The Foundations of Relationships Buyer-Suppliers in Supply Networks at Free Economic Zones

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Abstract
The main purpose of this article was to broaden the debate about the factors conditioning both the structure and the content of ties in supply chain relations by including geo-economic variables. So, we analyzed the relationships between focal companies and local suppliers at the Manaus (Brazil) Free Economic Zone.

Keywords: Relationship Management, Supply Chain Collaboration, Network Theory.

Introduction

Relationship management is the focus of continually renewed interest in research about supply-chain management. On the theoretical plane, studies of supply chain management highlight the benefits of partnerships and relationships between suppliers and customers and its effects on company performance and that of the supply chain as a whole (Morgan and Hunt 1994, Stank et al. 2001, Barratt 2004, Kampstra et al. 2006, Matopoulos et al. 2007, Nyaga et al. 2010).

In this context, the theme of "relationships" allows important theoretical and practical progress to be made in consolidating understanding of Supply Chain Management (SCM), especially when theoretical approaches that are rarely used in SCM research are employed. This is especially true when these approaches are used in a complementary fashion in order to obtain a deeper understanding of a phenomenon so that it can used more effectively.

This is precisely the purpose of the current proposal, which analyzes relationships in global chains but where there are focal companies attracted by the public policies in effect in locations with different geo-economic conditions. This situation suggests the need to organize relationships according to specific models, and this has implications for the effectiveness of the aforementioned public policies.

During the 1960s, in order to adapt to this new economic situation, a number of developed and developing countries began to adopt procedures to facilitate production and

international trade (Souza 2005). One such procedure was to set up economic zones offering tax and customs exemptions. The purpose of these zones was to develop infrastructure that would attract foreign investment, new technology and create jobs and income in these countries.

Brazil has its own know-how in this area, due to the Manaus Free Economic Zone (MFEZ), which was initially conceived in the 1950s as a geopolitical project to safeguard national sovereignty in the Amazon region (Bomfim and Botelho 2009). This research was carried out in the MFEZ, which is nowadays called the Manaus Industrial Park (MIP). According to data provided by Suframa (2014), the companies in the MIP that received incentives ended 2013 with total sales of R$83.28 billion, 13.31% more than the previous year's figure of R$73.50 million.

As far as empirical aspects are concerned, the main reason for carrying out this research is the fact that, in the context of the MIP, there are gaps in the topic of "supply chain relationships". Studying relationships with local suppliers and identifying barriers to the attraction of strategic suppliers to industrial parks and free economic zones that are far from important centers of consumption and suppliers can help to strengthen the regional development model that is the object of this study. It may therefore help to guide the way development strategies are used to develop the MIP supply chain.

Furthermore, the contribution made by knowledge from other disciplines to the study of supply chain management, such as the foundations and concepts of Network Theory, widen opportunities for research and for deepening understanding about SCM (Skjoett-Larsen 1999).It is a fundamental axiom of Network Theory that the different actors -constituting the network are not independent but influencing each other (Borgatti and Li 2009).

In addition to this, such inter-organizational relationships deepen an organization's essential competencies while also driving progress in adverse environments (Johanson and Vahlne 2003, Friedman 2009, Pitelis and Teece 2009). In the context of supply chain management, Network Theory helps us to understand the dynamics of relationships throughout the supply chain (Skjoett-Larsen 1999).

Taking this theoretical context into account along with the empirical aspect, the principal aim of this research may be defined as, firstly of, all to determine the nature of the relationship between focal companies and local suppliers as regards collaboration and integration. And, secondly, the factors that lead strategic suppliers to be attracted to Industrial Parks/Free Economic Zones far from the main centers of consumption and suppliers.

Formulating the research question in an explicit manner is intended to improve understanding of the question of supply chain relationships, especially when they are encouraged by such public policies as, for example, fiscal policies. It is also intended to explain the extent to which these polices are successful in attracting chains which possess, at the very least, the two principal components of focal companies and their strategic suppliers In other words, it is intended to analyze situations where chains do not come into existence as a result of market forces.

Furthermore, since, as argued by Christopher (2007), it is also understood that competition no longer takes place between companies but between supply chains, regional development policies should be based on the Supply Chain Management paradigm in order to establish competitive chains that are able to attract focal companies and their strategic suppliers and not just isolated businesses. This aspect has an impact on the way that companies decide on the scale of their local and global operations.

Theoretical Foundations

This section seeks to present the theoretical framework forming the basis of the research, which has already been discussed in the section dealing with the constructs that will be used in the empirical part of the project.

From the theoretical point of view, this research seeks to improve understanding of relationships with suppliers in supply chains, specifically by concentrating efforts on Industrial Parks/Free Trade Zones that are far from important centers of consumption and suppliers and, especially, as regards supply chain integration and the factors leading to the attraction of strategic suppliers to these environments. It is also intended to show that provisional results indicate the need to discuss certain aspects of the supply chain organization in adverse environments, such as the logistical problems due to the location of the MIP.

The use of different theoretical approaches in SCM research represents significant progress in supply-chain management studies, since it redirects the units of analysis to the structures of network relationships (Martes et al. 2006, Martes 2009). Borgatti and Li (2009) add that using Network Theory to study focal company-local supplier relationships as social and organizational phenomena makes it possible to analyze the actors from a relational perspective, which increases the possibility of deepening theoretical understanding of SCM.

The above arguments encourage the use of this theoretical perspective to explain relations between focal companies and local suppliers in adverse logistic environments. According to this approach, it is extremely important to evaluate developments in these relationships in connection with supply chain integration and development of collaborative practices during the empirical part of the research.

Furthermore, integrating theoretical approaches in order to analyze social networks, supply-chain integration and collaboration brings this research into line with the tendencies to use both a multidisciplinary approach and different research methods in studies dealing with supply chain management (Skjoett-Larsen 1999, Boyer and Swink 2008, Golicic and Davis 2012). It also adds a regional dimension to the specific topic of the field of operations and, by placing it in the wider context of macro-economic policies, it puts it in the forefront of knowledge about this area at the international level.

The work carried out by Tichy et al. (1979) used the social network approach in organizational studies to analyze organizational behavior, based on the premise that the Social Network Analysis (ARS) approach is able to deal with the most diverse types of individual or organizational interactions, as well as making it possible to identify cause and effect within the structure of relationships.

Granovetter (1985) investigated the role of social networks in facilitating interaction across organizational boundaries. His social immersion approach was a direct criticism of the market emphasis and hierarchical dualism put forward by Williamson (1975).

Uzzi (1997) highlighted the benefits of the links between producers and suppliers in the women's clothing industry in New York in developing trust, not only in the case of partners in the supply chain but also for the segment as a whole. Uzzi's main argument is based on the premise that when there are risks it is necessary to create trust within the network. Powell (1990) supports this point of view by arguing that network structures are more agile, more flexible and possess superior expertise. In Powell's opinion (1990), networks have these properties because their actors trust each other. In other words, this trust comes about because of the mutual

relationships that are frequently built into the set of roles that constitute the ties between its actors and their shared expectations.

According to Galaskiewicz (2011), Network Theory is important for the management of inter-organizational relations between companies in a supply chain. At the same time, he emphasizes the challenge presented by the need to develop a global network theory for managing supply chains. Another of this author's concerns is the fact that inter-organizational relations are associated with different structures of governance.

Galaskiewicz (2011) also holds that network theory can increase the theoretical value of supply chain management. The links within the chain are important in order to build collaborative relationships between actors and can also facilitate confidence building, information exchange, and cooperation and coordination in the supply chain. According to this author, the challenge is to make it possible for Network Theory to deal with the complexities of supply chains.

Supply chains are, in fact, networks and not simply a collection of relationships between suppliers and customers. They frequently extend beyond international frontiers and different parts of the network may be under the jurisdiction of different political regimes. Some parts operate within individual structures of governance while others do not have this restriction (Gereffi 1994).

Methodology

In order to achieve these aims, our approach brings together Social Network theories and other paradigms that can help us to understand the formation and functionality of supply chains in terms of their relations based on collaboration and integration of processes.

This research was carried out in the Manaus Industrial Park (MIP). A multiple case study was carried out with focal companies with American, Brazilian, Chinese, Korean and Japanese nationalities. As unit of analysis we used the focal companies-suppliers relationships of the MIP and their first-tier suppliers, chosen according to their suitability. The subjects of the research were the individuals who are directly involved in management of the relationship in the supply chain, consisting of electronic focal companies and local suppliers (directors, managers and heads of department).

As regards the methodology used to carry out the research, we chose a quantitative research approach, complemented by a qualitative approach in order to explain both the relationships with local suppliers and the factors attracting strategic suppliers to Industrial Parks/Free Economic Zones far from the important centers of consumption and suppliers.

At the quantitative stage, descriptive in nature, the emphasis was on measuring the metrics/constructs previously defined in this project. The main focus in this phase was to ensure operationalization of the data-collection instruments for the local first-tier suppliers of the five focal companies under study.

A review of the literature indicated the constructs for supply chain integration, collaboration and Network Theory which were used to evaluate the degree of integration between focal companies and local suppliers.

The data collection phase of the research was carried out in two stages. The first was a semi-structured interview. After mapping the first-tier suppliers, the second stage consisted of a survey with a self-administered questionnaire to collect data from the local suppliers. During this

quantitative stage, the emphasis was on measuring the metrics/constructs already defined for carrying out this research.

The questionnaire was planned to allow data to be collected from the local first-tier suppliers while taking into account the possibility that one supplier may be part of the chain supplying all five of the focal companies under investigation. The Table 1 shows a summary of the metrics/constructs that was used.

Table 1 – Summary of the Quantitative Data-Collection Instruments

Theoretical Foundations	Metrics/Constructs
Social Network Analysis	- Classification of the Network (CN) - Centrality (C) - Roles (R) - Position (POS)
Supply-Chain Integration	- Information Sharing (IS) - Resource Sharing (RS) - Sharing of Risks and Returns (SRR) - Support from Top Management (AAA) - Supply-Chain Coordination (SCC) - Integration of Key Processes (IKP) - Relationship Management (RM) - Integrated Logistics (LI)
Collaboration	- Trust (T) - Collective Problem Solving (CPS) - Integrated Planning (IP) - Collective Development (CD) - Collective Learning (CL)) - Sharing of Advantages (PS/SA) - Flexibility (FLEX)

A 7-Point Likert Scale was used to measure the questions regarding each of the research constructs, in the following order of concordance: 1 – The practice is not present in the focal companies relationships, and 7 – The practice is commonplace in the focal companies relationships.

The connections between focal companies and local first-tier suppliers were analyzed using the UCINET 6.0 software, a tool used to process and classify relations. Exploratory factor analysis and descriptive statistics techniques (Hair et al. 2009) were used to measure the constructs proposed. Finally, the Content analysis was used as a method to analyze the information collected during interviews.

Results: Analysis and Implications

Characterization of Supply Chain under the Perspective of the Network Theory

Fifty local suppliers of first layer were identified as responsible for providing instruction manuals, Plastic and Metal Parts, Packaging, Labels, EPS pads, Adhesive Tapes, Remote Control Assembly and Printed Circuit Boards, Plastic Bags, Welding, SMD Adhesives and Power Cables. The supply chain has researched 116 effective relationships in a total of 2,975 potential relationships, through the combination of the five focal companies and 50 local suppliers of first

layer. This implies a density of 0.039, which represents only 3.9% of the potential of possible relationships, that is to say, the network density is low.

The nodes shown in Figure 1 show the identified relationships as well as the central actors in the supply chain searched.

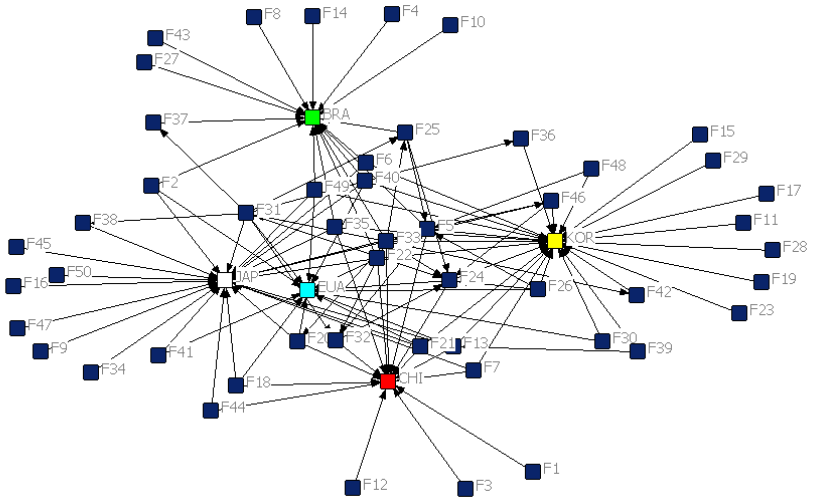

Figure 1 - Relationships in the Network and Central Actors of the Supply Chain

The five focal companies show themselves as key actors in the local supply chain. Test results confirm that a small number of companies dominate the network (Powell et al. 2005). In addition to the focal companies, few local suppliers determine the pace of change and the coordination of flows along the chain, and are presented as the main connecting actors within the local supply chain.

On the other hand, considering the results of Bonacich centrality test generated by UCINET, the local suppliers F32 - Injected Parts, F26 Steel parts and F-25, although they do not have a significant number of connections, they are those which have the links that enable more centrality within the network, that is, these local suppliers have the potential to establish relationships in the context of the supply chain searched.

The result of intermediation centrality test generated by UCINET highlights the role of intermediation of 9 local suppliers, especially the F5 and F24 suppliers, both suppliers of injected parts.

In addition, the cohesion test generated by the cohesion test UCINET has a low connectivity (4.9%) and a high fragmentation of the relationships between focal companies and local suppliers (95.1%).

Due to the high degree of technological sophistication of the sector, local suppliers play a supporting role in the supply chain of the global electronics industry. Relationships among partners occur unilaterally, there are no cohesive subgroups or clicks, and the relationships between focal companies and local suppliers have weak links.

Integration of Supply Chain and Deployment of Relationships

In order to measure the degree of integration of the supply chain and the breakdown of relationships among focal companies and local suppliers, 15 constructs were developed from the literature search as shown in Table 2.

Table 2 - Summary of Constructs Chain Integration and Collaboration

Theoretical Basis	Constructs	Number of Variables
Supply Chain Integration	- Information Sharion	13
	- Resource Sharing	11
	- Risks and Returns Sharing	14
	- Senior Management Support	13
	- Chain Cordenation	12
	- Processes Key Integration	9
	- Management of Relationships	12
	- Integrated Logistics	9
Collaboration	- Trust	9
	- Joint Resolution of Problems	8
	- Integrated Planning	8
	- Joint Development	7
	- Joint Learning	9
	- Profit Sharing	6
	- Flexibility	11

The data were processed using the Exploratory Factor Analysis (EFA) whose purpose was to reduce the original number of variables, through the extraction of independent factors, so that these factors may explain, in a synthesized form, the original variables of the research.

Before the application of the AFE, the data arrays were evaluated using the Kaiser-Meyer-Olkin test (KMO) and the Bartlett's test of sphericity. Furthermore, analysis of commonalities, the generation of anti-images matrices and the matrices of rotated components were applied to each of the proposed constructs. Tables 3 and 4 present a summary of the results of the factor analysis.

All constructs showed significant results for the sample adequacy test, as KMO> 80%, and all Bartlett significance tests also yielded significant values with p <0.0001. Where AFE extracted more than one component in the constructs used, the sum of the accumulated variance meets the criteria of the total variance explained by at least 60% (Hair et al. 2005).

Table 3 -AF Synthesis of Integration for the Supply Chain

Constructs	# Variables	KMO	Sig. Bartlett	# Factors	Variance Factor 1 (%)	Cumulative Variance Factors 1 and 2 (%)	Cumulative Variance Factors 1, 2 and 3 (%)
Information Sharion	13	0,903	< 0,0001	3	63,627	73,358	81,531
Resource Sharing	11	0,929	< 0,0001	1	81,318	-	-
Risks and Returns Sharing (1st round)	14	0,913	< 0,0001	2	66,974	79,949	-
Risks and Returns Sharing (2nd round)	13	0,916	< 0,0001	1	72,120	-	-
Senior Management Support	13	0,859	< 0,0001	2	56,955	73,086	-
Chain Cordenation	12	0,919	< 0,0001	2	75,193	83,858	-
Processes Key Integration	9	0,900	< 0,0001	1	76,320	-	-
Management of Relationships	12	0,803	< 0,0001	3	49,188	65,780	74,475
Integrated Logistics	9	0,952	< 0,0001	1	90,971	-	-

Table 4 -AF synthesis for Collaborative Practices

Constructs	# Variables	KMO	Sig. Bartlett	# Factors	Variance Factor 1 (%)	Cumulative Variance Factors 1 and 2 (%)	Cumulative Variance Factors 1, 2 and 3 (%)
Trust	9	0,856	< 0,0001	2	60,668	73,296	-
Joint Resolution of Problems	8	0,895	< 0,0001	1	72,707	-	-
Integrated Planning	8	0,924	< 0,0001	1	86,063	-	-
Joint Development	7	0,924	< 0,0001	1	88,388	-	-
Joint Learning	9	0,907	< 0,0001	1	82,404	-	-
Profit Sharing	6	0,892	< 0,0001	1	89,916	-	-
Flexibility	11	0,926	< 0,0001	2	67,580	78,014	-

The results of this research phase indicate a low degree of integration of electronics supply chain sub-sector of the PIM. The degree of local supply chain integration had an average of 2.61, considering the result of 8 constructs used to measure the degree of the chain integration. All focal companies surveyed showed results lower to 3.5 (average value at Likert scale used). The focal company with Brazilian nationality was the one with the best individual result, averaging 2.95. However, no significant differences were observed in the average obtained by the five focal companies surveyed (P-value <0.05).

Moreover, measuring the constructs that investigated the breakdown of relationships among focal companies with local suppliers, the survey results indicate that most relationships are still in the early stages of supply development chain.

The construct *Trust* was the one that had the best assessment of the 7 constructs used to investigate the collaborative practices between focal companies and local suppliers. All the focal companies surveyed achieved degrees between 4 and 5 to measure this construct.

The collaborative stage between suppliers and customers requires high levels of trust among partners (Spekman et al. 1998). To the extent that this level is reached, the relationships are strengthened and they create an essential condition for the development of other collaborative practices.

Confidence levels observed in the search results, did not allow the deployment of relationships between focal companies and first layer local suppliers for the collaborative stage. The collaborative practices among the five focal companies with its first layer of local suppliers are still incipient and restricted to few relationships.

In measuring the other constructs, all the focal companies surveyed obtained results between 2 and 3, similar to those observed in assessing the degree of the integration between focal companies and local suppliers.

The collaborative stage in the context of the local supply chain is restricted to relationships of local suppliers F5, F10 and F33 with the focal company of Brazilian nationality. With the exception of the results obtained by the focal firm with Brazilian nationality (average = 2.81), the survey results indicate that there are significant differences in averages obtained by the other four focal companies surveyed (P-value <0.05).

The survey results also indicate the need to maximize the trust links between focal companies and local first-layer suppliers in order to promote the development of other collaborative practices among partners, and promote the integration of the local supply chain.

Conclusions and Contributions

The integration of theoretical approaches and the multidisciplinary involving the supply chain management (Boyer and Swink 2008, Golicic and Davis 2012) oxygenates the research in the field of operations. By including geo-economic variables, this research sought to broaden the debate about the factors conditioning supply chain relations, as regards both the structure and content of ties. In case the current research, the results contribute to the advancement of understanding to the relationships with supply chain suppliers in peculiar conditions, well as used the economic discussions with new lenses to evaluate and stimulate its effectiveness as development policies.

The model of regional development, while solution designed for solving economic and geopolitical issue from distant regions or devoid of advantages, in the referred case, the Brazilian Amazon, supported on granting fiscal incentives, succeeded in attracting important global players of several industry segments.

However, the study indicated the weakness of the attraction model in the supply chain approach: attracted isolated companies who did not bring the expected aggregate value to the location, once the main suppliers not followed. The suppliers established locally are responsible for low complexity items and low value added, while the strategic supplies for the final assembly of electronic goods are imported.

It is hoped that the results of the research not only make a contribution from the theoretical point of view by using a new theoretical perspective to analyze the data but that it also does so in an very practical manner for both the public and private sectors. As far as the private sector is concerned, the results may indicate ways of improving competitiveness in the chains on the basis understanding the structure of the chain and the content of the relationships that increase the potential for value creation for its members.

In the case of the public sector, it is hoped that the research can provide a basis for public regional development policies that will generate jobs and income so that incentives for setting up or expanding companies take a wider context for competitiveness into consideration; one that is related to the logic of supply chains instead of being based on an analysis of the potential of one single company.

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