes it possible to carry out joint actions and enable the transaction of resources (ISATTO *et al.*, 2015). Thus, the following hypothesis is recommended:

**H1:** There are differences between builders and suppliers regarding the performance of the acquisition and integration process at the CSCC.

The management of the inter-organizational relationship plays a vital role within the CSCC in the search for efficiency in production and costs for the entire system, from the creation of raw materials to finished products. Among the strategies of this management, the construction of partnerships stands out. An adequate supply chain management must form partnerships or strategic alliances between builders and suppliers (SANTOS; JUNGLES, 2008; CRESPI-MAZET; PORTIER, 2010; MENG, 2012; BONDINUBA *et al.*, 2016). Lambert *et al.* (1996) conceptualize partnership as a business relationship based on mutual trust, openness, shared risks, and rewards that result in better performance and generate competitive advantage. The realization of lasting partnerships promotes a better performance of the chain, avoiding the interruption of supply of materials, reducing the risk of contractual delays and fines, and making the company reliable and quality (SANTOS; JUNGLES, 2008; BANDEIRA *et al.*, 2009). The partnership promotes organizational flexibility, increased information flow, reduced uncertainties, in addition to providing the development of an environment to support innovation and learning, raising the possible profit for the entire CSCC (BEACH *et al.*, 2005; BONDINUBA *et al.*, 2016). The partnership is the collaboration of companies to realize a competitive strategy, and it is the formation of an alliance to achieve a goal through the interaction of members (GUERRINI; VERGNA, 2010; CRESPI-MAZET; PORTIER, 2010). The partnerships collaborate with the integration of the supply chain, improving processes, increasing profit, and providing a sustainable competitive advantage (BONDINUBA *et al.*, 2016). Chart 1 illustrates three classifications for partnerships between customers and suppliers.

As a participant in the upstream operation, the partnership with the supplier provides a continuous flow of goods and services, without interruption in the production process. The partnerships differ from each other, mainly depending on the level of involvement between the participants. In the construction industry, the traditionally preferred acquisition method is based on the lowest price (BEMELMANS *et al.*, 2012; BONDINUBA *et al.*, 2016), is the relationship more adversarial and less collaborative than the average found in other sectors (JU *et al.*, 2017). In Brazil, Bandeira *et al.* (2009) had already undertaken a case study in which they concluded that the construction-supplier relationship was predominantly based on the relationship of domination. It was due to factors inherent to the sector, such as excellent bargaining power imposed by the construction companies. Thus it is proposed:

**H2:** here is deep integration in the relationship between builders and suppliers at the CSCC, and consequently, partnerships in early stages predominate.

Santos and Jungles (2008) point out three critical elements for forming partnerships: trust and cooperation, long-term relationships, and information sharing. When these elements are present, reinforce the authors. The probability of a positive result, such as the increase in added value and the reduction of waste, is more significant. Trust is based on the belief that the parties have an agreement not to act in opposition to shared interests. The partnership's success is related to non-opportunistic behavior (NEVES; GUERRINI, 2010; JU *et al.*, 2017). There must be confidence in the business to continue (Meng, 2012). They reduce conflicts, favor decision-making, and contain partners' propensity to give up the relationship (Bondinuba *et al.*, 2016).

Cooperation is essential in the processes of innovation, acquisition of technology, and opening up to differentiated markets, as it allows access to complement production, resources, and products, which enables the reduction of risks and or competitive advantages (ISATTO *et al.*, 2015; CHRISTOPHER, 2016). A relationship based on cooperation, allows partners to share resources jointly, promoting increased productive capacity and competitiveness (CHEUNG, 2011). Neves and Guerrini (2010) affirm the need for an information structure, with methods of creation, administration, and communication, to cooperate between companies. Guerrini and Vergna (2011) and Jeong *et al.* (2013) affirm that an active collaboration allows organizations to make better use of resources, increase income in general, and be an effective method of reducing opportunism, improving the partnership's quality. The pooling of resources allows companies to achieve better results than they could achieve in isolation. The long-term relationship element also guarantees greater trust; it is usually established through contracts. In addition to consolidating trust, the agreements allow for a shared strategic vision and greater collaboration between companies, as a right buyer will work together with his supplier, and vice versa, so that both remain financially strong (PURDY; SAFAYENI, 2000; VENSELAAR *et al.*, 2015). Santos and Jungles (2008) and Papadopoulos *et al.* (2016) add that long-term relationships allow the development of a shared strategic vision. They are established by agreeing on long-term contracts with automatic renewal as the expected results are achieved. A long-term relationship between two or more companies is essential to make the business's goals, leveraging each participant (ISATTO *et al.*, 2015; PAPAPOPOULOS *et al.*, 2016).

The partnership with the supplier is established by the long-term relationship between the suppliers and the companies to foster the participating companies' operational and strategic competencies to achieve continuous benefits (LI *et al.*, 2001; VENSELAAR *et al.*, 2015). According to Meng (2012), the joint and prolonged functioning (lasting partnerships) of the agents that make up the chain guarantees the full and correct execution of the construction site's activities. It ensures that there is no interruption in the supply of materials, reducing the incidence of contractual delays and fines, raising the organization's quality, and improving its image before the market. The third key element for forming partnerships is sharing information, which can take place from the specifications of products and projects, planning and purchasing schedules, and full access to a database of customers and or suppliers. This element drives inter-organizational integration, as it can enable the transfer of know-how and conduct training and meetings between buyers and suppliers (PURDY; SAFAYENI, 2000; MENG, 2012; ISATTO *et al.* 2015). Information sharing is related to the level by which critical information is passed on to the supply chain partner (PAPAPOPOULOS *et al.*, 2016). In a construction project, it is essential to unite the resources and efforts of the participants, since teamwork is fundamental for success, as it develops Cooperation, open communication and problem-solving together, also promoting something not very common in the sector, interdependence (CHEUNG, 2011; PAPAPOPOULOS *et al.*, 2016). According to Christopher (2016), supply chain management, focusing on relationships, trust, recognition, Cooperation, and information sharing, is essential for pursuing positive results, increased productivity, efficiency, and reduced unit costs. Therefore,

**H3:** In the relationship between construction companies and suppliers, there is a predominance of trust and cooperation, long-term and information sharing.

CSCC operates with many suppliers, marketing, and maintenance services, so inter-organizational relationships are a reality in the sector and have a significant impact on the performance of companies in the chain (BANDEIRA *et al.*, 2009; MENG, 2012; OTHMAN *et al.*, 2015). Ju *et al.* (2017) point out that the peculiar characteristics of the sector's production process generate efficiency problems in the supply chain, such as the lack of coordination and integration between the various functional aspects involved, due to the separation between the project and the construction of the enterprise. In this sense, supply chain management assists in integrating tasks and processes of the organizations involved in implementing an information system that allows, from start to finish, the visualization of the entire supply chain and the identification of activities that do not add value. (JEONG *et al.*, 2013; CHRISTOPHER, 2016). Partnerships collaborate with the integration of the supply chain, improving processes, increasing profit, and providing a sustainable competitive advantage (CRESPIN-MAZET; PORTIER, 2010).

Therefore, it presents itself as a hypothesis,

**H4:** There are fundamental and structuring processes for forming a strategic partnership between construction companies and suppliers at CSCC.

## MATERIALS AND METHODS

Two agents' perceptions in the civil construction supply chain were taken into account to achieve this work's objective: the suppliers and the construction companies. An applied, descriptive and quantitative research was carried out. Data were collected from 50 construction companies and 50 suppliers (of material) of the Brazilian SCC. The use of a non-probabilistic sample was due to convenience. Accessible members (companies that responded to the study's request) of the population were selected. However, as in Brazil - and also in the international scenario - the construction sub-sector has similar general characteristics, as indicated by Mello and Amorim (2009), it is considered that convenience sampling is not biased concerning the entire population. Therefore, the results obtained are representative of the universe studied. A questionnaire divided into two parts was administered as a data collection instrument: i) profile of the organization and the interviewee; ii) identify the elements that constitute the builder-supplier relationship (Chart 2). The questionnaire was developed based on the researched theoretical framework, using MERLI (1994), LAMBERT *et al.* (1996), LI *et al.* (2001), SANTOS AND JUNGLES (2008) and BANDEIRA *et al.* (2009).

A semantic differential scale was used to transform qualitative variables into quantitative variables, comprising a pair of adjectives or antonyms. Respondents distributed responses on a range of 1 to 7 points. According to Hair Jr *et al.* (2005), the most appropriate number of categories is at most seven levels. The results were analyzed descriptively, comparatively, to identify characteristics related to the supply chain management of construction and supplier companies. The data were treated with the aid of the R, Project for Statistical Computing (R) software.



To facilitate the analysis, measures that further summarize the data obtained were applied, which resulted in values representative of the entire series. Two types of tests were used: those of central position and those of dispersion. The position measures used are: mode, median, and arithmetic mean, and the dispersion measure applied was the standard deviation. A standard deviation  $<1$  means that the responses are consistent, and for a deviation  $>3$ , there is high variability in the answers (HAIR JR *et al.*, 2005). Besides, normality, homoscedasticity, and hypothesis tests were applied to assess the data's overall structure and verify whether there was a difference between construction companies and suppliers' responses. The probability of significance (p-value) was set at 5% to reject the statistical tests' null hypothesis (H0). Then, p values  $<0.05$  lead to the rejection of H0 and, consequently, to the existence of a statistically significant difference between them. The Shapiro-Wilk test was used to test the normality of the data. The H0 for this test is that the data is usually distributed, following a Gaussian distribution. The p-value listed at the end of this test was less than 0.05 for all variables, so the null hypothesis that the data follows a normal distribution was rejected for all variables (Table 1 - in bold).

Levene's test is less sensitive to deviations from normality than the Bartlett test. Based on the medians, it was used to test whether the groups (builder and supplier) had equal variances. Consequently, it would allow the use of specific statistical tests, such as analysis of variance, which requires the fulfillment of such an assumption (homogeneity of variance). The null hypothesis of this test is that the variances are homogeneous. According to the homogeneity of variance test (Table 1), the Wilcoxon test option was to use. It is a nonparametric alternative to the T-test for two unpaired samples, used, in this case, to compare the medians of the groups and test the H0 that the medians are equal. The result highlighted in bold in the last columns of Table 1 showed significant differences (different perceptions on the part of construction companies and suppliers) concerning V1, V2, V3, V4, V5, V10, V12, V17 and V18 (outliers).

## RESULTS

First, the sample was identified (companies surveyed and respondents). The sample comprised 50 construction companies and 50 companies supplying materials in the construction industry. Table 2 summarizes the characteristics of the organizations surveyed, portraying several unusual occurrences (in percentage). It was extracted from this first approach that most of the organizations surveyed are located in the Metropolitan Region of Curitiba (76% of construction companies and 62% of suppliers); have more than five years of foundation (82% and 86%); these are limited companies (76% and 70%). It is also noted that the construction companies are managed by both family members (38%) and professionals (40%). The suppliers are handled by professionals (58%). The construction companies' size (52%) have up to 19 employees, and suppliers company (32%) have 20 to 99 employees. The construction companies have PBQP-H (24%), and (54%) have no one accreditation. The suppliers have ISO 9001 certification (28%), and (58%) have no one. The respondents inferred from Table 2; the majority belong to the engineering department (50% - in construction companies) or sales (44% - in suppliers). It should be clarified that the supplying companies' vendors are specialized workers, in general,

engineers or company administrators. Then, the descriptive analysis itself began. Table 3 presents the results obtained about the measures of location and dispersion to variables V1 to V20. The negative sign in the "Difference" column means that the median of the construction companies' responses was lower than the median of the suppliers' answers. In the view of the construction companies, their relationship with suppliers has the following positive characteristics (V3, V4, V5, V7, V10, and V12): it is based on the expectation that suppliers will comply with the agreement; moderate confidence level; lasting relationship; forecast of acquisition of new contracts; pressure to increase quality; and a differentiated price policy offered by the supplier. However, the construction companies expressed (V9, V14, and V17) some deficient processes for forming strategic partnerships, namely: autonomy for the delivery of materials without order, supply exclusivity, and sharing cost information for your products/developments. Other processes need to be developed (V2, V13, V18, V19, and V20). These are the supplier's participation in the supply sector meetings with the company's technical staff, supplier's production program participation; operational relationship (consultancies, training, transfer of know-how, integration events, and information exchange); and the selection and evaluation of suppliers. Similar to the results obtained with the construction companies, but with higher intensity, the supplier's relationship with its customers/construction companies has the following positive characteristics (V1 to V5, V7, and V12): it is based on the expectation that the construction companies comply with the combined; moderate-high confidence level; lasting relationship; participation in the product development cycle of customers/construction companies; differentiated price policy; forecast of new contracts; and operational cooperation. On the other hand, suppliers signal for some deficit processes to form strategic partnerships, which are (V9, V14, and V17): autonomy in the delivery of materials without order, sharing cost information for your products, and execution of exclusive agreements with customer' s/construction companies. Other processes, now identified by suppliers that still need to be increased are (V13 and V18): interference in the construction company's production programs; and participation in supply sector meetings with the construction company's technical staff.

## DISCUSSION

The hypotheses (H1, H2, H3, and H4) were tested; the groups (builder and supplier) were compared. Position measures (medians) were analyzed in the search for differences. Consequently, they pointed out processes that deserve attention to achieve higher symmetry in the relationship, a fertile field for successful partnerships. The preliminary results outlined in Table 1 and confirmed through the Wilcoxon Rank Sum Test (Table 1), identify variables with discrepancy (significant difference), so H1 is supported. The results also indicate that there is an asymmetry in the construction-supplier relationship. It can be explained by the higher bargaining power (V11) perceived by the construction companies that conduct the relationship with their suppliers to meet their own needs better and by the apparent conformity/acceptance by the suppliers. However, this asymmetry is in line with the studies by Bandeira *et al.* (2009) and Venselaar *et al.* (2015), does not prevent the formation of partnerships, including lasting ones, after all, the supplier, in general, also benefits from the relationship.

Chart 1.Types of partnership customers versus suppliers

Authors	Feature	Type of Partnership
Merli (1994)	Three levels of an operational relationship due to the degree of development of what he calls comakership or partnership relationship, in which actions are taken together	Class III (ordinary supplier): negotiations based on minimum quality specifications; security issues; prices; individual short-term lots; and systematic inspections of supplies. Class II ("integrated" supplier or "operational" comakership): quality guaranteed and self-certified based on pre-established criteria; systematic improvement of the quality and prices of the products supplied; automatic replenishment and without a this-that intermediary; price adjustment based on agreed standards; constant supplies in small lots for "open" orders; long-term relationship and periodic reviews; overall responsibility for the products supplied; absence of receipt inspection; and supplier consulting and training. Class I (co-maker supplier or partner): global comakership with partnership characteristics; class II operational activities; cooperation in the design of new products/technologies; joint investments in planning and development and technological achievements; and continuous exchange of information on processes and products.
Lambert et al. (1996)	Three types of partnership conform to the involvement degree of the supplier with the company	Type I: Companies position themselves as partners and, with limitations, manage activities, and planning. The partnership has a short-term focus and covers only one area or sector of the organization. Type II: companies move beyond the management of activities, starting for integration. The partnership is long term. It covers various areas and areas of organizations. Type III: companies have a significant level of operational integration. Each company perceps the other as an extension of its own company. There is no deadline for the partnership to end.
Li et al. (2001)	Four stages of a partnership	Stage 1 (competitive): partner companies are in contact with each other in a single point; there is no search for commitment; there is a high degree of confrontation. The partnership exists only to meet contract requirements. It is the most common case in civil construction partnerships. Stage 2 (oriented towards cooperation): there are more exceptional communication and interaction between the parties due to the change in the organizations' format to adapt to the enterprise. Stage 3 (integrated): communications and interactions are intensified even further, sharing of knowledge and resources between partners; Stage 4 (strategic cooperation): a strategic alliance is formed that promotes effective communication, exchange of knowledge, access to technology, and resources. A partnership based on confidence and commitment is created.

Chart 2. Applied Survey– variable V1 a V20

V	Construction Company (1)/Suppliers (2)
V1	What is the commitment degree of the supplier (1) / the construction company (2) in the participation and contribution of the development cycle of the products of the supplier (1) / construction company (2)?
V2	Is there an operational relationship with your suppliers (1) / the construction company (2)?
V3	How confident is the company concerning its suppliers (1) / construction company (2)?
V4	What is the expectation that: your suppliers (1) / construction companies (2) will comply with what has been agreed?
V5	Is the relationship between the company and: the suppliers (1) / the construction company (2) lasting?
V6	Is there an automatic renewal of the supply contract when the expected performance and objective is achieved?
V7	Are there plans for new contracts with your current suppliers (1) / construction companies (2)?
V8	Do your suppliers (1) / construction companies, (2) encourage and invest in developing new technologies??
V9	Does the company have access to product costing: from its suppliers (1) / from the construction company (2)?
V10	Does the construction company pressure its suppliers to increase quality?
V11	How does the company perceive itself about the bargaining power over its suppliers (1) / construction companies (2)?
V12	Does the supplier offer a differentiated pricing policy for the construction company?
V13	Do your suppliers (1) / the construction company (2) interfere in the production programs?
V14	Does the company enter into exclusive supply agreements in its projects (1) / in the construction companies' plans (2)?
V15	Does the company have suppliers, (1) / construction companies, (2) representing equal to or more than 50% of the company's supply costs?
V16	Does the construction company require quality accreditation of its products and or processes from its suppliers?
V17	Do suppliers have the autonomy to deliver materials without orders?
V18	Does the supplier participate in meetings with the construction company's technical staff and supply sector?
V19	Does the construction company carry out a selection process to choose its suppliers?
V20	Does the construction company carry out a performance evaluation process for its suppliers?

The discrepancy variables (Table 1) relate to (participation): participation in the product development cycle (V1); operational relationship (V2); trust (V3); compliance with the agreed (V4); duration/longevity of the connection (V5); pressure to increase quality (V10); differentiated price policy (V12); autonomy to deliver materials without orders (V17); and participation in meetings with the technical staff and the

supply sector (V18). It was decided to graphically compare the groups with the aid of boxplots arranged in parallel in pairs to facilitate the visualization and analysis of the discrepancies (construction and supplier) for each analyzed variable. Graph 1 shows the representative boxplots for V1, V2, V3, V4, and V5. Graph 2 shows the representative boxplots for V10, V12, V17, and V18.

Table 1. Tests of Normality, Homocedacity and Hypotheses

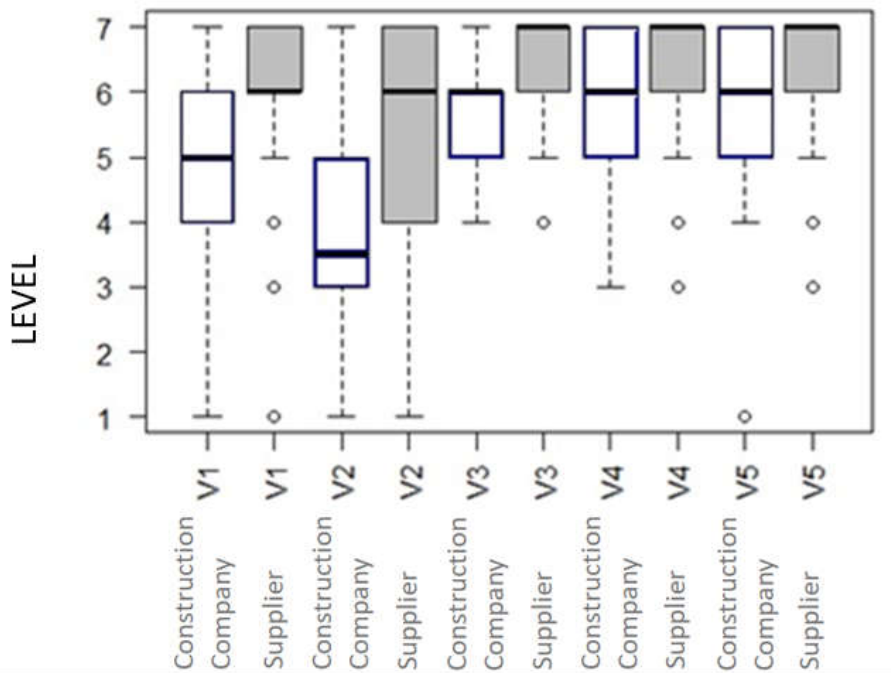
V	Normality ( <i>Shapiro-Wilk</i> ) p-value	Homocedacity ( <i>Levene</i> ) p-value	Test of Hypotheses ( <i>Wilcoxon</i> ) p-value
V1	3,171e-08	0,8409	7,227e-07
V2	6,551e-05	0,7612	1,859e-06
V3	1,993e-09	0,8919	8,598e-04
V4	5,322e-11	0,1238	3,691e-04
V5	5,599e-11	0,1292	0,001289
V6	9,465e-10	0,3820	0,2360
V7	8,441e-08	0,8079	0,1638
V8	2,054e-05	0,2578	0,819
V9	7,93e-10	0,8782	0,09123
V10	1,748e-06	0,0201	5,576e-04
V11	7,08e-05	0,4277	0,7905
V12	1,475e-08	0,7217	6,921e-05
V13	1,401e-06	0,1023	0,7095
V14	5,589e-11	0,8436	0,6569
V15	3,961e-08	0,5239	0,6277
V16	9,093e-06	0,0586	0,5890
V17	6,617e-15	0,0041	0,01852
V18	3,839e-06	1,0000	0,02576
V19	8,1e-05	0,4353	0,4868
V20	3,462e-06	0,6734	0,2229

Table 2. Researched companies and respondents profile

Features	Construction company	Supplier
Locality	Metropolitan Region of Curitiba – 76% Interior of Paraná, Santa Catarina – 4% Mato Grosso – 8% São Paulo, Minas Gerais – 2% Mato Grosso, Brasília – 2%	Metropolitan Region of Curitiba – 62% Interior of Paraná – 10% Santa Catarina – 18% São Paulo – 8% Rio Grande do Sul – 2%
Foundation	Up to 5 years – 12% Between 5 and 10 years – 16% Between 10 and 20 years – 34% More than 20 years – 32% Not answered (NA) – 6%	12% 22% 28% 36% 2%
Management type	Familiar – 38% Professional – 40% Mixed – 20% Other – 2%	28% 58% 14% 0%
Constitution type	Limited Company – 76% Mixed Capital – 8% Publicly Held – 4% Privately Held – 4% Other – 6% NA – 2%	70% 0% 6% 24% 0% 0%
Employees numbers	Until 19 employees – 52% Between 20 and 99 employees – 22% Between 100 and 499 employees – 8% More than 500 employees – 6% NR – 12%	12% 32% 20% 26% 10%
Accreditation	No one – 54% PBPQ-H – 24% ISO 9001 – 28% ISO 14000 – 2% Others – 2% NA – 4%	58% 6% 28% 10% 10% 0%
Job/Title	Construction company	Supplier
Director	42%	20%
Coordination	10%	8%
Manager	28%	32%
Engineer	50%	4%
Technician	2%	0%
Buyer	18%	0%
Salesman	0%	44%
Supervisor/ master	8%	0%
Analyst	0%	2%

Table 3. Results obtained (location and dispersion measures)

V	Construction company				V	Supplier				Differences (median)
	Mean	Mode	Median	Standard Deviation		Mean	Mode	Median	Standard Deviation	
1	4,76	5	5,00	1,41	1	6,10	7	6,50	1,23	-1,50
2	3,54	3	3,50	1,54	2	5,34	7	6,00	1,57	-2,50
3	5,72	6	6,00	0,83	3	6,36	7	7,00	0,85	-1,00
4	5,88	6	6,00	0,96	4	6,52	7	7,00	0,89	-1,00
5	5,66	6	6,00	1,26	5	6,28	7	7,00	0,96	-1,00
6	4,22	6	5,00	2,19	6	4,62	7	5,50	2,49	-0,50
7	5,50	6	6,00	1,15	7	5,84	7	6,00	1,30	0,00
8	4,70	5	5,00	1,45	8	4,90	6	5,00	1,58	0,00
9	2,88	1	2,50	1,77	9	2,52	1	1,00	2,16	1,50
10	5,30	6	6,00	1,54	10	3,72	1	3,00	2,08	3,00
11	4,80	6	5,00	1,23	11	4,40	4	4,00	1,48	1,00
12	5,16	6	5,00	1,09	12	6,06	7	7,00	1,41	-2,00
13	3,32	2	3,00	1,79	13	3,42	1	4,00	2,08	-1,00
14	2,84	1	2,00	2,06	14	2,76	1	2,00	2,22	0,00
15	3,54	1	4,00	2,22	15	3,70	1	3,50	2,36	0,50
16	4,74	5	5,00	1,59	16	4,42	7	5,00	2,04	0,00
17	1,48	1	1,00	1,07	17	2,48	1	1,00	2,15	0,00
18	3,18	1	3,00	1,83	18	4,04	5	4,00	1,86	-1,00
19	4,04	5	4,00	1,69	19	4,26	5	4,00	1,85	0,00
20	4,46	6	5,00	1,74	20	4,80	5	5,00	1,74	0,00

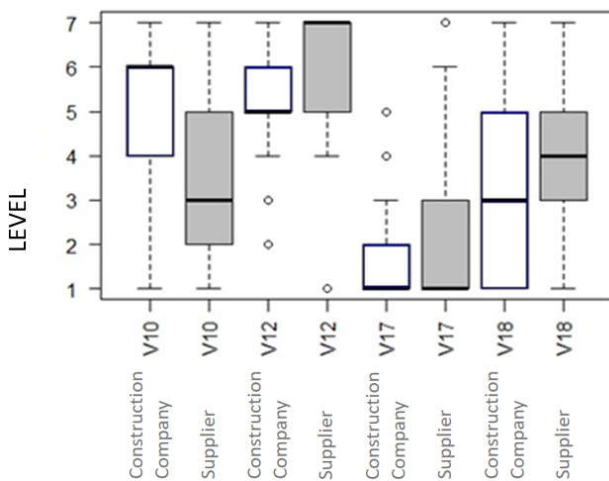


Graphic 1. Boxplots construction company and representative's suppliers of V1, V2, V3, V4 e V5

Despite the visual assessment of the variables in Graph 1 denouncing an absolute difference in the data's dispersion, this difference, as returned in the Levene Test (Table 1), is not statistically significant. Therefore, there is a certain homogeneity in the responses (construction company/supplier), which even have standard deviations (Table 3) from close values, which are similarly grouped around the mean. The discrepancy in responses (especially in variables V1 to V5), which are related to the essential elements proposed by Santos and Jungles (2008) - trust and cooperation, long-term relationship, and information sharing, shows the absence of true partnerships.

Unlike construction companies, suppliers refer to a higher level of confidence (V3 and V4). Besides, they consider themselves very committed (V1) in a fully lasting relationship (V5), while the construction companies perceive suppliers moderately committed in a not so long-lasting relationship. The most significant disagreement among respondents is the existence of an operational relationship (V2). Suppliers say they meet their customers' operational needs, while the construction company signals otherwise. From what is perceived, hypothesis H3 is not supported. The results indicate that the less confident builders do not recognize the cooperation, commitment, information sharing, and longevity





**Graphic 2. Boxplots construction company and representative's suppliers of V10, V12, V17 e V18**

that the more confident suppliers claim to have. The data are differently dispersed (significant difference) concerning V10 and V17 (Graph 2), as already pointed out in the Levene Test (Table 1). The suppliers' responses show more considerable variability and a higher standard deviation (Table 3). It was compared to the construction companies' values, which shows little cohesion in the suppliers' responses, evidencing even more significant heterogeneity in this group, besides, to denounce the existence of different types of construction-supplier partnerships. As for the outliers, although the identification of the causes of their occurrence is outside the scope of the present study, a plausible justification may be the CSCC's heterogeneity, especially about diversity (size, type, culture, organization, etc.) from supplier companies (the group with the highest outlier occurrence). The construction companies report exerting more significant pressure to increase quality (V10) than the suppliers claim to be charged for it (difference of 3 positions).

Therefore, they signal dissatisfaction concerning the services and products offered by suppliers. At the same time, they do not perceive this dissatisfaction or strongly believe in their services/products' quality. About the pricing policy (V12), suppliers attest to the existence (a fully developed process) of a differentiated strategy, but construction companies do not confirm this full existence. There are indications reinforced by outliers' presence, of the existence of a differentiated business relationship, with peculiar rights and conditions that vary from one contractor to another, however not applicable to all construction companies. There is a relative consonance between the groups regarding the little/non-existent autonomy to deliver materials without order (V17), which is opposed to the respondents' high levels of trust and commitment. It reveals a low level of involvement and cooperation among the participants in the chain, which precludes the existence of advanced partnerships, as proposed by Merli (1994), Lambert *et al.* (1996), and Li *et al.* (2001). As for participation in joint meetings (V18), the companies surveyed refer to medium to poorly developed processes, with suppliers claiming greater participation than that perceived by the construction companies. This discrepancy and low intensity in the answers denounce the lack of information sharing between the groups since the meetings are the primary means of indicating this element (PURDY & SAFAYENI, 2000). The global results show that builders and suppliers maintain an antagonistic and

purely commercial relationship, as identified by Beach *et al.* (2005). In the classifications of Merli (1994) and Lambert *et al.* (1996), respectively, are, therefore, standard suppliers and type I. The partnership, according to the classification of Li *et al.* (2001), is in the competitive stage. The results support H2. The relationship between builders and suppliers is poorly integrated, and, consequently, early-stage partnerships predominate. The research shows that the essential elements proposed by Santos and Jungles (2008) - trust and cooperation, a long-term relationship and information sharing - are not present in a practical, intense, predominant way, which makes it challenging to form strategic partnerships. H3 is rejected. There is, therefore, only a good business relationship between organizations. Builders and suppliers usually maintain a long-term relationship, often established through contracts, but without exploring the benefits of a shared strategic vision and greater collaboration between companies, as predicted by Purdy and Safayeni (2000). In general, the supplier seeks to sell its products to the construction company, without worrying about the performance, as a whole, of the sector's production chain, which, added to the low sharing of information, contributes to the lack of coordination and integration of the CSCC.

The purpose of this article is to identify essential processes for building strategic partnerships. In this sense, through the results obtained, the following fundamental and structuring processes were identified: participation of the supplier in meetings of the supply sector with the company's technical staff; operational relationship (consultancies, training, transfer of know-how, integration events and information exchange); supplier selection and evaluation processes; exclusive supply agreements; participation in the product development cycle; and differentiated price policy. The results support H4. The primary and structuring process in the formation of strategic partnerships should be added to the realization of a superior choice of suppliers, who, in the sequence, must have their performance evaluated. These processes, selection, and evaluation of suppliers promote meetings between the technical staff and the supply sector of the construction company with its suppliers, with more meetings favoring the establishment of a better inter-organizational operational relationship. The improvement of the operational relationship, in turn, intensifies the commitment of suppliers to participate and contribute to the development cycle of the construction company's products. A better functional relationship, with more significant commitment, raises the expectation of compliance with the agreement between the participants, increasing the inter-organizational relationship duration and leveraging investment in new technologies. Builder-supplier relationship trust measurement is done from the fulfillment's cooperation between organizations, relationships longer, and investment in new technologies. It is essential to highlight that the fundamental characteristic for the strategic partnership's construction is the quality of products/services offered by suppliers. Otherwise, there is no way to build a strategic partnership.

### Final Considerations

The management of CSCC encompasses all processes related to the product transformation flow, from raw materials to the distribution of finished products. The more integrated the chain, the higher the cooperation, the business synergy between its members, and the more efficient it will be in



production and costs. The integration of the chain, therefore, involves the strengthening of its links, especially with suppliers. One way to make this link reliable is to form partnerships. However, the partnership or strategic alliance, which is a management technique whose success depends, mainly, on the people who direct it (BRISCOE *et al.*, 2001), is not a simple task and requires that both parties work efficiently, to integrate and implement the processes that lead to their formation. The inter-organizational relationship that promotes integration - and, consequently, encourages partnerships is based mainly on three spheres: trust and cooperation, a long-term relationship, and information sharing. In this research, the processes related to the mentioned spheres were identified and analyzed. The results point to methods that must be developed to form partnerships. It also reveals that the SCC still has several deficiencies and limitations that impact its management's efficiency. The constructor-supplier relationship, in general, is based on purely commercial intentions and not on integration ideas. The conclusion is justified by the relationship asymmetry evidence in the relationship and the sharp dissonance of one participant's perception concerning another. The construction company does not realize the process development level that the supplier claims to deliver/exist. However, being the construction company, in general, the organization that orchestrates the supply chain, it can be said that there is deficiency and or lack of interest in this orchestration. On the other hand, the supplier is more committed to its financial results than the supply chain. Thus, to obtain higher efficiency in terms of production and costs, it is necessary that each participant, builder, and supplier, assume their role within the supply chain. The construction company needs to consider the orchestration (leadership) of the chain, and the supplier needs to be committed not only to individual results but globally.

## REFERENCES

- Bandeira, R. A. de M., Mello, L. C. B. de B., & Maçada, A. C. G. 2009. Relacionamento interorganizacional na cadeia de suprimentos: um estudo de caso na indústria da construção civil. *Produção*, São Paulo, 192, 376-387.
- Beach, R., Webster, M., Campbell, K. M. 2005. An evaluation of partnership development in the construction industry. *International Journal of Project Management*, 238, 611-621.
- Bemelmans, J., Voordijk, H., Vos, B., & Buter, J. 2012. Assessing buyer-supplier relationship management: Multiple case-study in the Dutch construction industry. *Journal of Construction Engineering and Management*, 1381, 163-176.
- Briscoe, G., Dainty, A. R., & Millett, S. 2001. Construction supply chain partnerships: skills, knowledge and attitudinal requirements. *European Journal of Purchasing & Supply Management*, 74, 243-255.
- Bondinuba, F.K., Edwards, D.J., Nimako, S.G., Owsusu-Manu, D., & Conway, C. 2016. Antecedents of supplier relation quality in the Ghanaian construction supply chain. *International Journal of Construction Supply Chain Management*, 61, 1-18.
- Cheung, Y. K. F. 2011. Relationship management as a strategy for supply chain engagement in the civil engineering construction industry PhD thesis, Queensland University of Technology. Retrieved from <https://eprints.qut.edu.au/46860/>
- Crespin-Mazet, F., & Portier, P. 2010. The reluctance of construction purchasers towards project partnering. *Journal of Purchasing and Supply Management*, 164, 230-238.
- Christopher, M. 2016. *Logistics & supply chain management*. Pearson: UK.
- Grove, E., Dainty, A., Thomson, D., & Thorpe, T. 2018. Becoming collaborative: a study of intra-organizational relational dynamics. *Journal of Financial Management of Property and Construction*, 231, 6-23.
- Guerrini, F. M. & Vergna, J. R. G. 2011. Um modelo de atores e recursos para redes de cooperação entre empresas em obras de edificações. *Produção*, São Paulo, 211, 14-26.
- Hair JR, J. F., Babin, B., Money, A. H., & Samouel, P. 2005. *Fundamentos de métodos de pesquisa em administração*. Porto Alegre: Bookman
- Isatto; E.L., Azambuja, M., Formoso, C.T. 2015. The role of commitments in the management of construction make-to-order supply chains. *Journal of Management in Engineering*, 314, 04014053-10.
- Jeong, J. G., Hastak, M., Syal, M., Hong, T. 2013. Framework of manufacturer and supplier relationship in the manufactured housing industry. *Journal of Management in Engineering*, 294, 369-381.
- Ju, Q., Ding, L., Skibniewski, Mirosław J. 2017. Optimization strategies to eliminate interface conflicts in complex supply chains of construction projects. *Journal of Civil Engineering and Management*, 1-15.
- Lambert, D. M., Emmelhainz, M. A., & Gardner, J. T. 1996. Developing and implementing supply chain partnerships. *The International Journal of Logistics Management*, 72, 1-18, <https://doi.org/10.1108/09574099610805485>
- Li, H, Cheng, E. W. L., Love, P. E. D., & Irani, Z. 2001. Co-operative benchmarking: a tool for partnering excellence in construction. *International Journal of Project Management*, 193, 171-179.
- Mello, L. C. B. de B. & Amorim, S. R. L. 2009. O subsetor de edificações da construção civil no Brasil: uma análise comparativa em relação à União Europeia e aos Estados Unidos. *Production Journal*, São Paulo, 19 2, 388-399.
- Meng, X. 2012. The effect of relationship management on project performance in construction. *International journal of project management*, 302, 188-198.
- Merli, G. 1994. *Comakership: A nova estratégia para os suprimentos*. Rio de Janeiro: Qualitymark.
- Neves, F. V. F. & Guerrini, F. M. 2010. Modelo de requisitos e componentes técnicos para a formação e gerência de redes de cooperação entre empresas da construção civil. *Gestão & Produção*, São Carlos, 171, 195-206.
- Othman, AA, Abd Rahman, S., Sundram, VPK, & Bhatti, MA. 2015. Modelling marketing resources, procurement process coordination and firm performance in the Malaysian building construction industry. *Engineering, Construction and Architectural Management*, 226, 644-668.
- Papadopoulos, G. A., Zamer, N., Gayialis, S. P., & Tatsiopoulos, I. P. 2016. Supply chain improvement in construction industry. *Universal Journal of Management*, 410, 528-534.
- Purdy, L. & Safayeni, F. 2000. Strategies for supplier evaluation: a framework for potential advantages and limitations. *IEEE Transactions on Engineering Management*, 474, 435-443.
- Santos, A.P.L. & Jungles, A.E. 2008. *Como gerenciar as compras de materiais de construção civil*. Diretrizes para a compra pró ativa. São Paulo: Pini Editora.

- Seth, D.; Nemani, V. K., Pokharel, S., & Al Sayed, A. Y. 2018. Impact of competitive conditions on supplier evaluation: a construction supply chain case study. *Production Planning & Control*, 29(3), 217-235. <https://doi.org/10.1080/09537287.2017.1407971>
- Simchi-Levi, D.; Kaminsky, P.; Simchi-Levi, E. 2010. *Cadeia de suprimentos projeto e gestão: conceitos, estratégias e estudos de caso*. Porto Alegre: Bookman Editora.
- Souza, A. L. D. 2014. *Parceria na construção civil: Um estudo do relacionamento entre construtoras e fornecedores*. Dissertação de Mestrado, Universidade Federal de Santa Catarina. Recuperado de <https://repositorio.ufsc.br/handle/123456789/132459>
- Venselaar, M., Gruis, V., & Verhoeven, F. 2015. Implementing supply chain partnering in the construction industry: Work floor experiences within a Dutch housing association. *Journal of Purchasing and Supply Management*, 21(1), 1-8. <https://doi.org/10.1016/j.pursup.2014.07.003>
- Vrijhoef, R. & Koskela, L. 2000. The four holes of supply chain management in construction. *European Journal of Purchasing & Supply Management*, 6, 169-178.

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